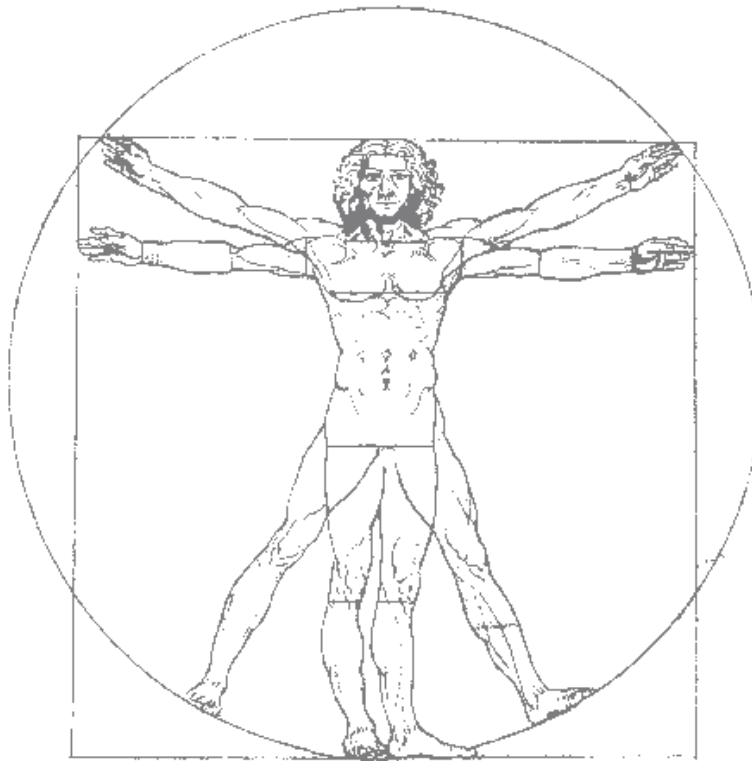


SURGICAL SCIENCES
Twenty-Ninth Annual
Residents' and Fellows'
RESEARCH DAY

WAKE FOREST SCHOOL OF MEDICINE



NOVEMBER 4, 2021

Research Day Chairperson

Reese Randle, MD



Wake Forest[®]
School of Medicine

In keeping with the mission of the School of Medicine to maintain extensive research programs, Surgical Sciences is proud to announce its 29th Annual Research Day. From its humble beginning in the early 1990's to the very large symposium of today, the Residents' and Fellows' Research Day has grown with the Surgical Sciences. This day is an opportunity to display and recognize the depth and breadth of research within Surgical Sciences; not only to our peers in the surgical departments, but to the entire population of the Medical Center.

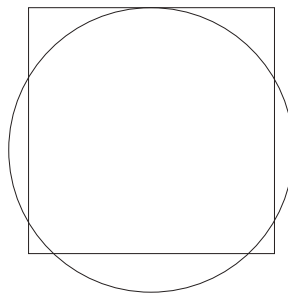
Students from both medical and graduate programs; residents, and fellows present data on activities, projects and applications which cover a broad spectrum ranging from the very basic to clinically applied research and the testing of innovative procedures or medications in patients. While the posters are presented by the trainees of Surgical Sciences, this is a celebration of the research carried out by residents, fellows, graduate students, medical students, Ph.D. researchers, surgeons and other dedicated research staff.



In recognition of the need to balance the dual goals of promoting effective scientific collaborations through open sharing of early stage results, on the one hand, and promoting commercialization in the public interest through intellectual property of research developments, on the other, the Surgical Sciences Research Day is conducted as a “closed meeting.” Accordingly, you acknowledge and agree that by participating in the event, you will receive and maintain any unpublished information or materials in confidence until such time as the information or materials are published or otherwise made publically available by the originating investigator.

SCHEDULE OF ACTIVITIES

- 11:30 am – 1:00 pm..... Set Up Posters
Commons Conference Rooms 1, 2, & 3
G and E Floor, Nutrition Center
- 1:00 pm – 2:00 pm..... Research Lecture
Rebecca Sippel, MD, FACS
“The Challenges of Running a Surgical
Clinical Trial: The Road to Success is an
Obstacle Course”
Babcock Auditorium
E Floor, Gray Building
- 2:00 pm – 4:00 pm..... Judging of Posters and Reception
Commons Conference Rooms 1, 2, & 3
G and E Floor, Nutrition Center



KEYNOTE SPEAKER



Rebecca Sippel MD, FACS

Professor of Surgery

Chief, Division of Endocrine Surgery

Vice Chair of Academic Affairs and Professional Development

University of Wisconsin-Madison

Rebecca Sippel, M.D., FACS, is a tenured Professor of Surgery, Chief of the Division of Endocrine Surgery, and Vice Chair of Academic Affairs and Professional Development at the University of Wisconsin. She is a nationally recognized leader in the field of endocrine surgery. She is currently serving as the program director for the Endocrine Surgery Fellowship at the University of Wisconsin. She is past Secretary of the American Association of Endocrine Surgeons and past President of Association for Academic Surgery. She has a highly productive clinical research program focusing on the diagnosis and management of patients with endocrine disorders and the outcomes of patients after surgery. She is currently PI on an R01 funded randomized controlled trial examining the utility of prophylactic central neck dissection for patients with clinically node negative thyroid cancer.

SURGICAL SCIENCES

DEPARTMENT CHAIRMEN:

Edward H. (Ted) Kincaid M.D.Department of Cardiothoracic Surgery
J. Wayne Meredith, M.D.Department of General Surgery
Charles L. Branch, Jr., M.D.Department of Neurosurgery
Craig M. Greven, M.D.Department of Ophthalmology
L. Andrew Koman, M.D.Department of Orthopaedic
J. Dale Browne, M.D.Department of Otolaryngology
Lisa David, M.D.Department of Plastic and Reconstructive Surgery
Anthony Atala, M.D.Department of Urology
Matthew Edwards, M.D.Department of Vascular and Endovascular Surgery

RESEARCH DAY 2021 PLANNING COMMITTEE

HOST DEPARTMENT- GENERAL SURGERY

J. Wayne Meredith, M.D.Chair, Department of General Surgery
Reese Randle, M.D.Chairperson, Department of General Surgery
James Jordan, Ph.D.....Co-Chairperson, Department of Cardiothoracic Surgery

Committee Members

Lydia DurrHypertension & Vascular Research
Shanna J. Ellison.....Hypertension & Vascular Research
Jennifer Hinson.....Department of General Surgery
Kenya Little.....Hypertension & Vascular Research
Sarah P. Smith, C.A.P.....Hypertension & Vascular Research
Emily Southern.....Department of General Surgery
Pam Stafford.....Hypertension & Vascular Research

PAST KEYNOTE SPEAKERS

1993	Frank W. LoGerfo, M.D. Chief, Division of Vascular Surgery Harvard Medical School	2002	W. Randolph Chitwood, Jr., M.D. Professor and Chairman Department of Surgery East Carolina University School of Medicine
1994	James A. O'Neill, Jr., M.D. C. E. Koop Professor of Pediatric Surgery University of Pennsylvania School of Medicine	2003	L. D. Britt, M.D., M.P.H. Brickhouse Professor of Surgery Chairman, Department of Surgery Eastern Virginia Medical School
1995	James Patrick O'Leary, M.D. Isidore Cohn, Jr., Professor and Chairman, Department of Surgery LSU School of Medicine	2004	Arthur Kellermann, M.D., M.P.H. Professor and Chairman Department of Emergency Medicine Director, Center for Injury Control Rollins School of Public Health Emory University Atlanta, Georgia
1996	Joseph A. Smith, Jr., M.D. William M. Bray Professor and Chairman Department of Urologic Surgery Vanderbilt University School of Medicine	2005	James Urbaniak, M.D. Virginia Flowers Baker, Professor and Chair Emeritus Division of Orthopaedic Surgery Duke University Medical Center Durham, NC
1997	Robert Martuza, M.D. Professor and Chairman Department of Neurosurgery Georgetown University Hospital	2006	William D. Steers, M.D., F.A.C.S. Professor and Chairman Department of Urology University of Virginia Charlottesville, Virginia
1998	John M. Fredrickson, M.D. Professor of Otolaryngology Washington University School of Medicine	2007	Mitchell Berger, M.D. Professor and Chairman Department of Neurological Surgery Kathleen M. Plant Distinguished Professor Director, Brain Tumor Surgery Program University of California San Francisco
1999	Joseph E. Murray, M.D. 1990 Nobel Laureate in Medicine Professor Emeritus of Plastic Surgery Brigham and Women's Hospital Harvard Medical School	2008	Raphael Lee, M.D. Professor of Surgery (Plastic) Professor of Medicine (Dermatology) Professor of Organismal Biology and Anatomy Professor of Molecular Medicine University of Chicago Medical Center
2000	C. Thomas Caskey, M.D., F.A.C.P. President and C.E.O. Cogene Biotech Ventures		
2001	Elizabeth G. Nabel, M.D. Scientific Director, Clinical Research National Heart, Lung and Blood Institute National Institutes of Health		

PAST KEYNOTE SPEAKERS

2009	Alexander W. Clowes, M.D, Professor of Vascular Surgery V. Paul Gavor – Helen S. and John A. Schilling Endowed Chair in Vascular Surgery The University Washington	2017	Micheal T. Longaker, M.D, M.B.A., F.A.C.S. Deane P. and Louise Mitchell Professor and Vice Chair Co Director, Stanford Institute for Stem Cell Biology and Regenerative Medicine Director, Children's Surgical Research Director, Program in Regenerative Medicine Professor, by Courtesy, of Bioengineering Professor, by Courtesy, Department of Materials Science and Engineering Stanford University School of Medicine Lucile Salter Packard Children's Hospital
2010	Jonas T. Johnson, M.D. Professor of Otolaryngology Eugene N. Myers, M.D. Chair in Otolaryngology University of Pittsburg School of Medicine		
2011	Marco Zarbin, M.D., Ph.D., F.A.C.S. Professor of Ophthalmology & Visual Science The University of Medicine & Dentistry New Jersey Medical School	2018	Todd E. Rasmussen, M.D., F.A.C.S. Colonel USAF MC Harris B. Shumacker, Jr. Professor of Surgery Associate Dean for Research F. Edward Hébert School of Medicine Uniformed Services University
2012	Paul Sobotka, M.D., F.A.C.P., F.A.C.C. Professor of Medicine / Cardiology The Ohio State University Chief Medical Officer, Coridea-NC1		
2013	Vindo H. Thourani, M.D. Associate Professor of Surgery, Division of Cardiothoracic Surgery Department of Surgery Emory University School of Medicine.	2019	Andreas K. Lauer, M.D. Professor and Chair Department of Ophthalmology Oregon Health & Science Universtiy
2014	Regis J. O'Keefe, M.D., Ph.D. Professor and Chair Orthopaedic Surgery Washington University School of Medicine St. Louis, Missouri	2020	Ana H. Kim, M.D. Director, Cochlear Implant Program Associate Professor, Department of Otolaryngology/Head & Neck Surgery Columbia University Medical Center
2015	Ralph V. Clayman, M.D. Professor, Department of Urology Dean, Emeritus University of California, Irvine School of Medicine Irvine, California		
2016	Andres Lozano, M.D., Ph.D., FRCSC, FRSC, FCAHS Professor and Chairman, Dan Family Chair in Neurosurgery RR Tasker Chair in Functional Neurosurgery Canadian Research Chair in Neuroscience (Tier 1) University of Toronto		

PREVIOUS AWARD RECIPIENTS

CLINICAL RESEARCH

GOLD MEDAL

1993	Tim Dersch, M.D. Plastic and Reconstructive Surgery
1994	Raymond Poore, M.D. Urology
1995	Preston R. Miller, M.D. General Surgery
1996	L. Andrew Eskew, M.D. Urology
1997	S. Iyer, Ph.D. Hypertension Center
1998	Alan Burke, M.D. Otolaryngology
1999	Charles J. Rosser, M.D. Urology
2000	Gregory S. Cherr, M.D. General Surgery
	Dean DeRoberts, M.D. Plastic Surgery Resident
2001	Matthew S. Edwards, M.D. General Surgery Fellow
2002	Jonathan C. Hundley, M.D. General Surgery Resident

SILVER MEDAL

R. Bradley Thomasson, M.D. General Surgery
Anthony Seaton, M.D., Ph.D. Urology
L. Andrew Eskew, M.D. Urology
John P. Little, M.D. Otolaryngology
A. J. C. Burke, M.D. Otolaryngology
Dom Coric, M.D. Neurosurgery
Jonathon Deitch, M.D. General Surgery
Todd R. Reulbach, M.D. Otolaryngology
Sanford G. Duke, M.D. Otolaryngology
Marc. M. Malek, M.D. Plastic and Reconstructive Surgery
Steven D. Wray, M.D. Neurosurgery Resident
Tina Singh, M.D. Ophthalmology Fellow
Jeffrey McNeil, M.D. CT Surgery Fellow

CLINICAL RESEARCH continued

GOLD MEDAL

- 2002 Phillip S. Moore, M.D.
 General Surgery
 Resident
- Claire Sanger, M.D.
 Plastic and Reconstructive Surgery
 Resident
- James D. Maloney, M.D.
 CT Surgery
 Fellow
- 2003 J. A. Veys, M.D.
 Urology
 Resident
- D. Wilson, M.D.
 General Surgery
 Fellow
- 2004 Catherine J. Rees, M.D.
 Otolaryngology
 Resident
- Jeffrey A. Travis, M.D.
 Cardiothoracic Surgery
 Fellow
- Annemarie Relyea-Chew, B.S.
 Emergency Medicine
 Student
- 2005 Dean DeRoberts, M.D.
 Plastic and Reconstructive Surgery
 Resident
- Eric S. Gwynn, M.D.
 Urology and Sticht Aging Center
 Resident
- Barnaby Dedmond, M.D.
 Orthopaedics
 Fellow

SILVER MEDAL

- Michael R. Goins, M.D.
 Otolaryngology
 Resident
- Matthew M. Mondt, M.D.
 General Surgery
 Resident
- Jeffrey A. Travis, M.D.
 General Surgery
 Fellow
- Jeffrey David Pearce, M.D.
 General Surgery
 Resident
- David Cole, M.D.
 Orthopaedics
 Resident
- Hiroshi Yokoyama, M.D.
 Hypertension and Vascular Disease Center
 Fellow
- R. Shayn Martin, M.D.
 General Surgery
 Resident
- Christina M. Plikaitis, M.D.
 Plastic and Reconstructive Surgery
 Resident
- Graham Bundy, M.D.
 Cardiothoracic Surgery
 Fellow

CLINICAL RESEARCH continued

GOLD MEDAL

2006	Oliver Adrian Varban, M.D. General Surgery Resident
	Adrian Lata, M.D. Cardiothoracic Surgery Fellow
2007	Christina M. Plikaitis, M.D. Plastic and Reconstructive Surgery Resident
	Rajinder Singh, M.D. General Surgery and Internal Medicine Fellow
	Cheryl Onwuchuruba Orthopaedics Student
2008	Jeff Carter, M.D. General Surgery Resident
	Rajinder Pal Singh, M.D. General Surgery Fellow
	Joshua Matthew Cooper Orthopaedic Surgery Student
2009	Jeff Carter, M.D. General Surgery Resident
	Luke Neff, M.D. General Surgery Resident
	Phillip Moore, M.D. Vascular and Endovascular Surgery Fellow

SILVER MEDAL

2006	Daniel Barnes, M.D. Emergency Medicine Resident
	George D. Chloros, M.D. Orthopaedic Surgery and Neurology Fellow
	Matthew T. Cline Orthopaedics Student
2007	Ellen Chance Sanders, M.D. Ophthalmology Resident
	William Todd Stoeckel, M.D. Plastic and Reconstructive Surgery Resident
	Joe Gonzalez-Engle Emergency Medicine Student
2008	Christina M. Plikaitis, M.D. Plastic and Reconstructive Surgery Resident
	Rajinder Pal Singh, M.D. General Surgery Fellow
	Stephanie Lareau Emergency Medicine Student
2009	Jordan Wallin, M.D. Otolaryngology Resident
	Roche de Guzman, Ph.D. Institute for Regenerative Medicine Fellow

CLINICAL RESEARCH continued

GOLD MEDAL

2009	Kerry Danelson Plastic Surgery Student
2010	Robert D. Becher, M.D. General Surgery Resident Thomas Sarlikiotis, M.D. Orthopaedics Fellow Kevin Shamburg Orthopaedics Student
2011	Jade M. Nunez, M.D. General Surgery Resident Billy G. Chacko, M.D. Vascular and Endovascular Surgery Fellow W. Parker Abblitt, B.S. Orthopaedic Surgery Student
2012	Mark Witcher, M.D. / Ph.D. Neurosurgery Resident Billy G. Chacko, M.D. Cardiology, Ophthalmology, Cardiovascular Epidemiology Fellow Richard Kao Otolaryngology Student

SILVER MEDAL

Babak Yekta Emergency Medicine Student
Jeffrey Carter, M.D. General Surgery Resident Jaehyun Kim, Ph.D. Institute for Regenerative Medicine Fellow Amber Campbell Plastic Surgery Student
James T. O'Neil, M.D. Otolaryngology Resident Hamza Rana, M.D. Vascular and Endovascular Surgery Fellow Bronwyn Russell, B.S. Orthopaedic Surgery Student
Tim Fife, M.D. Otolaryngology Resident JaNae Joyner, Ph.D. Hypertension and Vascular Research Center Fellow Wayne Chen Orthopaedics Student

CLINICAL RESEARCH continued

GOLD MEDAL

2013	Benjamin Schmidt, MD Cardiothoracic Resident
	Kelly Kempe, MD Vascular and Endovascular Fellow
	Ashley Wagoner, BS Hypertension & Vascular Research Center Student
2014	Andrea Doud, M.D. General Surgery Resident
	Alejandro Marquez-Lara, M.D. Orthopaedics Fellow
	Ashley Wagoner, B.S. Hypertension and Vascular Research Center Student
2015	Brian Bones, M.D. Radiology Resident
	Hany El-Hennawy, M.D. Surgery - Transplant Fellow
	Amber Carrier, Ph.D Surgery - Transplant Student

SILVER MEDAL

Andrea Doud, MD General Surgery Resident
Imran Choudhry, MD Orthopaedics Fellow
Matthew Rohlfing, BS Orthopaedics Student
Reese Randle, M.D. General Surgery Resident
Mark Witcher, M.D. Neurosurgery Resident
Hany El Hennawy, M.D. General Surgery Fellow
Jia Hao Liang, B.S. General Surgery Student
Ryan Rebowe, M.D. Plastic and Reconstructive Surgery Resident
Bruce Chung, M.D. General Surgery - Trauma Fellow
Ashley Wagoner, B.S. Hypertension and Vascular Research Student

CLINICAL RESEARCH continued

GOLD MEDAL

2016	Konstantinos Chouliaras, MD General Surgery-Oncology Resident
	Nima Pourhabibi Zarandi, MD Institute for Regenerative Medicine Fellow
	Hayden Holbrook, BS Orthopaedic Surgery Student
2017	Olivia Priest, MD Plastic and Reconstructive Surgery Resident
	David Harriman, MD General Surgery-Transplant Fellow
	Tyler Callese, BS Radiology/Vascular and Interventional Radiology Student
2018	Robert C. Siska, MD Plastic and Reconstructive Surgery Resident
	David Harriman, MD General Surgery-Transplant Fellow
	Mike C. Lin, BS Cardiothoracic Surgery Student
	Lindsay Jones Allred, MD Plastic and Reconstructive Surgery (Educational Science) Resident
2019	Christine Velazquez, MD Plastic and Reconstructive Surgery Resident

SILVER MEDAL

Mija Khan, MD Plastic and Reconstructive Surgery Resident
Baha Alradawna, MD General Surgery-Transplant Fellow
Alexandra Goodwin, BS Orthopaedic Surgery Student
Konstantinos Chouliaras, MD General Surgery-Oncology Resident
Robert Ferguson, MD Cardiothoracic Surgery Fellow
Heather Barber, BS Institute for Regenerative Medicine Student
Konstantinos Chouliaras, MD General Surgery-Oncology Resident
Ioannis Kontopidis, MD Cardiothoracic Surgery Fellow
Tracey Pu, BS Cardiothoracic Surgery Student
Suman Medda, MD Orthopaedic Surgery Resident

CLINICAL RESEARCH continued

GOLD MEDAL

2019	Adam Campman Nelson, MD General Surgery Fellow
	R. Andrew Hesse, BS Surgery-Ophthalmology Student
	Thomas N. Steele, MD Plastic and Reconstructive Surgery (Educational Science) Resident
2020	Mija Khan, MD Plastic and Reconstructive Surgery Resident
	Christine Velazquez, MD General Surgery Fellow
	Vanessa Lukas, BA General Surgery-Urology Student

SILVER MEDAL

David Hobson, MD Cardiothoracic Surgery Fellow
Harper Wilson, BS/BA Otolaryngology Student
Jungwon Park, MD, PhD Plastic and Reconstructive Surgery Resident
Shiny Rajan, PhD Institute for Regenerative Medicine Fellow
Ishetta Madeka, BA General Surgery-Oncology Student

BASIC RESEARCH

GOLD MEDAL

1993	Dudley Hudspeth, M.D. Cardiothoracic Surgery
1994	David Pollock, M.D. Orthopaedic Surgery
1995	James Jordan, B.S. Cardiothoracic Surgery
1996	Stephen Troum, M.D. Orthopaedic Surgery
1997	David Major, M.S. Plastic and Reconstructive Surgery
1998	Wade J. Sexton, M.D. Urology
1999	Jung-Soo Kim, M.D. Otolaryngology Dickson Schaeffer, M.D. Orthopaedic Surgery
2000	D. Nicole Deal, M.D. Orthopaedic Surgery
2001	Claire Sanger, D.O. Plastic Surgery and Reconstructive Surgery Resident LioMar A. Alvarez, Ph.D. Hypertension & Vascular Research Center Fellow
2002	Cassandra A. Lee, M.D. Orthopaedic Surgery Resident Atsushi Sakima, M.D. Hypertension & Vascular Disease Center Fellow

SILVER MEDAL

Ibrahim Benter, Ph.D. Hypertension and Vascular Research Center
Virginia Newman, M.D. General Surgery
Xiao Wei Lu, M.D. Hypertension and Vascular Research Center
Robert D. Riley, M.D. General Surgery
Zhongyu Li, M.D. Orthopaedic Surgery
Timothy Oskin, M.D. General Surgery
M. Todd Kirby, Ph.D. Neurosurgery
Cassandra Lee, M.D. Orthopaedic Surgery Resident
Tina Singh, M.D. Neurobiology & Anatomy Fellow
Jason A. Castle, M.D. Orthopaedic Surgery Resident
Ojas Shah, M.D. Urology Fellow

BASIC RESEARCH continued

GOLD MEDAL

- 2002 Jason Hong
Hypertension & Vascular Disease Center
Student
- 2003 Cassandra Lee, M.D.
Orthopaedic Surgery
Resident
- R. Richmond, Ph.D.
Hypertension & Vascular Disease Center
Fellow
- P. Garabelli
Hypertension & Vascular Disease Center
Student
- 2004 Jian Shen, M.D., Ph.D.
Orthopaedic Surgery
Resident
- Anastasios Papadonikolakis, M.D.
Orthopaedic Surgery
Resident
- Michiya Igase, M.D.
Hypertension and Vascular Disease Center
Fellow
- David R. Soto-Pantoja, B.S.
Hypertension and Vascular Disease Center
Student

SILVER MEDAL

- Jing Li
General Surgery
Student
- Matt Camp
Plastic Surgery
Student
- G. A. Elsaidi, D.O.
Orthopaedic Surgery
Resident
- A. Sakima, M.D.
Hypertension & Vascular Disease Center
Fellow
- Stevco Stefanoski
Otolaryngology
Student
- L. Anton
Hypertension & Vascular Disease Center
Student
- Jill Wykosky, B.S.
Neurosurgery
Resident
- Liliya M. Yamaleyeva, M.D.
Hypertension and Vascular Disease Center
Fellow

BASIC RESEARCH continued

GOLD MEDAL

- 2005
- Matthew Bolinger, M.D.
Otolaryngology
Resident
- Yagna Jarajapu, Ph.D.
Regenerative Medicine
Fellow
- Jill Wykosky, B.S.
Neurosurgery
Student
- Steven J. Newton
Hypertension and Vascular Disease Center
Student
- Benjamin C. Wood
Plastic and Reconstructive Surgery
Student
- 2006
- Patrick William Whitlock, M.D., Ph.D.
Orthopaedic Surgery and
Wake Forest Institute for
Regenerative Medicine
Resident
- Pedro Miguel Baptista, M.D.
Wake Forest Institute of
Regenerative Medicine
Fellow
- Jyotsana Menon
Hypertension and Vascular Disease Center
Student
- Jill Wykosky
Neurosurgery and Radiation Oncology
Student

SILVER MEDAL

- Cassandra Lee, M.D.
Orthopaedic Surgery
Resident
- Normann B. Cabrera, M.D.
Orthopaedic Surgery
Fellow
- William Frazier, M.D.
Otolaryngology and
Wake Forest Institute for
Regenerative Medicine
Resident
- Tao Xu, M.D.
Wake Forest Institute of
Regenerative Medicine
Fellow
- Maxwell Kenneth Langfitt
Orthopaedics
Student

BASIC RESEARCH continued

GOLD MEDAL

- 2007
- Peter J. Apel, M.D.
Orthopaedics
Resident
- Enzo S. Palma, M.D.
Neurosurgery and Radiation Oncology
Fellow
- Jill Wykosky
Neurosurgery
Student
- 2008
- Patrick W. Whitlock, M.D.
Orthopaedic Surgery
Resident
- Pedro M. Baptista, M.D.
Regenerative Medicine
Fellow
- Hetal Pandya
Neurosurgery
Student
- 2009
- Hossam Shaltout, Ph.D.
Hypertension & Vascular Research Center
Resident
- Benjamin Corona, Ph.D.
Regenerative Medicine
Fellow
- Kyle Binder
Regenerative Medicine
Student

SILVER MEDAL

- Katheryne J. Stabile, M.D.
Orthopaedics and WFIRM
Resident
- George Chloros, M.D.
Orthopaedics
Fellow
- Jyotsana Menon
Hypertension
Student
- Andy Stevens, M.D.
Neurosurgery, Infectious Disease & Pathology
Resident
- Bryan Tillman, M.D.
Regenerative Medicine &
Vascular & Endovascular Surgery
Fellow
- David Ricardo Soto-Pantoja
Hypertension & Vascular Research Center
Student
- Luke Neff, M.D.
Regenerative Medicine
Resident
- TanYa Gwathmey, Ph.D.
Hypertension & Vascular Research Center
Fellow
- Katherine Cook
Hypertension & Vascular Research Center
Student

BASIC RESEARCH continued

GOLD MEDAL

2010	Sandeep Mannava, M.D. Orthopaedics Resident
	Roche de Guzman, Ph.D. Regenerative Medicine Fellow
	Carla Maria Lema Tome, Ph.D. Neurosurgery Fellow
	Hetal Pandya Neurosurgery Student
2011	Kyle David Wood, M.D. Urology Resident
	Wenhong Chen, M.D., Ph.D. Neurosurgery Fellow
	Van T. Nguyen Neurosurgery Student
2012	Austin Stone, M.D. Orthopaedic Surgery Resident
	Christopher MacNeil, Ph.D. Plastic and Reconstructive Surgery Fellow
	Elizabeth Miller Cardiothoracic Surgery Student

SILVER MEDAL

Luke Neff, M.D. General Surgery Resident
Manisha Nautiyal, Ph.D. Hypertension & Vascular Research Center Fellow
Shantaram Bharadwaj, Ph.D. Institute for Regenerative Medicine Fellow
Van Nguyen Neurosurgery Student
Charles Peyton, M.D. Institute for Regenerative Medicine Resident
Christopher M. MacNeill, Ph.D. Plastic and Reconstructive Surgery Fellow
Amanda Beauchamp Neurosurgery Student
Reese Randle, M.D. General Surgery Resident
Norihito Moniwa, M.D. Hypertension and Vascular Research Center Fellow
Tabitha Rosenbalm Plastic and Reconstructive Surgery Student

BASIC RESEARCH continued

GOLD MEDAL

2013	Mark Witcher, M.D., Ph.D. Neurosurgery Resident
	Sara Ferluga, Ph.D. Neurosurgery Fellow
	Rui Wang Plastic and Reconstructive Surgery Student
2014	Austin Stone, M.D., Ph.D. Orthopaedics Resident
	Tabitha Rosenbalm, Ph.D. Plastic and Reconstructive Surgery Fellow
	Elizabeth Graham, B.S. Plastic and Reconstructive Surgery Student
2015	Alejandro Marquez-Lara, M.D. Orthopaedic Surgery Resident
	Hooman Sadri-Ardekani, M.D., Ph.D. Wake Forest Institute for Regenerative Medicine Fellow
	Eleanor McCabe-Lankford, B.S. Plastic and Reconstructive Surgery Student

SILVER MEDAL

2013	Daniel Bracey, M.D. Orthopaedics Resident
	Christopher MacNeil, Ph.D. Plastic and Reconstructive Surgery Fellow
	Alison Arter Hypertension and Vascular Research Center Student
2014	Cara Lorentzen, M.D. Orthopaedics Resident
	Ian Hutchinson, M.D. Orthopaedics Fellow
	Bryce Robinson, B.S. Cardiothoracic Surgery Student
2015	W. Keith Ballentine III, M.D. Urology Resident
	Joao Paulo Zambon, M.D., Ph.D. Wake Forest Institute for Regenerative Medicine Fellow
	Guorui Deng, B.S. Hypertension and Vascular Research Student

BASIC RESEARCH continued

GOLD MEDAL

2016	Benyam Yoseph, MD Institute for Regenerative Medicine Resident
	Guillermo Galdon, MD Institute for Regenerative Medicine Fellow
	Renata Magalhaes, MD Institute for Regenerative Medicine Student
2017	Daniel Bracey, MD, PhD Orthopaedic Surgery Resident
	Nima Pourhabibi Zarandi, MD Institute for Regenerative Medicine Fellow
	Catherine Moore, BS Plastic and Reconstructive Surgery Student
2018	Lily Velet, MD Urology Resident
	Nima Pourhabibi Zarandi, MD Institute for Regenerative Medicine Fellow
	Omeed Rahimi, MS Hypertension and Vascular Research Student
2019	Amy P. Trammell, MD Orthopaedic Surgery Resident
	Tomohisa Yamashita, MD, PhD General Surgery Fellow

SILVER MEDAL

2016	Ryan Rebowe, MD. Plastic and Reconstructive Surgery Resident
	Xue Ma, MD, PhD Orthopaedic Surgery Fellow
	Eleanor McCabe-Lankford, BS Plastic and Reconstructive Surgery Student
2017	Taylor Peak, MD Urology Resident
	Ronald Nelson, Jr., PhD Institute for Regenerative Medicine Fellow
	Marianne Collard, BS Hypertension and Vascular Research Student
2018	Edward J. Doyle, III, MD Otolaryngology Resident
	Manuel U. Ramirez, PhD Hypertension and Vascular Research Fellow
	Elizabeth R. Stirling, MS Hypertension and Vascular Research Student
2019	Robert Siska, MD Plastic and Reconstructive Surgery Resident
	Omar A. Abdelaal, MD Institute for Regenerative Medicine Fellow

BASIC RESEARCH continued

GOLD MEDAL

- 2019

Jordan Forte, BS
Plastic and Reconstructive Surgery
Student
- 2020

Aaron Bradshaw, MD
General Surgery-Urology
Resident

Brittany Liebenow, BA
Neurosurgery
Student

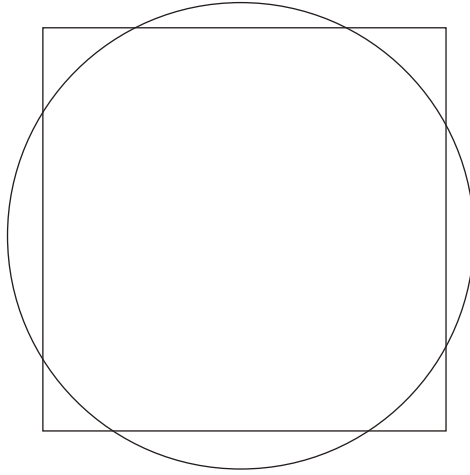
SILVER MEDAL

- Adam Jorgensen
Institute for Regenerative Medicine
Student

Tyler Overholt, MD
General Surgery-Urology
Resident

Ishetta Madeka, BA
General Surgery-Oncology
Student

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1. Endocrine-Targeted Therapy and Diet Interactions on Gut Permeability and the Microbiome

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Background: Studies implicate the gut microbiome as a risk factor for estrogen receptor-positive (ER+) breast cancer and a factor modifying therapeutic response. Alterations in gut microbial composition associated with obesity result in increased intestinal permeability and elevated LPS bioavailability. We propose oral endocrine-targeting therapies may differentially affect gut microbiome populations in mice consuming a healthy or western diet to affect intestinal permeability mediating chronic low-grade inflammation, leading to tumor recurrence. Methods: 6-week-old female C57BL/6 mice were placed on a healthy control (HC; 21% kcal from fat derived from olive oil and fish oil) or a Western diet (45% kcal from fat derived from corn oil, lard, milk-fat) for 6 weeks. They were randomized based on body fat composition into 6 groups: HC, HC+tamoxifen (TAM; 37 ppm tamoxifen citrate), HC+aromatase inhibitor (AI; 5 ppm letrozole), Western diet, Western+TAM and Western+AI. Body weight measurements, glucose tolerance test (GTT), intestinal permeability assays, plasma LPS ELISA, immunohistochemistry (IHC) and fecal metagenomics sequencing were performed. Results: Increases in body weight and body fat composition were significantly different across groups. In the GTT, Western+AI had higher fasting blood glucose and area-under-the-curve. Intestinal permeability measurements indicate endocrine therapies alter intestinal permeability, with plasma LPS and FITC dextran displaying decreasing trends with endocrine therapy. Ultrasound colon thickness measurements were increased in Western plus endocrine therapy. Differences in microbiota and phage populations with endocrine therapy demonstrate oral endocrine therapies differentially shift *Lactobacillus* and *Lactococcus* populations. Conclusions: Our study indicates oral endocrine therapies affect the gut microbiome and intestinal permeability that are sensitive to dietary-influenced baseline microbiota populations, which result in differential drug metabolic outcomes. Future studies modifying gut *Lactobacillus* abundance in ER+ tumor bearing mice will be performed to determine relevance of this population modifying anti-cancer tamoxifen efficacy.

2. Harnessing the Microbiome to Impact Chemotherapeutic Responsiveness in Triple Negative Breast Cancer

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Triple negative breast cancer (TNBC) is highly aggressive subtype with a 5-year survival rate significantly worse when compared to other breast cancers types. Furthermore, there are no targeted therapy options, limiting these patients to cytotoxic chemotherapy regimens. Increasing evidence show the strong correlation between gut microbiota and the development of many diseases including breast cancer. Moreover, gut microbiota populations are highly plastic, shifting in response to diet changes, drug administration, and geographical location. The purpose of our study was to determine whether chemotherapy modifies the gut microbiota populations and whether ablation of the microbiome modifies drug responsiveness. To do so, 8-week old female BALB/c mice were injected with 4T1-luciferase TNBC cells into the mammary fat pad. Once tumors reached 100 mm³, mice were either untreated (control group), treated with 1x weekly 2.5 mg/kg doxorubicin (Dox) for 4 weeks, or treated with Dox + antibiotics (mixture of streptomycin, ampicillin, and colistin in the drinking water to ablate the microbiome) and the fourth group are treated with only antibiotics cocktail in their drinking water. Fecal samples were collected at T0 (before treatment) and T4 (after treatment). Mice from Dox +antibiotics group displayed reduced tumor weight and decreased lung metastatic burden, suggesting presence of gut microbiome modifies chemotherapy efficacy. Metagenomics analysis of fecal samples showed no bacterial microbiome detected in antibiotics treated groups. Doxorubicin treatment modulated the diversity and abundance of many bacterial species including increase in *Akkermansia muciniphila*, *Alistipes shahii*, *Prevotella copri*, and *Bacteroides vulgatus*. Doxorubicin treatment affected some bacterial species that were used as probiotics including reduced *Bacteroides uniformis*, *Lactobacillus johnsonii* and increased *Bifidobacterium longum* abundance. Furthermore, doxorubicin only treated group was stratified into responders and non-responders according to tumor growth over time, and metagenomics data showed elevated proportional abundance in *Alistipes shahii*, *Bacteroides vulgatus* in responders post treatment. On the other side, non-responders showed increase in *Enterococcus faecalis* and reduction in *Bacteroides cellulosilyticus* bacterial species post treatment.

These modulations in gut microbiota were associated with intestinal inflammation changes in villi length, muscularis layer thickness and goblet cells counts. Taken together, our data demonstrates that ablation of gut microbiota using antibiotics along with chemotherapy treatment may show better outcomes than using doxorubicin. Moreover, systemic treatment with chemotherapeutic agents can modulate gut microbiota composition suggesting that fecal microbiota populations could be used as a predictive biomarker of chemotherapeutic responsiveness and modulation of the gut microbiota through dietary, antibiotics or probiotic interventions may affect therapeutic efficacy.

3. Frontal bossing is the longest standing descriptor of the morphology of patients with sagittal craniosynostosis

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PURPOSE: Frontal bossing is the longest standing descriptor of the morphology of patients with sagittal craniosynostosis. Attempts have been made to objectively quantify bossing; however, none have used imaging that can be easily obtained without radiation exposure. As a result, most clinical descriptions of preoperative and postoperative frontal bossing remain subjective.

METHODS: Clinical computed tomographic scans and 3D stereophotograms of 415 patients with sagittal craniosynostosis and 220 normal patients ranging in age from 0 to 72 months taken between 2013-2019 were used to create 3D models. Ten equidistant axial and sagittal planes were created for each individual, and a Cartesian grid was created from the intersection of these planes across the cranial surface. The distances between the 42 points of intersection found to overlay the forehead and the mid-coronal plane were analyzed in order to quantify the difference in forehead protrusion between the two populations.

RESULTS: In patients with sagittal craniosynostosis, increased protrusion was seen at all points on the forehead with the greatest differences present at the superior and lateral aspects. By using the point of maximum protrusion and the change in protrusion in the superior and horizontal directions an objective frontal bossing index can be measured.

CONCLUSIONS: The frontal bossing index (FBI) will allow for objective quantification frontal severity in patients with sagittal craniosynostosis using only 3D photography or surface laser scanners, making the FBI available to nearly all clinicians. This will guide surgical decision making and allow for greater accuracy in analyzing and comparing operative outcomes.

4. Balloon Occlusion Cholangiography and Sphincteroplasty Catheter-An Novel Device for Performing Laparoscopic Balloon Sphincteroplasty

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Background: Choledocholithiasis can be managed safely by either laparoscopic cholecystectomy (LC) with pre-/post-operative endoscopic retrograde cholangiopancreatography (ERCP) or LC with intraoperative laparoscopic common bile duct exploration (LCBDE). LC + LCBDE has the advantage of being a one-step, one-anesthetic process. This technique has decreased in utilization over the past decade in the United States. At Wake Forest, we have piloted a stepwise technique to perform balloon sphincteroplasty as a simple LCBDE adjunct. This has prompted adoption by both the acute care surgery and pediatric surgery services. Implementation of the technique has allowed for identification of opportunities for improvement and innovation. In response to this, a novel device was designed by the surgical team to allow for both balloon occlusion cholangiography and balloon sphincteroplasty with a singular catheter. After a prototype was built, a proof of concept trial was performed in a pig animal model. **Methods:** The balloon occlusion cholangiography and sphincteroplasty prototype was designed by the surgical team. Beacon Launch Partners produced the prototype. The catheter allows for a cholangiogram to be performed through the lumen of the catheter for the identification of common bile duct stones. The advantage of this system is that the distal tip of the catheter has a round balloon which can be inflated to seal the common

bile duct. This allows for pressurization of the bile duct distally when performing the cholangiogram and attempting to flush stones forward. If pressurized flushing is unsuccessful, the distal balloon can be deflated and the proximal elongated proximal balloon can be advanced to straddle the sphincter. Once the proximal balloon is in position, it can be inflated to dilate the sphincter which should facilitate stone clearance. After dilation, the smaller distal balloon can once again be utilized to seal the duct and flush stones forward into the duodenum. All of these steps can be performed sequentially without the need for any device exchange. This prototype device was tested in a pig animal model in which peanuts were inserted into the common bile duct to act as common bile duct stones. Clearance of the duct was attempted with the novel device. Results: Initial fluoroscopy demonstrates the “stones” (peanuts) in the common bile duct of the animal. The common bile duct is sealed with the distal balloon and a subsequent cholangiogram is performed with pressurized flushing. The sphincter is dilated by the more proximal elongated balloon. After dilation the proximal balloon is deflated and the catheter is withdrawn. The distal balloon re-creates a seal for final cholangiogram/power flushing. The “stones” have been noted to flush forward into the duodenum. Conclusions: The balloon occlusion cholangiography and sphincteroplasty catheter is a novel device that allows for performing a cholangiogram, pressurized flushing of the CBD, and dilation of the sphincter without any instrument changes. It has been determined to be successful in clearance of common bile duct stones in an animal model and may prove to be helpful in an operative setting.

5. A Novel Suturing Trainer for Medical Students

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Purpose:

Suture training is a critical component of the medical school curriculum, as it serves as the first opportunity to learn proper technique. For those students who enter surgical specialties such as plastic surgery, early and repetitious practice is crucial in developing competence for residency. Currently, the majority of medical schools in the United States utilize suture training tools such as porcine feet or sponges to simulate human tissue. At our institution, satisfaction survey data has indicated dissatisfaction with the accessibility, quality, and longevity of these materials. Herein, the purpose of this project is to devise a novel tool for suture training using medical grade silicone and a three dimensional (3D) printed stencil to create life-like, standardized tissue defects.

Methods:

Using 3D printing, a 10cm x 5cm x 2cm mold was developed. Via Blender software, tissue defects of varying depths, shapes, and sizes were included in the design. Different textures of silicone were poured into the mold and dyed with pigment to simulate the layers of skin, fat, and muscle. Plastic surgeons were consulted on material textures and layer depths. Study outcomes included a thirty-question survey given to fourth year medical students following a thirty minute practice session with the silicone device. Questions measured texture characteristics and similarity of suture material to human tissue on a scale from 1 to 5 (5 being identical to human tissue). Additionally, the survey assessed limitations with current suture training models, and impression of this novel device's educational utility.

Results:

Twenty five fourth years participated in the study. All (n=25) had sutured on human tissue an average of 46.0 (SD: 66.0) times. Additionally, all participants had sutured on porcine feet and sponges. The most common barriers to self-directed suturing practice were accessibility to material (n=23) and material longevity (n=20). The mean score for the silicone pad's tissue layers (4.20, SD: 0.5) and “feel” (4.36, SD: 0.64) was significantly higher ($p<.0001$) than those for porcine feet (2.52, SD 1.00 and 2.48, SD: 0.87 respectively) and sponges (1.21, SD: 0.51 and 1.38 SD 0.65, respectively). Upon assessment of varying suturing techniques on each material, the mean score for the silicone pad's interrupted sutures (4.56, SD: 1.411) running sutures (4.30, SD 0.62), and knot tying (4.44 SD: 0.711) was significantly higher ($p<.0001$) than those for porcine feet (3.08, SD: 1.04; 2.16, SD: 0.85; and 3.36, SD: 0.95 respectively) and sponges (1.75, SD: 0.85; 1.66, SD: 0.816; and 2.04, SD: 0.99 respectively). All (n=25) participants stated that the silicone suture pad was the best tool to practice suturing, and 92% (n=23) stated that their suture skills would be better or much better if the silicone pads replaced porcine feet and sponges.

Conclusion:

Preliminary survey data demonstrate that the silicone suture pad generated with a 3D printed stencil serves as a mobile, cost-effective, and realistic training tool. This suturing training device has been introduced into the Wake Forest surgical training curriculum, and an IRB has been submitted to follow longitudinal student improvement as a result of exposure to this suturing device over time.

6. A Cost analysis of Transmetatarsal Amputation Postoperative Wound Complications

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Background: The purpose of the current study is to identify the cost associated with transmetatarsal amputation (TMA) flap healing complications. **Methods:** Utilizing CPT codes, all TMAs performed in the Wake Forest Baptist Medical Health System (WFBHS) between January 1, 2015 and January 1, 2020 were identified. Inclusion criteria includes TMAs which achieved an entirely closed skin envelope at time of surgery. Exclusion criteria include TMAs without adequate follow up or those which underwent fluorescence angiography. Costs were calculated by analyzing the facility location, number of days hospitalized, reoperation rates, additional procedures performed, and prosthesis costs in 1 year from index TMA. **Results:** 87 patients and 90 TMAs met criteria for enrollment in this cohort. Of the 90 TMAs performed, 43% (39/90) healed with intact skin envelope at 1 month postoperatively. Of the TMA patient population 21% (19/90) had a partial thickness wound and 33% (30/90) had a full thickness wound at 1 month postoperatively. Patients with a healed TMA at one month postoperatively were admitted for an average of 6.5 days in the one year following a TMA including index admission. Patients with full thickness postoperative wounds were admitted for an average of 22.6 days in the same one-year period. Patients with healed TMA at one month postoperatively had 0 reoperations. Patients with full thickness postoperative wound healing complications experienced an average of 1.3 revision procedures. The average 1 year cost of TMA was 25,745 USD. The average cost of a TMA which healed at the one-month mark was 15,914 USD. The average 1 year cost of TMA with a full thickness wound was \$44,015 ($p < 0.00001$). **Conclusion:** Complications from transmetatarsal amputations are common and significant causes of patient morbidity and mortality. In our data set full thickness wound dehiscence increases the likelihood of readmission and reoperation. The authors theorize efforts to reduce wound healing complications associated with TMA may decrease postoperative complications and cost to the healthcare system through fewer readmissions and fewer limb salvage procedures.

7. Blockade of CD47/Thrombospondin-1 signaling Modulates Cellular Energetics as a Protective Mechanism from Chemotherapy-Induced Cardiac Injury

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Advances in early detection and treatment have led to a decrease in cancer-related mortality; consequently, by the year 2030, there will be over 20 million cancer survivors in the United States. Anthracycline-based treatment regimens are currently essential for managing triple-negative breast cancer. Patients treated with doxorubicin (DOX) often exhibit cardiovascular morbidity due to cumulative dose-dependent cardiotoxicity. Novel strategies are needed to overcome anthracycline-induced cardiotoxicity in the increasing number of breast cancer survivors. Activation of the CD47/Thrombospondin-1 (TSP1) signaling axis impacts the progression of heart failure with reported increased TSP1 levels following myocardial infarction. Therefore, we examined the potential of CD47 blockade as a strategy to prevent cardiac injury as a consequence of cancer chemotherapy. CD47 is a transmembrane protein that plays a role in cell fate during cellular stress through its interaction with TSP1 (Figure 1). Our data in a syngeneic orthotopic breast cancer model shows that CD47 blockade using an in vivo anti-sense phosphodiesterase morpholino (PMO) preserved ejection fraction, fractional shortening, and cardiac output when compared to DOX treatment. RNA sequencing was performed on the hearts of control and CD47 PMO-treated mice to determine a potential cardioprotective mechanism. Gene set enrichment analysis (GSEA) showed significant positive enrichment for metabolic pathways including pyruvate metabolism ($NES = 2.3$, $p < 0.002$), fatty acid oxidation ($NES = 2.53$, $p < 0.003$), oxidative phosphorylation ($NES = 2.0$, $p < 0.01$) while negative enrichment was observed in

pathways related to cytokine receptor interaction (NES= -2.2, p<0.002) and extracellular matrix receptor (ECM) interaction (NES= -2.6, p<0.05). During cardiac insult, metabolic flexibility of cardiomyocytes results in metabolic reprogramming from fatty acid oxidation to a glycolytic mechanism to overcome injury. Thus, DOX-associated cardiotoxicity may be mediated by an increase in TSP1 and a decrease in glycolysis, leading to the inability to overcome acute cellular stress. In-vitro cellular bioenergetics analysis revealed that TSP1 caused a dose-dependent reduction in glycolytic flux and glycolytic capacity in cardiac cells. This analysis, coupled with preserved cardiac cell viability in cells treated with CD47 PMO in the presence of DOX, suggests that TSP1 may act through CD47 to prevent cardiac cell metabolic reprogramming needed to overcome injury. Overall, our studies suggest that the TSP1/CD47 axis may be central to the interplay of ECM proteins and metabolism to preserve cardiac tissue integrity; thus, targeting this pathway may prevent the onset of chronic cardiac disease due to chemotherapy in cancer patients.

8. Pre-Pectoral Breast Reconstruction Learning Curve: A Single Institution Retrospective Study

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Introduction and Background We hypothesize a learning curve exists with pre-pectoral breast reconstruction technique. This study aims to compare the outcomes of pre-pectoral breast reconstructions at our institution.

Methods After IRB approval, we completed a retrospective analysis of all pre-pectoral breast reconstructions. Breasts were divided into first 75 and last 75 completed pre-pectoral reconstructions. Statistical measures were used to compare means and categorical variables.

Results From 2016 to 2020, 92 patients, and 164 breasts underwent mastectomy and subsequent pre-pectoral breast reconstructions. Pre-pectoral breast reconstruction has become utilized more frequently in our practice. Age, BMI, comorbidities, and mastectomy techniques were not different between groups. Pre-pectoral techniques involved placement of ADM.

We significantly increased the amount of direct to implant reconstructions performed (p<0.0005)

When comparing prosthetic failure, in the first group of 75 breasts there was an expander loss rate of 19.7% and implant loss rate of 14.5%. In the last group of 75 breasts, expander loss rate 14.5% and implant loss rate 9.2%, not statistically significant between groups

Conclusions: Our data suggest that there is a learning curve effect present in our ability to identify patients suitable for immediate or delayed direct to implant reconstruction. Additionally, there is a trend toward reduction in prosthetic failure. We demonstrated significant practice transition to pre-pectoral breast reconstructions with improving complication profile.

9. Impact of COVID-19 Pandemic On Breast Cancer Screening and Operative Treatment

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The COVID-19 pandemic has impacted many areas of healthcare and had significant impact on care delivery. On March 26, 2020, a joint statement by the American Society of Breast Surgeons (ASBrS) and American College of Radiology (ACR) recommended that all medical facilities postpone all breast screening exams immediately due to concerns of mortality of coronavirus outweighing any potential mortality from a delay in screening. To better understand the changes to detection and treatment of breast cancer at our institution, Wake Forest Baptist Health (WFBH), we analyzed mammogram rates (screening as well as diagnostic) and breast cancer operations between 2019 to 2020. From 2019 to 2020, we analyzed retrospective data of mammograms from the Radiology Department as well as breast cancer operations at WFBH. Due to potential overlap between the two samples with regards to mammography, comparative analysis with relative and absolute differences were utilized. Proportion comparison with Z-score was utilized based on NC Census data for women eligible for mammogram screening (age 40-74) in Forsyth County, NC. For comparison of breast cancer stage, a breast

cancer stage severity score was formulated and statistical analysis was performed with Mann-Whitney U-test (two-tail, $p < 0.05$). Proportion analysis was compared to overall WFBH operative volume per public quarterly reports. Data obtained from mammography revealed a relative decline from 2019 to 2020 in breast cancer screening. Screening mammograms decreased by 44% or 1558 fewer screening mammograms ($Z = 4.75$, $p < 0.00001$) and by 21% or 771 fewer for diagnostic mammograms ($Z = 2.16$, $p = 0.03$). With regards to breast cancer operations, we did not identify a statistically significant difference in number of new breast cancer operations at WFBHMC with 340 in 2020 as compared to 384 in 2019 ($p = 0.9905$). We compared a breast cancer stage severity score (weighted by stage at time of operation) which did not reveal statistically significant difference in stage of breast cancer at time of operation ($p = 0.71$, $U = 28$). Mammography was impacted more than breast surgery cases by the COVID-19 pandemic in our current analysis. More data needs to be collected in order to evaluate future impact on morbidity and mortality related to breast cancer operations. Future analysis examining impact over time will look at any persistent disparities related to delay in breast cancer care due to COVID-19.

10. Trabeculectomy Revision via Needling Augmented with Sub-conjunctival Mitomycin

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Purpose / Relevance:

Trabeculectomy has been a common glaucoma surgery for many years. As such, the glaucoma specialist sees many patients who have had trabeculectomy which has failed over the years due to scarring. In these patients, low IOP may be obtained by a relatively non-invasive needling technique, re-opening an outflow pathway through scar tissue. This study suggests that needling may be preferable to more invasive, higher-risk surgical options.

Methods:

This is a retrospective chart review of all patients who had trabeculectomy revision via needling augmented with sub-conjunctival mitomycin as a stand-alone procedure during the years 2018-2020. Demographic data extracted included age, race, type of glaucoma. Historical surgical data included prior ocular surgery, bleb status, time between initial trabeculectomy and revision, pre-operative IOP, and number of glaucoma medications. Post-operative data included IOP at post-op day 1, week 1, month 1,3,6, and number of glaucoma medications at the same time points.

Results:

The medical records of 59 patients met study criteria. The average pre-operative IOP ($n = 59$) was 23.8 mmHg on an average of 3 topical glaucoma medications. On post-op day 1 ($n = 58$), average IOP was 11.8 on 0.5 glaucoma meds. On post-op week 1 ($n = 58$), month 1 ($n = 56$), month 3 ($n = 53$), month 6 ($n = 48$), the average IOP was 13.0, 13.4, 15.0, 13.7 respectively, with an average number of glaucoma meds of 0.7, 0.7, 1.0, 1.1. Wilcoxon-ranked signed tests showed the difference between pre-op IOP and post-op IOP at months 1, 3, 6 to be significant ($Z = -6.1$, $p < 0.001$; $Z = -5.6$, $p < 0.001$; $Z = -5.4$, $p < 0.001$), and the difference in pre-op and post-op number of glaucoma medications to be significant ($Z = -6.1$, $p < 0.001$; $Z = -5.1$, $p < 0.001$; $Z = -5.2$, $p < 0.001$).

Discussion:

A common scenario for the glaucoma specialist is the patient who has had trabeculectomy which has failed. At that point, commonly considered surgical options include tube shunts and ciliary photocoagulation. These surgeries carry significant risk of complications, and often have a prolonged recovery requiring a robust medicinal regime. This study suggests that an attempt to improve the function of the trabeculectomy should not be overlooked. The needling option is relatively non-invasive, does not require an incision, and requires minimal surgical time and anesthesia. In this study needling proved highly effective at significantly lowering IOP and medication burden.

Conclusion:

Glaucoma specialists should consider needling among the treatment options in patients who have failed trabeculectomy. In this study of patients undergoing needling, the average IOP was 42% lower than pre-op and the patient's medication burden was significantly less.

11. Examining the impact of exogenous lactate isoform administration on breast cancer cell proliferation and metabolic pathways

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Obesity is a prevalent health condition in the United States and has been found to serve as a modifiable risk factor for breast cancer development in postmenopausal women. As poor diet, like one high in fats and sugars, is a major contributing factor for the development of obesity and subsequent breast cancer, it is essential to maintain a healthy dietary lifestyle as a way to prevent breast cancer development. Balanced diets can also maintain essential intestinal and gut health by maintaining the symbiotic relationships between the microbes found there, but may also play a role on microbes found in distal organs and tissues, like the breast. Using a nonhuman primate (NHP) model, our lab performed metabolomics on mammary glands from *M. fascicularis* NHPs fed a Western or Mediterranean diet for 2.5 years. With the animals separated in groups based on body fat composition, we were able to look at the impact of adiposity within dietary patterns on mammary gland (MG) metabolism. Comparing metabolites identified from these MGs, NHP with the highest body fat composition displayed decreased lactate concentrations when compared with lean NHP breast tissue levels. In addition to the increased levels of lactate found in these MGs independent of diet, elevated proportional abundance of lactate-producing bacteria were present in lean NHP breast tissue, suggesting a potential role of the microbiome in the regulation of gland-specific lactate. C57BL/6 mice demonstrate susceptibility to dietary induced obesity. When analyzing protein levels of lactate dehydrogenase (LDH) enzyme isoforms responsible for converting pyruvate to lactate, LDHA (L-lactate isoform specific) and LDHD (D-lactate isoform specific), LDHA and LDHD were higher in MG tissue of low-fat control diet-fed mice compared to Western diet-fed mice. These data suggest the regulation of lactate metabolism by obesity within the mammary gland compartment may be mediated through repression of enzyme activity. In opposition to our findings, the overproduction of lactate is often associated with cellular stress and as a metabolic waste product. In a stressful cellular environment, like that lacking oxygen and/or uncontrolled proliferation, there is a shift in the glycolytic pathway to produce more lactate from pyruvate. As rapid proliferation is a hallmark of cancer cells, we aimed to investigate the impact of lactate administration on cell proliferation. When analyzing cell proliferation in vitro of non-neoplastic and breast cancer cells treated with exogenous doses of L- and D-lactate isoforms, data showed differential regulation in cell proliferation in the presence of D-lactate. Western blot analysis of matching protein samples taken at 24 hours post treatment, begin to also show differential protein expression of LDHA, LDHD and proliferating cell nuclear antigen (PCNA) in the presence of L- and D-lactate. These data begin to suggest the potential regulation of lactate metabolism regarding enzyme activity in breast cancer cells and subsequent impact on cell proliferation. Our lab aims to continue to investigate how diet, obesity and the microbiome mediate breast cancer risk and development. Future goals of the study include to investigate the impact of L-lactate and D-lactate isoforms on obesity-mediated breast cancer risk, breast metabolic pathways, and localized gland inflammation. Moreover, we plan to further explore the effect of the breast microbiome on regulating localized lactate levels within the MG to potentially modify breast cancer risk.

12. #Who: Investigation of Who Creates Laryngology Content posted on Instagram

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Introduction: Social media use is rising in medicine with both patients and providers developing a larger presence on networking platforms. Data suggests that many patients utilize social media to discern information regarding diagnosis and modalities of care. Therefore, it is important that information circulated on social media is accurate. A recent study in dermatology, through the analysis of hashtags (#), reported that many of the dermatology posts queried on Instagram were not entries created by dermatologists. This raises concern regarding the validity and accuracy of content viewed by people seeking information. Currently, there is no literature regarding the quality of laryngology social media posts and this study aims to raise awareness to mediate that gap between patients and providers. Methods: Fellowship-trained laryngologists were surveyed to obtain the most common encountered diagnoses and procedures. Hashtags were queried on Instagram over a set time period and the type of influencer was recorded into a category. Analysis was conducted to determine the

accounts involved in sharing laryngology content and further subcategorized into physician, speech language pathologist (SLP), and other. Results: Fellowship-trained laryngologists suggested top diagnoses and procedures. Many of the laryngology hashtags utilized on Instagram are from non-laryngologists. Discussion: With the growth of the online presence of information in laryngology, it is important that laryngologists remain on the forefront of sharing and teaching social media users to ensure the distribution of reliable information.

13. IMPACT OF PRE-OPERATIVE METABOLIC EQUIVALENT STATUS ON SURGICAL OUTCOMES IN HEAD AND NECK CANCER PATIENTS

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Importance: The association between functional status and postoperative complications in cancer surgery is well-described in the literature; however, utilization of pre-operative screening tools to predict post-operative outcomes in head and neck cancer patients are lacking. Objective: The aim of this study is to determine if there is an association of low functional status, using metabolic equivalents (METs), with post-operative adverse events and/or increased length of stay (LOS) among head and neck cancer patients who underwent surgical resection. Design, Setting, and Participants: This was a retrospective medical chart review of 221 patients with squamous cell carcinoma (SCC) of the aerodigestive tract, from 2014 through 2020, who underwent surgical resection and completed a standardized MET questionnaire during their pre-operative visit. Main Outcomes and Measures: METs is the objective measure of the ratio of the rate at which a person expends energy, relative to the mass, while performing various physical activities. METs are measured on a scale from 1-10, where one MET is equivalent to the energy expended when sitting quietly. The MET measurements were divided into three groups: METs > 10-7 is group 1; METs 6-4 is group 2; METs 4-1 is group 3. LOS and post-operative adverse events (systemic and wound-related complications) were identified in the cohort in attempt to determine a correlation with MET status. Statistical analysis was carried out via Welch t-test comparison and p value of 0.05 was considered statistically significant. Results: 48% of the total patients experienced post-operative adverse events. 20% of these patients were located in MET group 3, 75% were located in MET group 2, and 8% were located in MET group 1. 20.8% of patients had a performance equivalent to 4 or less METs, 64.7% 4-6 METs, and 14% of patients had more than 7 METs. MET group 1 (n=32) mean LOS was 5.56 days while MET group 2 (n=143) mean LOS was 8.69 days (p=0.005). MET group 2 (n=143) mean LOS was 8.69 days while MET group 3 (n=46) mean LOS was 12.67 days (p=0.06). MET group 1 (n=32) mean LOS was 5.56 days while MET group 3 (n=46) mean LOS was 12.67 days (p=0.002). The logistic regression adjusted r² was 65.29% for predicting adverse events and LOS duration from MET status. Conclusion: Low MET status was found to be associated with an increased LOS and 96% of adverse events were in patients who were in MET groups 2 and 3. Given these findings, MET status could be utilized to counsel patients regarding their chances of post-operative adverse events and increased LOS.

14. Assessment of CT-based Muscle and Adipose Phenotypes for Prediction of Peri-operative Outcomes in Head and Neck Cancer

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Importance Although body mass index, albumin, and prealbumin may inform nutritional status, these measures are subject to alterations unrelated to nutrition. Sarcopenia (substantial loss of muscle mass and function) is associated with many adverse health outcomes, including mortality. Automated abdominal CT-based muscle measurements are a widely accepted sarcopenia biomarker and may better inform peri-operative risk than historical nutritional markers. Objective We hypothesize an association of sarcopenia with peri-operative complications and increased length of stay among head and neck cancer patients undergoing surgical resection. The goal of this study is to test our hypothesis through retrospective chart review and image analysis. Design, Setting, and Participants Retrospective chart review of 165 patients with squamous cell carcinoma (SCC) of the oral cavity, oropharynx, hypopharynx, or larynx who underwent staging PET/CT followed

by surgical resection between 2010 and 2014. Main Outcomes and Measures Patients were analyzed separately by sex. From each patient's PET/CT, a single axial CT image at the L3 vertebral level was selected for automated muscle and adipose cross-sectional area (CSA) analysis (Slice-O-Matic software; TomoVision). Hounsfield unit (HU) thresholds (-29 to +150 HU for muscle; -190 to -30 HU for fat) were utilized. All automated L3 CSA outputs were reviewed by an attending radiologist, and manual adjustments were performed when necessary (3D Slicer; <https://www.slicer.org/>). Post-operative complications included both systemic complications (e.g., stroke, myocardial infarction) and wound-related complications. Length of stay (LOS) was divided into the following two groups: group 1 (LOS 1-10 days); group 2 (LOS 11-15 or more days). Results The following statistics were derived by utilizing a student t-test with the adjusted r^2 being 63.82% for predicting adverse events and LOS duration from mean L3 CSA. Males (n=129): Patients experiencing adverse post-operative events (n=99) had a mean L3 CSA of 148.07 cm² compared to 154.21 cm² among patients without complications (n=30) (p=0.05). LOS group 1 (n=89) mean L3 CSA was 150.69 cm² while LOS group 2 (n=40) mean L3 CSA was 141.22 cm² (p=0.055). Females (n=36): Patients experiencing adverse post-operative events (n=21) had a mean L3 CSA of 107.41 cm² compared to 107.71 cm² among patients without complications (n=15) (p=0.16). LOS group 1 (n=22) mean L3 CSA was 111.40 cm² while LOS group 2 (n=14) mean L3 CSA was 101.46 cm² (p=0.133). There were no significant associations between assessed adipose tissue phenotypes (total, visceral, subcutaneous, intermuscular) and outcomes. Conclusion Sarcopenia (as determined by L3 muscle CSA) was associated with increased complications and LOS among males in our cohort. The same associations were not observed in females, though small sample size may have an influence. L3 muscle CSA may have a role to inform patient counseling regarding adverse event risks and estimated LOS prior to head and neck cancer surgical resection.

15. Assessment of CT-based Cervical Spine Muscle Cross- sectional Area for Prediction of Peri-operative Outcomes in Head and Neck Cancer

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Introduction: Lumbar sarcopenia, defined as substantial loss of muscle mass and function at L3, is associated with many adverse health outcomes, including mortality. Many patients who are diagnosed with head and neck cancer undergo Neck CT scans for staging and treatment planning. The purpose of this study is to examine the potential for association of automated cervical spine, CT-based measurements with peri-operative complications and increased length of stay (LOS) among head and neck cancer patients undergoing surgical resection. Methods and Materials: A retrospective review of prospectively collected data from 61 patients with squamous cell carcinoma (SCC) of the oral cavity, oropharynx, hypopharynx, or larynx who underwent staging PET/CT followed by surgical resection between 2010 and 2014. Statistical analysis was carried out using a student t-test with the adjusted r being 64% for predicting adverse events and LOS duration from mean C3 CSA. Outcomes and Measures: Patients were analyzed separately by sex. From each patient's PET/CT, a single axial CT image at the C3 vertebral level was selected for automated muscle cross-sectional area (CSA) analysis (Slice-O-Matic software; TomoVision). Hounsfield unit (HU) thresholds (-29 to +150) were utilized. All automated C3 CSA outputs were reviewed by an attending radiologist and manual adjustments were performed when necessary. Post-operative complications included both systemic complications (e.g. stroke, myocardial infarction) and wound-related complications. LOS was divided into the following 4 groups: group 0 (LOS <5 days); group 1 (LOS 5-10 days); group 2 (11-15 days); group 3 (>15 days). Discussion: Figure 1: Males (n=48): LOS 0 (n=3) mean C3 was 40.96cm². LOS 1 (n=31) mean C3 was 41.54cm². LOS 2 (n=5) mean C3 was 39.59cm². LOS 3 (n=9) mean C3 40.92cm². Figure 2: Females (n=13): LOS 0 (n=0). LOS 1 (n=9) mean C3 was 32.83cm². LOS 2 (n=2) mean C3 was 25.57cm². LOS 3 (n=2) mean C3 was 39.11cm². The studies utilizing L3 data is promising for an avenue to help predict increased LOS and adverse peri-operative outcomes. The decision to analyze C spine stems from the CT scans available for head and neck patients. The C3 area did not decrease with increased LOS and was not found to be statistically significant in any LOS groups, males or females. The limitations of the study are likely due to the small power of the study; however, repeat analysis of an increased number of patients is to come. Conclusion: Sarcopenia (as determined by C3 muscle CSA) does not appear to be associated with increased LOS or peri-operative events amongst males or females in our cohort. However, small sample size may be a significant limiting factor.

16. The Effects of Prolonged Intraoperative Hypothermia on Patient Outcomes in Immediate, Implant-Based Breast Reconstruction

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Introduction: Maintenance of normothermia has been an important factor in limiting post-operative complications that has been well established in the general surgery literature. Implant-based breast reconstruction (IBBR) after mastectomy consistently has higher rates of infection than other (non-breast) implant based procedures or even autologous breast reconstruction. Additionally, hypothermia causes vasoconstriction, significantly decreasing subcutaneous oxygen tension resulting in poor wound healing. This study aims to evaluate the implications of extended intraoperative hypothermia on post-operative complications. **Methods:** A retrospective review of patients that underwent immediate breast reconstruction following mastectomy was performed. Patients were organized into a majority normothermic (NT) group if >50% of the operative time was spent $\geq 36^{\circ}\text{C}$ or a majority hypothermic (HT) group if $\geq 50\%$ of the operative time was spent $< 36^{\circ}\text{C}$. Patient demographics, comorbidities, surgical techniques, and postoperative complications were recorded. Univariate and multivariate statistics were utilized to assess for significant relationships. **Results:** There were 329 total patients that met inclusion criteria with 174 in the NT group and 155 in the HT group, yielding 302 and 264 total breasts, respectively. There was no significant difference in rates of infection ($p=1.0$), seroma ($p=0.27$), hematoma ($p=0.61$), or wound dehiscence ($p=1.0$). However, patients in the HT group had significantly more ischemic complications ($p=0.009$). After controlling for tobacco use, body mass index, mastectomy pattern, radiation, and mastectomy weight, multivariate analysis showed a 54.5% increased risk for ischemic complications in the HT group ($p=0.04$). **Conclusion:** IBBR continues to have higher rates of complications relative to their autologous counterparts. Prolonged intraoperative hypothermia can increase the risk for the development of ischemic wounds such as tissue necrosis or eschar formation. While there are many contributing factors, core body temperature can be easily augmented to reduce ischemic complications.

17. Modeling Pheochromocytoma & Paraganglioma Responses to Systemic Therapy in Patient-Derived Tumor Organoids

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Introduction

Pheochromocytomas (PCC) and paragangliomas (PG) are rare neuroendocrine tumors, with an incidence of ~ 0.8 per 100,000. Surgery is the only curative treatment option for patients with localized disease. However, patients with advanced disease lack effective treatments and the rarity of metastatic disease creates challenges in treatment advancements. This study aimed to evaluate the feasibility of patient-derived tumor organoids (PTOs) as a pre-clinical platform to explore treatments for these rare tumors.

Methods

After IRB approval, tumors were obtained from patients with PCC or PG who underwent operative resection. Tumors were processed to isolate tumor cells for incorporation into PTOs utilizing a collagen-based hydrogel. Blood was also obtained from patients to isolate peripheral mononuclear immune cells to create immune-enhanced PTOs (iPTOs). Organoids underwent treatment with chemotherapy, immunotherapy, or small molecule inhibitors. Cell viability was determined using multiple assays.

Results

Five PCC and two PG tumor samples were obtained from December 2020 – September 2021. Viable tumor organoids

were successfully generated from six tumors (6/7, 85.7%) for treatment studies. PCC and PG PTOs displayed high histological fidelity compared to primary tumor tissue. PCC and PG PTOs demonstrated sensitivity to cytotoxic agents and small molecule inhibitors. Sunitinib demonstrated significant treatment efficacy with an average post-treatment viability of 16.8%. Cabozantinib and Pazopanib also demonstrated efficacy with average post-treatment viabilities of 39.2% and 42.5%, respectively. One iPTO set demonstrated sensitivity to Ipilimumab/Nivolumab (1/6, 16.7%).

Conclusion

PTOs are a feasible platform to study PCC and PG and their response to treatments. Our results highlight the utility of small molecule inhibitors in the treatment of PCC and PG.

18. Targeting Inositol-requiring enzyme-1 (IRE1) signaling impacts triple-negative breast cancer chemotherapy sensitivity and prevents chemotherapy-related cardiotoxicity

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Triple-negative breast cancer (TNBC) is one of the most highly aggressive breast cancer types that predominately affect young and minority women. TNBC is ER-negative, PR-negative, and HER2 normal, accounting for 10-20% of all breast cancer cases. Unfortunately, there are no targeted therapeutic options, limiting TNBC patients to more severe toxic chemotherapy regimens associated with cardiac dysfunction, primarily myocardial ischemia and bradycardia. Due to the clinical benefit of chemotherapy, it is now essential to find novel strategies to ameliorate side effects. Another issue compounded in the risk of developing cancer and chemotherapy-related toxicities is obesity. Obesity is associated with worse overall survival in women with TNBC. Inositol-requiring enzyme-1 (IRE1) is an arm of the unfolded protein response (UPR) pathway that plays a crucial role in tumor development. IRE1 signaling is the most evolutionary conserved branch of the UPR. It has been shown that IRE1/XBP1 protein levels are upregulated in TNBC. Preliminary work demonstrates that high-fat diets increased IRE1 levels in the DMBA tumor model. However, whether diet differentially stimulates IRE1 on TNBC is unknown.

To investigate the role of Obesity and IRE1 targeting chemotherapy response and prevention of therapy-related cardiac toxicity, we obtained female BALB/c mice placed on control and western diets at 3-weeks of age 5 weeks. At 8-weeks of age, mice were injected with 4T1-luciferase breast cancer cells in the left inguinal fat pad. Primary tumor growth was monitored by IVIS and calipers weekly for 21 days. Primary tumors were then surgically resected, and IVIS imaging was performed to confirm complete tumor removal. One week after tumor resection, mice received 3.3 mg/kg doxorubicin (DOX) I.V. for 3 weeks. Tumor recurrence and metastases were monitored by IVIS. Cardiac function was measured by Vevo ultrasound. These studies demonstrated that the western diet stimulates primary breast tumor growth, decreased DOX responsiveness, and potentiated cardiac dysfunction compared with control diet consuming mice. Also, western diet affected the development of DOX-induced cardiac dysfunction by increasing cardiac fibrosis in response to therapy.

Also, we developed a syngeneic model of murine breast cancer by injecting female BALB/c mice consuming a control diet with 4T1-luc in the mammary gland. Once tumors developed mice were treated with the anthracycline doxorubicin with or without anti-sense morpholino to IRE1. We found that a combination of targeting IRE1 with doxorubicin (DOX) enhanced chemotherapy responsiveness in the 4T1 breast cancer model. Furthermore, we found that DOX alone reduces fractional shortening and ejection fraction but this effect was prevented by targeting IRE1. Also, IRE1 blockade reduces interstitial fibrosis in combination with DOX and reduces vimentin also known as fibroblast intermediate filament in combination with DOX. Also, 4T1 TNBC cell line conditioned media significantly upregulated IRE1 protein levels and decreased p-JNK (54kDA) in H9C2 rat cardiac myoblast cells. Overall results suggested that systemic suppression of IRE1 protected cardiac tissue in mice treated with doxorubicin while enhancing anthracycline-mediated tumor killing.

19. Application of Patient Derived Organoids in Modeling Merkel Cell Carcinoma

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Introduction

Merkel cell carcinoma (MCC) is a rare neuroendocrine cancer, with an estimated 0.3 cases per 100,000. Systemic therapy is often utilized as an adjunct to surgery, but a consensus treatment is yet unidentified. This study aimed to evaluate the feasibility of patient-derived tumor organoids (PTOs) as a pre-clinical platform to evaluate treatments for these tumors.

Methods

Tumor tissue from MCC patients was processed to isolate unsorted tumor cells, which were further suspended in an ECM based hydrogel. Patient blood and lymph tissue was also collected and incorporated into immune enhanced organoids (iPTOs). Organoids and tissue were compared using histology to determine PTO fidelity. Organoids were treated with chemotherapy or immunotherapy agents and cell viability was determined to determine efficacy of treatment regimens.

Results

Seven tissues were provided from six patients from December 2018-June 2021. Six tissues (5/6, 83.3%) provided sufficient viable cells to create PTOs, with patient matched iPTOs created in 4/6 (66.6%) patients. Histology on matched patient tissues and PTOs correlated expression of MCC markers. PTOs demonstrated variable responses to chemotherapy regimens between patients, with combinational therapy of cisplatin and doxorubicin demonstrating the highest rate of response (5/6, 83.3%). Immunotherapy did not demonstrate efficacy in four patients tested, although iPTOs demonstrated increased immune cell activity when treated.

Conclusion

PTOs are a feasible model for exploring new treatment regimens for this rare primary. PTOs have the potential to predict individualized patient responses to a variety of treatments, which could aid in achieving greater treatment efficacy with currently available drugs.

20. Peritoneal Mesothelioma Organoid Response to HIPEC

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Introduction

Peritoneal mesothelioma (PM) is a rare malignancy (2 patients per million) with poor prognosis, representing about 10-15% of all mesothelioma cases per year. We previously reported on the feasibility of generating PM patient-derived tumor organoids (PTOs). Herein we present the application of PM PTOs in elucidating personalized response to HIPEC.

Methods

After IRB approval, tumor samples were obtained from patients with PM undergoing cytoreductive surgery with HIPEC at Wake Forest. PTOs were fabricated with tumor cells suspended in a collagen-based hydrogel and treated with HIPEC regimen mimicry. Viability, live/dead imaging, and IHC analysis were performed post-treatment. Treatment efficacy was defined as killing at least 50% of organoid cells.

Results

Seven anatomically spatially specimens were processed from 4 patients from October 2020 through June 2021, with 3 specimens coming from the same patient. All underwent successful organoid fabrication, with 6/7 (86%) sites undergoing comparative 37° and 42° HIPEC treatments with cisplatin and MMC. Response to HIPEC was patient and site specific. Hyperthermia enhanced the cytotoxicity of both drugs which average post treatment viability drop of 27.1% and 19.4% respectively compared to normothermia. Heated cisplatin displayed the greatest cytotoxicity with an average post-treat-

ment viability of 45.5%. Overall, heated cisplatin demonstrated efficacy in 4/6 (66.7%) tumors, with statistically significant superiority in 3/6 (50%) PTOs when compared to mitomycin C. Mitomycin C demonstrated efficacy in only 1/6 (16.7%) of specimens, which was not responsive to cisplatin in the hyperthermic condition.

Conclusions

Peritoneal mesothelioma PTOs treated with HIPEC, exhibit patient and site specific response to treatment. Cisplatin exhibits superior cytotoxic activity over MMC. Organoids have the potential to personalize efficacious HIPEC regimens for PM patients.

21. The Microbiome Mediates Carcinogenic Alterations of the Mammary Gland in the Context of Obesity

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Obesity increases the relative risk for breast cancer incidence. Several obesity-linked molecular mechanisms are demonstrated to drive breast cancer progression, however, if and how obesity contributes to breast cancer initiation is poorly understood. Obesity alters adipose tissue structure and signaling, immune cell activity, and shifts the microbiome in ways that could potentially increase breast cancer risk. Our preliminary experiments with a mouse mammary carcinogenesis model indicate that diet-induced obesity alters the microbiome in the gut and the mammary gland that leads to decreased tumor-free survival, reduced tumor latency, and increased tumor multiplicity. Microbial-associated molecular pattern (MAMP)-proteins and metabolites such as lipopolysaccharide (LPS), a toll-like receptor 4 (TLR4)-agonist, could directly affect breast epithelial cell signaling. LPS was found to be elevated in the plasma and mammary glands of obese mice. Experiments in a 3D culture model of breast glandular units (acini) show that LPS disrupts the tight junctions (TJs) that maintain apical polarity. The loss of apical polarity is a known functional biomarker of breast cancer risk. Other biomarkers of risk include DNA damage and oxidative stress which were shown to be elevated by LPS treatment. Preliminary data show that LPS activates the nuclear factor-kappa B (NFkB) pathway by binding to the TLR4 receptor leading to an increased expression of inflammatory cytokines such as tumor necrosis factor-alpha (TNF-α). The outcomes of our study underscore the importance this under-appreciated component of the tumor microenvironment, the microbiome, in the prevention of breast cancer. In conclusion, we show that obesity-modulated gut microbiome increases breast cancer risk, at least partly, through the involvement of microbiome metabolites such as LPS.

22. Laparoscopic Common Bile Duct Exploration: A Model in Surgical Innovation and Intraoperative Education

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Background: Today, there are increased efforts to promote surgical trainee and faculty competency and performance. One-stage laparoscopic common bile duct exploration (LCBDE), in comparison to laparoscopic cholecystectomy with pre- or post-cholecystectomy endoscopic retrograde cholangiopancreatography (ERCP), for treatment of choledocholithiasis is an ideal model for surgical innovation and intraoperative education while developing valuable skills. To that end, we describe our process of surgical technique conception, implementation, multiple surgical service adoption, and refinement.

Methods: In 2018, surgeons at Wake Forest conceived a technique to treat common bile duct stones during laparoscopic cholecystectomy for adult and pediatric patients. With initial success with the technique, we sought to create an efficient and accessible framework for acute care surgery (ACS) and pediatric surgery services to facilitate implementation. We initiated three phases to promote early adoption and implementation. First, we created an interactive pathway. Next, we defined the exact steps of the procedure, created an educational video, and constructed an intraoperative cart housing all necessary equipment along with just-in-time access to online educational material displayed on the cart via QR code. We then engaged in a targeted educational campaign to pediatric and ACS surgeons and surgical residents to drive adoption. To ensure quality outcomes, we created a prospective observational registry for continuous analysis of our progress.

As a final additional step, we designed a surgeon feedback survey to engage in continuous learning and near real-time feedback to correct and refine steps in the pathway with an emphasis on patient safety, user-experience, and efficiency.

Results: The number of LCBDE cases performed by the ACS service per year are as follows: 9 cases in 2019, 21 cases in 2020, and 22 cases to date in 2021. The rate of successful LCBDE on the ACS service from 2019 to present were the following: 55.6% in 2019, 90.5% in 2020, and 87.4% currently in 2021. Data suggests that through our efforts to create an interactive pathway and implement it in an intentional manner, we have increased the success of treating common bile duct stones intraoperatively.

Conclusions: Diffusion of innovative surgical techniques within a health system requires a multi-modal approach to promote efficient adoption and refinement with the ultimate goal of quality outcomes. Creative teaching methods integrating technology (QR codes to educational materials including videos, creation of intraoperative pathways, and a REDCap QA survey) drive innovation. Our next steps include tracking feedback and continuing our prospective observational registry to foster targeted pathway and phase-of-care refinement.

23. Characterizing Vascular Endotheliopathy Associated With Partial Versus Full REBOA In A Hemorrhagic Shock Model

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Intro: Shock induced endotheliopathy is a growing concern within the field of hemorrhagic shock and resuscitation, where shedding of the endothelial glycocalyx results in altered coagulopathy and endothelial dysfunction. While this phenomenon has been well described within trauma populations, less is known about how resuscitative endovascular occlusion of the aorta (REBOA) impacts the vascular endothelium. REBOA is known to significantly alter the hemodynamics within the aorta and results in profound ischemia reperfusion injury distal to the occlusion. Thus, we hypothesize that the altered hemodynamics imposed by REBOA may also contribute to significant changes to the integrity of the endothelial glycocalyx. Towards this goal, we performed a pilot study to quantify the extent of endotheliopathy in a hemorrhagic shock swine model, subjected to either partial (pREBOA) or full REBOA (fREBOA) with the hypothesis that pREBOA will exert less endothelial damage compared to fREBOA.

Methods:

Yorkshire swine were subjected to 20% hemorrhage followed by pREBOA versus fREBOA (n=4 per group) for 20 minutes and subsequently resuscitated with a standardized critical care protocol (vasopressor support along with fluid and blood resuscitation) for 6 hours. Serum samples were obtained at 5 time points: baseline (T0), end of hemorrhage (T30), end of aortic occlusion (T60), 10 minutes post-occlusion / initiated resuscitation (T75), and at the end of study (T310). All animals included in this analyses survived the study period. An enzyme-linked immunosorbent assay (ELISA) was used to quantify serum levels of key endothelial glycocalyx components, including hyaluronic acid (HA) and syndecan-1 (SDC-1). Descriptive statistics was used to determine differences between groups in terms of SDC-1 and HA levels.

Results:

Baseline vitals were similar between the fREBOA and pREBOA groups. We observed changes in SDC-1 and HA over time consistent with the hemorrhagic shock model. Pigs undergoing fREBOA had nearly double the levels ($11.4 \text{ ng/ml} \pm 4.99$ vs. $6.27 \text{ ng/ml} \pm 2.89$) of SDC-1 at baseline compared to those undergoing pREBOA. Furthermore, SDC-1 levels were elevated at T30, T60, and T75 for fREBOA in comparison to pREBOA ($8.80 \text{ ng/ml} \pm 2.80$ versus $5.57 \text{ ng/ml} \pm 1.44$, $5.32 \text{ ng/ml} \pm 1.63$ vs $5.10 \text{ ng/ml} \pm 0.93$, and $7.11 \text{ ng/ml} \pm 4.54$ versus $5.81 \text{ ng/ml} \pm 1.19$, respectively). The pREBOA group demonstrated lower HA levels, compared to those experiencing fREBOA, especially at T60 and T75 ($787.85 \text{ ng/ml} \pm 207.41$ versus $915.76 \text{ ng/ml} \pm 499.03$ and $682.73 \text{ ng/ml} \pm 225.09$ versus $1253.74 \text{ ng/ml} \pm 524.03$). This suggests that there is less endothelial glycocalyx damage imposed by pREBOA.

Conclusion:

In our preliminary study, swine treated with fREBOA displayed higher circulating levels of both SDC-1 & HA during aortic

occlusion (T60) and post occlusion (T75). This initial study suggests greater endothelial dysfunction with full aortic occlusion compared to partial aortic occlusion, which may inform the conduct of endovascular resuscitative efforts for patients in hemorrhagic shock. Future studies are needed to determine the relationship between the altered hemodynamics from REBOA and circulating biomarkers of endotheliopathy to improve the implementation of aortic occlusion interventions and resuscitation post-REBOA.

24. Achilles Heel No Longer: Marked Decline in Early Relaparotomy and Allograft Pancreatectomy Rates following Simultaneous Kidney-Pancreas Transplantation in the Contemporary Era

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Background: Technical complications requiring early relaparotomy (relap) and allograft pancreatectomy (AP) have long been the Achilles heel of simultaneous kidney-pancreas transplantation (SKPT). Methods: Single center retrospective review of all SKPTs from 11/1/01 - 8/12/20 with T-cell depleting antibody, tacrolimus, MMF, and steroids. Anticoagulation other than ASA 81 mg was not routinely used and all patients were managed by standardized protocols including enteric exocrine drainage. Early relap was defined as occurring within 3 months of SKPT. Patients (pts) were stratified into 2 sequential eras: Era 1 (E1): 11/1/01 - 5/30/13; Era 2 (E2) 6/1/13 - 8/12/20. Results: During the period of study, 255 SKPTs were performed (E1, n=165; E2, n=90) with an overall mean follow-up of 8.1±5 years. Recipient age and donor and recipient ethnicity, gender, and BMI were comparable between eras. E1 pts received organs from older donors (E1 27 vs. E2 23 years, P<0.001) with longer pancreas graft cold ischemic times (CIT) (E1 16 vs. E2 13 hours, P=0.04). E2 pts received more imported organs (E1 16% vs. E2 27%, P=0.04). E1 pts had a higher early relap rate (E1 43% vs. E2 14%, P<0.001) and were more likely to require AP (E1 10.3% vs E2 2.2%, P=0.019). E2 pts underwent systemic venous drainage more frequently (E1 8% vs. E2 29%, P<0.001). The most common indications for early relap in E1 were pancreas thrombosis (12%), abscess/infection (12%), bleeding (4%), and leak (4%) whereas in E2 were for abscess/infection (3%), small bowel obstruction (3%), and thrombosis (2%), P=0.001. Pancreas venous drainage technique did not affect either early relap or AP rates. Actuarial death-censored pancreas graft survival rates are shown in Table 1. Mean transplant volume was 14/year for E1 and 13/year for E2; mean transplant volume in the past 3 years of E2 was 18/year. Conclusions: Maximizing donor quality (younger donors) and minimizing CIT are paramount for reducing complications requiring either early relap or AP and for optimizing long-term pancreas graft survival following SKPT. Considering that the pancreas is the only organ for which supply exceeds demand, this can be achieved without compromising transplant volume by judicious use of imported organs.

25. Perioperative Chemotherapy for Resectable Colorectal Liver Metastases: Analysis from the Colorectal Operative Liver Metastases International Collaborative

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Background: Perioperative chemotherapy has been increasingly used with surgery as multimodality treatment for resectable colorectal-liver metastases (CLM). There is paucity of clinical data addressing optimal timing of chemotherapy administration relative to surgery. We examined outcomes of patients undergoing neoadjuvant and adjuvant chemotherapy in an international multicenter database of surgically-managed CLM. Methods: Data from 897 patients were obtained from a collaborative of CLM hepatectomy cases from five hepatobiliary institutions between 2000-2018. Overall survival (OS) was measured from time of hepatectomy for patients receiving: surgery alone, neoadjuvant chemotherapy, adjuvant chemotherapy, and neoadjuvant-plus-adjuvant chemotherapy. Kaplan-Meier analysis was performed to detect differences in OS between treatment groups. Single- and multi-variable analysis with Cox proportional hazards were run for OS between groups. Results: 164 patients (18.28%) received surgery, 132 (14.72%) received neoadjuvant-only, 249 (27.76%)

received adjuvant-only, and 352 (39.24%) received neoadjuvant-plus-adjuvant chemotherapy; with median OS of 40.1, 43.6, 56.0, and 49.1 months, respectively. Median OS for adjuvant-only was significantly longer compared to neoadjuvant-only ($p=0.047$) and surgery ($p=0.004$), and similar to neoadjuvant-plus-adjuvant ($p=0.104$). There were no significant differences in comorbidities between groups, based on Charlson-Deyo scores ($p=0.941$). There were significant differences in number of lesions ($p<0.0001$) and maximum tumor size ($p=0.0008$) between groups. On multivariate analysis, extra-hepatic disease ($p=0.0002$), intraoperative transfusion ($p<0.0001$), number of lesions ($p<0.0001$), and treatment algorithm ($p<0.0001$) were independent predictors of OS. Discussion: Despite group differences, adjuvant chemotherapy for CLM was independently associated with improved OS compared to other chemotherapeutic approaches. For patients with resectable disease, upfront surgery should be considered.

26. Skin Organoids: Tissue-Specific Self-Organization and Injury Model

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Ex vivo fabricated skin tissue constructs such as 3D skin organoids are becoming an alternative to fully replace animal models and traditional 2D cell cultures. A complex structure of 3D skin organoids allow for physiological cell-cell/cell-matrix interactions and enable them to serve as a model for drug testing and disease. Currently, the mostly used skin models on the market are reconstructed human epidermis and bioprinted skin. However, both are time and labor intensive. Furthermore, they require an air-liquid interface for maturation that is difficult to incorporate into body-on-a-chip platforms in contrast to spherical skin organoids.

In this study, we created human skin organoids containing multiple skin cell types in order to recreate the skin microarchitecture including authentic cell interactions. Seeding combinations of keratinocytes, melanocytes, dermal fibroblasts pre-adipocytes and follicle papillae cells in Low Attachment 96 Well Plates supported self-organization into spherical organoids, that maintained long-term viability (>30 days). Visual observation showed maturation of the skin organoids by obtaining uniform pigmentation and decreasing their size significantly by day 21 in culture. Anatomical analysis including histology, scanning electron microscopy and immunohistochemistry revealed skin-specific layer organization within the organoids, with the surface layer formed by epidermal cells (keratinocytes, melanocytes) and the central core formed by dermal (fibroblasts and follicle dermal papillae cells) and hypodermal (pre-adipocytes) cells. In addition, capillary-like structures composed by endothelial cells were observed inside the skin organoids, as well as high production of extracellular matrix proteins such as collagen III, and laminin.

To test the response of the skin organoids to external insults, they were exposed to UVB light and to skin irritating chemicals. The organoids developed endoplasmic reticulum (ER)-stress response and apoptosis upon UVB exposure and decreased cell viability and disruption of normal skin anatomy in response to skin irritating chemicals.

Taken together, these novel multicellular skin organoids are less technical demanding and are more reproducible compared to other 3D skin models. Ultimately, this technique could provide a reliable in vitro model of skin for investigation of dermato-pathologies and screening of treatments and counter measures.

27. The Demographics of Patients Presenting for Laryngological Care at an Academic Medical Center

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Objectives: Few studies address the demographics/epidemiology/socioeconomic status of patients presenting to a laryngologist at a tertiary care center for treatment. In order to identify any possible disparities in voice, airway and swallowing care, we sought to analyze the aforementioned data for new patients presenting to the voice center at an academic medical center. Methods: This is a retrospective cohort study of prospectively collected data from an institutional database of 4,623 new adult patients presenting for laryngological care at a tertiary care, academic medical center from 2015-2020. Demographic data were analyzed. Results: Of 4,623 patients 62.8% were female and 37.2% were male with ages ranging

from 19-99 years (Avg-59.51, SD-15.83). Patients were 81.8% white, 13% black, and 5.2% other, compared with 56.3% white, 34.8% black, 20% other in the local municipality from US Census Data. Payer mix included 46.98% Medicare, 42.59% commercial insurance, 3.22% Medicaid, 5.19% other, and 2.01% uninsured/self-insured. Patient demographics based on primary diagnosis codes were also examined. A majority of patients presented with voice related complaints. Conclusion: Understanding the demographics of those with laryngological disorders will help to develop targeted interventions and effective outreach programs for underrepresented patient populations. Future multi-center studies could provide further insight into the distribution of healthcare disparities in laryngology.

28. Normative Value for the Laryngopharyngeal Measure of Perceived Sensation

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Objectives: The Laryngopharyngeal Measure of Perceived Sensation (LUMP) is a recently validated patient-reported outcome measure (PROM) aimed at evaluating the symptom severity of patients with globus pharyngeus. The objective of this study was to define the normative values for the LUMP questionnaire. **Methods:** The LUMP questionnaire was completed by eighty-eight subjects. Individuals without throat related symptoms such as dysphagia, dysphonia, or cough were provided LUMP. The results of the eight-item questionnaire were analyzed for standard error of the mean (SEM), mean and standard deviation (SD). **Results:** Review of the eighty-eight LUMP questionnaires elucidated a mean of 0.42 (SEM = 0.10, SD = 0.96) in the normative population. By gender, the female (n=50) mean was 0.24, SD = 0.66, SEM = 0.09; for males (n=38), the mean was 0.66, SD = 1.21, SEM = 0.20. **Conclusion:** This study provides normative data for the LUMP, a recently established PROM useful in patients with globus pharyngeus. A LUMP score greater than, or equal to 3 should be considered abnormal, and warrants additional attention.

29. Characterizing Safety and Efficiency of Umbilical Hernia Repair on the Resident Run Surgical Service

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Background: The chief resident service provides final-year surgical trainees with a supervised experience in independence, responsibility and decision-making like they will face after graduation. Residents are entrusted to determine their personal preferred operative techniques while being supervised by an attending physician. The graduated independence this service provides is reliant on if it is safe for patients and cost effective for the institution. **Hypothesis:** We hypothesized outcomes and operative cost of umbilical hernia repairs to be equivalent between the chief resident service and the standard academic service. **Methods:** We matched each adult undergoing umbilical hernia repair from 07/2016-06/2019 on the chief resident service to two standard academic service patients based on operative indication, sex, and age. We compared demographics, surgical complications, operative time, 30-d complications and operative costs. **Results:** This study included 90 patients undergoing open umbilical hernia repair (30 chief service patients and 60 standard academic service patients). Chief service patients had less comorbidities on average (Charlson Comorbidity Index 0.5 vs 1, P = 0.05), but mean body mass index (31.8 vs 31.6, P = .55) and fascial defect size (1.6cm vs 1.8cm, P = 0.85) were similar between the chief resident and standard academic services, respectively. The overall complication rate was similar (10.0% chief resident, 10.0% standard, P= 1.0) Additionally, there were no significant differences in recurrence (6.7% chief resident and 1.7% standard, P = 0.23) infection (0.0% chief resident versus 5.0% standard, P= 0.12), seroma (3.3% chief resident versus 1.7% standard, P= 0.62) or hematoma (0.0% chief resident, 1.7% standard, P= 0.37) between services. Procedure-related ED visits were similar (10.0% chief resident versus 5.0% standard, P= 0.38) and no patients on either service required readmission or reoperation within 30 days. The chief resident service averaged longer operating times (38±22 vs 26±16 min, P < 0.01) as well as more time spent in the operating room (88±34 vs 70±21 min, P <0.01) versus the standard academic service, respectively. More time in the operating room translated into higher time-based cost for chief resident's service (\$763vs \$609, P < 0.01), but mean cost for materials was similar (\$203vs \$231, P= 0.52) between the chief resident and standard service, respectively. **Conclusions:** The chief resident service provides safe operations for patients undergoing umbilical hernia repair with outcomes similar to those on the standard academic service. Although operative times are longer on the chief resident service, residents spend no more on materials than faculty when operating according to their preferences.

30. Intra-arterial delivery of immunotherapy for treatment of patients with refractory head and neck cancers

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Background: Patients with head and neck squamous cell carcinoma (HNSCC) have poor prognosis and few treatment options. In clinical studies, immunotherapy checkpoint inhibitors such as Pembrolizumab has demonstrated efficacy in solid tumors, though only 20% of HNSCC patients respond to monotherapy and only up to 45% respond to dual therapy. Immune cell infiltration into the tumor microenvironment is necessary for successful tumor eradication. Pre-clinical evidence of intra-arterial (IA) and IV delivery shows that IA delivery significantly increased T-cell tumor infiltration over IV therapy, due to local T cell activation. Further research is critical to discern the clinical benefit of IA immunotherapy administration in the treatment of head and neck cancer patients.

Hypothesis/Objectives: Intra-arterial infusion of Pembrolizumab in treatment naïve Head and Neck Squamous Cell Carcinoma patients is feasible and accelerates intratumoral T cell activation and infiltration without increased risk of adverse effects.

Methods: This is a proof-of-concept feasibility pilot study in which 5 patients with newly diagnosed HNSCC will be treated with fluoroscopic-guided intra-arterial injection of 200mg Pembrolizumab as their first dose of immunotherapy, followed by conventional IV treatment at three-week intervals. We will enroll a second matched cohort (n=5) who will undergo conventional IV Pembrolizumab therapy at the same dose and administration schedule, without a first IA booster dose. In both groups, prior to the second dose, an outpatient tumor biopsy will be performed and assessed with immunohistochemistry for quantification of activated T cells. Levels of immune-regulatory plasma microRNA will be quantified using PCR to assess response rates as per existing pembrolizumab protocols. Volume of the target HNSCC tumor will be calculated on computed tomography with contrast before treatment and after 4 total doses. All adverse effects over 90 days will be recorded.

Results: This proposal has been ratified by the Head and Neck DOT. We anticipate that >80% participants enrolled in this study will be able to undergo IA administration of pembrolizumab, and that serious adverse effects (including but not limited to bleeding, stroke, inpatient admission, rash, neurologic deficit) will be no higher in the IA group compared to the IV group. Using descriptive statistics, tumor T cell infiltration and tumor volume between groups will be compared using chi square tests for proportions and t-tests or ANOVA for continuous variables. Independent outcome predictors will be identified using regression analysis and other inferential statistical analysis will be performed as indicated.

Conclusion: Intra-arterial infusion of Pembrolizumab in treatment naïve HNSCC patients is likely a feasible treatment to potentiate increased immune cell infiltration and improve response rates to checkpoint inhibitors.

31. Early Outcomes with the Vantage Total Ankle Prosthesis

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Background: The Vantage total ankle replacement is a modern prosthetic design not well established in the literature. The aim of the present study was to analyze the early outcomes and complications of the Vantage total ankle system. **Methods:** Twenty-two Vantage total ankle implants were included in the study. Survivorship, complication rate, patient satisfaction, postoperative brace use, and pain levels were evaluated. **Results:** At a mean follow up of 24.6 month, there was a 4.5% (1/22) overall complication rate and 100% implant survivorship. Patient-reported pain scores decreased from an average 7.4 preoperatively to 0.66 postoperatively. Only 9% (2/22) of patients required a brace postoperatively, and there was a 100% patient-reported satisfaction rate. **Conclusion:** The Vantage total ankle system was associated with a low complication rate and positive early outcomes in terms of pain improvement and patient-reported satisfaction.

32. A Single Institution Comparison of Complications After Autologous vs Alloplast Cranioplasty

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Introduction and Background

Cranioplasty is a standard neurosurgical procedure used to reconstruct skull defects which may arise secondary to infection, congenital defects, trauma, or following tumor resection. Cranioplasty may be performed using either native bone (autograft) or foreign material (alloplast). Though often performed and well-studied, cranioplasty still presents a clinical challenge in minimizing negative outcomes that may lead to graft removal and revision. We hypothesized that the use of alloplastic graft material is associated with a lower rate of complications, and that comorbidities traditionally associated with poor wound healing (e.g., diabetes, prior radiation, smoking) would lead to a higher rate of complications.

Methods

A retrospective chart review of patients that underwent cranioplasty between 2000-2019 at Wake Forest Baptist Medical Center was performed. Three hundred and seventy-five adult cranioplasty patients treated from 2000-2019 were studied retrospectively. Demographics, comorbidities, and graft materials were assessed. Graft complication was defined as events requiring surgical revision or removal.

Results

The overall complication rate was 19.5% (n=73). Head and neck (HENT) radiation and use of autograft were associated with an increased risk of complications ($p=0.028$ and $p=0.004$, respectively). The rate of complications differed by indication for surgery, with tumor resection having the highest rate at 38.5% ($p=0.003$). Equal numbers of alloplast (50.9%) and autograft (48.0%) were used. Smokers were more likely to have an autograft (47.1%, $p=0.021$). After controlling for smoking in multivariate analysis, autograft was no longer an independent risk factor for complications. Fifty-nine patients (15.7%) had a revisionary operation. Graft-related complication was the most common indication for revision. We found no statistically significant association between indication for surgery and indication for revision. In multivariate analysis, HENT radiation alone increased odds of a graft complication by 15.63 fold ($p=0.007$). No other variables were statistically significant.

Conclusions

In our cohort, previous head and neck irradiation was associated with an increased risk of complication after cranioplasty. Although patients with autologous reconstruction had a higher incidence of complication, this difference was no longer significant when controlling for the higher rate of smoking among those who had autologous reconstruction. Finally, when controlling for all tested variables (MOI, age, smoking, HENT radiation, graft type), HENT radiation was found to significantly increase the odds of having a graft complication by a factor of 15.63. MOI had no influence on odds of graft complication.

33. Limitations of Neurobehavioral Testing in Rat Models of Intracerebral Hemorrhage

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Background: The incidence of spontaneous intracerebral hemorrhage (ICH) has been alarmingly high in the United States since the early 1980's, without any significant medical advancements in treatment. With case fatality rates up to 50%, new treatment strategies are critically needed. The majority of ICH research has been conducted in young, healthy male mice, which do not mirror the human ICH population. We have developed a rat model of ICH with concomitant cardiometabolic

comorbidities, which more closely align with the human ICH population in order to improve chances for successful identification of translational therapeutic targets. However, efficient neurobehavioral measurements have not been well-validated in rat models. In murine models, the Garcia score and Corner Turn tests are two measures of neurobehavioral change; however, there is significant variation in the amount of time and effort required to complete these two tests and the Garcia score measure has not been validated in rat models. Hypothesis: The Garcia score will have higher sensitivity in detecting neurobehavioral changes in rats than the Corner Turn test and will be more efficient in terms of completion time. Methods: The Garcia score and Corner Turn test were performed on 11 male Sprague Dawley rats at 7-8 weeks old for baseline measurements. Following this, small volume (50 μ L) autologous-injection ICH (n=6) and large volume (150 μ L) autologous-injection ICH (n=5) was performed per the standard Diz/Wolfe ICH lab protocol. Behavioral measures were performed at baseline and repeated at 24- and 72-hours post-surgery by the same technicians on all rats with video capture to document and standardize scoring. Results: Correlation is significant at 1-day post-ICH between Garcia and Corner Turn, but not significant at baseline (BL) or 3-day. Mann Whitney U tests demonstrate that at each timepoint, there are no significant differences between volumes for both tests. Friedman's test was used to test whether behavioral test scores differed between timepoints. For Garcia, 1-day is significantly different from BL ($p < .001$) and from 3-day ($p = .023$). For Corner Turn, 1-day is significantly different from BL ($p = .017$) and from 3-day ($p = .009$). Percent change between timepoints in Garcia and Corner Turn scores was calculated for both hematoma volumes. Garcia and Corner Turn both show a decrease in average performance from BL to 1-day, and an improvement in average performance from 1-day to 3-day. This trend is the same in both volume groups. For both Garcia and Corner Turn, the small volume group shows a greater improvement in average performance from 1-day to 3-day than the large volume group. Conclusions: The Garcia score and the Corner Turn test both effectively demonstrate neurobehavioral changes 24 hours post-ICH in a rat model. However, neither test was able to detect behavioral changes from baseline at 72 hours. Both models also lacked the sensitivity to detect behavioral differences between the 50 μ L and 150 μ L hematomas. Moreover, both tests showed the same trends in percent changes between different timepoints. With this information, we are more aptly able to understand the limitations of these measures and interpret the data they produce more carefully. Additionally, we can have confidence in the fidelity of the Garcia score and use this method alone rather than the Corner Turn test in order to conserve time and effort. Lastly, our data shows that deficits are significant 1-day post-ICH, but there is improvement in behavioral performance at day 3 compared to day 1, more so for the small volume group. This provides evidence of the initiation of recovery from hematoma in the rat model and that smaller hematomas confer a greater likelihood of restoration of neurological function. An important limitation to our experiment is lack of power in sub-groups due to small sample size. Funding: This work was supported by a pilot grant from the Wake Forest Cardiovascular Sciences Center.

34. Wide-awake Local Anesthesia with No Tourniquet: An Updated Review

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Background: The wide-awake local anesthesia with no tourniquet (WALANT) technique has become popularized for various hand/upper extremity procedures. Before surgery, patients receive local anesthetic, consisting of lidocaine with epinephrine, and remain awake for the entire procedure. The purpose of this review was to investigate the advantages, diverse application, outcomes, cost benefits, use in challenging environments, patient considerations, and contraindications associated with WALANT.

Methods: A comprehensive review of the literature on the WALANT technique was conducted. Search terms included: WALANT, wide-awake surgery, no tourniquet, local anesthesia, hand, wrist, cost, and safety.

Results: The WALANT technique has proven to be successful for common procedures such as flexor tendon repair, tendon transfer, trigger finger releases, Dupuytren disease, and simple bony procedures. Recently, the use of WALANT has expanded to more extensive soft-tissue repair, fracture management, and bony manipulation. Advantages include negating preoperative evaluation and testing for anesthesia clearance, eliminating risk of monitored anesthesia care, removal of anesthesia providers and ancillary staff, significant cost savings, and less waste produced. Intraoperative evaluations can be performed through active patient participation, and postoperative recovery and monitoring time are reduced. WALANT is associated with high patient satisfaction rates and low infection rates.

Conclusions: The WALANT technique has proven to be valuable to both patients and providers, optimizing patient satisfaction and providing substantial healthcare savings. As its application continues to grow, current literature suggests positive outcomes.

35. Analysis of Bedside Eyelid Laceration Repair from January 2014- November 2020

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Introduction: Wake Forest Baptist Medical Center (WFBMC) is a Level 1 Trauma center and eye injuries, especially eyelid lacerations, are a common consult for the Ophthalmology service. Precise anatomic tissue realignment during primary eyelid laceration repair can minimize complications and reduce the need for secondary repairs. The potential complications of lid repair surgery include functional and cosmetic complications. Currently, there is no comparative data in the literature that analyzes complication rates following primary eyelid laceration repair at the bedside in the emergency department setting. The goals of this study were threefold: to measure complication rates following primary eyelid laceration repair performed at the bedside in the WFBMC Emergency Department at the time of consultation from January 2014 to November 2020, to evaluate if the WFBMC practice pattern for managing eyelid trauma is resulting in low complication rates and desirable outcomes, and finally, to assess any need for quality improvement. **Objectives:** The primary objective was to determine the complication rates of primary eyelid laceration repair performed at bedside in the WFU ED. The secondary objective was to analyze the need for secondary eyelid repairs following a primary repair performed at the bedside. **Methods** The study was a retrospective chart review from January 2014 - November 2020 using ICD9 and ICD10 codes for eyelid laceration. **Results:** A total of 124 patients met inclusion criteria. Of those 124 patients, 86 (69%) were males and 38 (31%) were females. 102 patients were adults and 22 were children. The most common mechanism of eyelid laceration was motor vehicle collision (37%), blunt trauma (20%), fall (15%), assault (13%), animal scratch or bite (8%), followed by miscellaneous (7%). Of those 124 patients, 91 patients had at least one post-operative visit and were included in the final analysis of the data. 33 patients were lost to follow up and were not included in the final analysis of the data. 6 patients were identified as having a functional complication, which resulted in an overall functional complication rate of 6.6%. 8 patients were identified as having a cosmetic complication, which resulted in an overall cosmetic complication rate of 8.8%. None of the patients who had a cosmetic complication require secondary repair. Therefore, there was an overall rate of need for secondary surgical repair of 2.2%. The functional complication rate per year was 0.97%. The cosmetic complication rate per year was 1.3%. The infection rate per year was 0.16%. The yearly rate of secondary repair was 0.32%. **Conclusion:** There is no comparative data in the literature that specifically analyzes complications rates following primary eyelid laceration repair at that bedside in the emergency department. Overall, there are low complication rates following primary eyelid laceration repair at the bedside. The WFBMC practice pattern for managing eyelid trauma at the bedside resulted in good outcomes from January 2014 - November 2020.

36. Cost-Consciousness of General Surgery Residents During Laparoscopic Cholecystectomy and Open Inguinal Hernia Repair

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Background: General surgical chief residents are entrusted with the task of choosing the necessary equipment to perform common core operations according to their preferences on the chief resident service. To determine if residents are cost-conscious when selecting the materials needed to perform these operations, we aimed to compare operative costs between the chief resident service and standard academic service (SAS) for two common procedures, laparoscopic cholecystectomy and open inguinal hernia repair. **Hypothesis:** We hypothesized that chief residents will not incur higher material costs than general surgery faculty on standard academic services when they are entrusted to direct laparoscopic cholecystectomies and open inguinal hernia repairs according to their preferences. **Methods:** We matched adults undergoing laparoscopic cholecystectomy and unilateral open inguinal hernia repair without additional procedures from 07/2016-06/2019 on the chief resident service to the SAS (1:1) by CPT, age, and sex. We compared material and time-based operative costs between the services. **Results:** For laparoscopic cholecystectomy (n=120), body mass index (mean 31.9 versus 32.6, P=0.42), Charlson comorbidity index (mean 0.78 versus 0.98, P=0.69), and previous abdominal surgery (55% versus 63.3%, P=0.35) were similar between the chief service and SAS, respectively. Time in the operating room was greater for the chief service versus SAS (158.55 versus 134.70 minutes, P=0.001), and consequently, time-based costs

were greater on the chief service (\$1380.97 versus \$1173.24, $P=0.001$). However, material-based costs were lower on the chief service by an average difference of \$70.33 (\$490.69 versus \$561.02, $P=0.063$). Relatedly, residents used fewer disposable clip appliers (3 clip appliers on the chief service versus 13 clip appliers on the SAS, $P=0.006$), for an average cost savings of \$26.68 per case ($P=0.007$). The total operative cost (material and time-based costs) difference per laparoscopic cholecystectomy was only \$137.40 (\$1871.66 for the chief service versus \$1734.26 for the SAS, $P=0.04$). For open inguinal hernia repair ($n=100$), body mass index (mean 27.4 versus 25.8, $P=0.24$), Charlson comorbidity index (mean 1.3 versus 1.5, $P=0.35$), and previous abdominal surgery (44% versus 56%, $P=0.23$) were similar between the chief service and SAS, respectively. Use of mesh was almost unanimous between services (100% on chief service versus 98% on SAS, $P=0.24$); however, the residents used less costly mesh on average (\$155.40 versus \$199.30, $P=0.01$). The chief service had greater operating room time (163.80 versus 99.72 minutes, $P<0.001$), time-based costs (\$1426.7 versus \$868.56, $P<0.001$), and total cost (\$1709.56 versus \$1205.69, $P<0.001$), respectively. However, chief residents spent significantly less (\$282.86 versus \$337.13, $P<0.001$) on materials. Conclusions: Chief residents are seemingly cost-conscious, as evidenced by their relatively low material-based operative costs for common general surgery operations like laparoscopic cholecystectomy and open inguinal hernia repair. Differences in time-based costs between the chief service and the SAS are offset by lower material-based costs on the chief resident service.

37. Making Common Duct Exploration Common-Balloon Sphincteroplasty as an Adjunct to Transcystic Laparoscopic Common Bile Duct Exploration for Pediatric Patients

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Background:

Definitive management of choledocholithiasis with laparoscopic common bile duct exploration (LCBDE) at the time of cholecystectomy can avoid ERCP and decrease length of stay (LOS). However, pre- or post-operative ERCP is often employed, and this practice pattern may arise from the perceived complexity of LCBDE. To simplify LCBDE, we refined a 4-step technique for over-the-wire balloon dilation of the Sphincter of Oddi. We reviewed our initial experience with balloon sphincteroplasty on a pediatric surgery service and compared it to standard transcystic LCBDE methods.

Methods:

We retrospectively reviewed the records of patients who underwent LCBDE with balloon sphincteroplasty compared to previously described methods (flushing, wire baskets) on the pediatric surgery service at a single tertiary care center over a 36-month period. Age, fluoroscopy time, operative time, complications, and outcomes were compared.

Results:

The balloon sphincteroplasty technique was utilized exclusively for LCBDE in 15 patients ages 11-18 over the last 16 months. Prior to that, 14 patients underwent LCBDE utilizing more standard techniques (flush, crush, basket retrieval). All common bile ducts were successfully cleared in the balloon sphincteroplasty group, compared to 11/14 of patients undergoing standard methods. Those 3 that failed required postoperative ERCP. Average fluoroscopy time (minus ERCP) was similar amongst the two groups (292 ± 150 seconds with balloon sphincteroplasty, 326 ± 228 seconds without; $p=0.47$). Average operative time and LOS were similar ($p<0.05$). No postoperative complications were noted at 30-day follow up in either group.

Conclusion:

Balloon sphincteroplasty is a simple and safe adjunct to LCBDE. This simplicity may drive adoption of LCBDE amongst pediatric surgeons and increase the opportunity for them to provide the full spectrum of choledocholithiasis management for their patients.

38. Development and Delivery of Renal Progenitor Organoids for Rapid Kidney Tissue Integration and Functional Recovery

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Over 50% of patients with renal failure do not have access to the life-saving treatments of dialysis and transplantation due to a lack of transplantable organs and the high costs of maintenance care. This gap in care is predicted to grow dramatically in the next decade as the incidence of its highest causative factors, diabetes and hypertension, increases worldwide-especially in countries that lack the infrastructure for current treatments. To address this gap, we aim to develop a clinically feasible cell-based renal regeneration strategy capable of developing functional nephron structures by delivering scaffold-encapsulated progenitor-derived organoids into renal parenchyma. We modified well-established renal organoid formation protocols using an aggrewell culture system to increase yields for enhanced reconstitution of renal structures. In vitro analyses of these organoids assessed proper differentiation and maturation. In following in vivo studies using athymic mice, we encapsulated human renal progenitor organoids in a 0.2% collagen-based scaffold and implanted them into renal parenchyma. Contralateral kidneys were harvested as normal controls in addition to acellular vehicle-only controls. Assessment of morphological and biochemical parameters in vitro and in vivo demonstrated cell viability and proper upregulation of renal markers followed by renal structure formation. In vitro results show the expression of renal markers at 2 weeks and the formation of kidney-like structures at 4 weeks in culture. In vivo results show that acellular scaffolds alone induce tissue regeneration unseen in normal controls; and the integration of implanted cells into nephron-like structures by 2 weeks in organoid delivery groups. These findings show that delivery of renal progenitor organoids forms renal structures and facilitates rapid kidney tissue integration in vivo. This regeneration strategy may bridge the current gaps in care in patients with renal failure.

39. Investigation of fat embolism etiopathogenesis

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Introduction and Background Fat embolism syndrome (FES), a rare clinical syndrome involving the triad of respiratory distress, cerebral dysfunction, and petechial rash, is a feared complication of soft tissue trauma including liposuction and lipoinjection. Despite having been initially described in 1861, the pathogenesis of FES remains poorly understood. Several theories of fat embolism exist, and all presuppose venous injury as mode entry of fat emboli into the venous system. In light of recent evidence gleaned from a single patient experience, we postulate a novel description of the source fat emboli and their mode of injury in FES. We hypothesize that patients with clinically diagnosed FES more commonly demonstrate lipid droplets in lung parenchyma rather than arterial occlusion with fat tissue. At present, the treatment of FES is merely supportive, as clinical efforts are blunted by our poor understanding of this disease process. Elucidation of FES etiopathogenesis may enable clinicians to develop targeted therapies for treating this life-threatening condition. Given that liposuction and fat grafting are becoming ever more popular procedures, an improved understanding of these associated complications is urgent. **Methods** Retrospective analysis of documented cases of fat embolism at our institution was completed. By chart review, the pathology reports of deceased patients will be reviewed for detailed description of presence, location (intra-arterial vs parenchymal), and composition (fat tissue versus lipid aggregate) of fat emboli. **Results** Following IRB approval, patients diagnosed with fat embolism from 2006 through and July 2021 were identified by ICD code. In total 37 patients were identified. Patient charts were reviewed to determine the context of their fat embolism diagnosis, and the presence of autopsy records that could allow reanalysis of histopathology. Of the 37 patients, 9 were deceased. MRNs for these patients were cross-referenced with autopsy records. No patients had autopsy records available. **Conclusions:**

Data obtained from chart review yielded insufficient pathology reports to characterize etiopathogenesis of fat embolism. Further study is needed, ideally with larger sample size, in order to adequately characterize this syndrome.

40. Nephron Sparing Surgery for Ureteral Urothelial Cancer with Oncologic Outcomes and Follow-up

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INTRODUCTION AND OBJECTIVE

Upper urinary tract masses have primarily been managed with radical nephroureterectomy leaving the patient with a solitary kidney and consequences thereof. Robotic-assisted surgery allows for nephron-sparing approaches with the option for segmental ureterectomy or excision of the distal ureter with partial cystectomy with concurrent ureteral reconstruction by uretero-ureterostomy or ureteroneocystostomy with Boari's flap. Presented here is one of the largest single surgeon, single-center series with long-term reconstructive and oncologic efficacy data.

METHODS

A single-surgeon, retrospective review of patients undergoing surgical management of ureteral masses from 2008 to 2021 was conducted. Patient demographics, intraoperative data, pathologic results, and oncologic follow-up were reviewed.

RESULTS

22 patients were identified with a mean age of 71 ± 11 years. The distribution of the ureteral masses locations was varied with 68.2% distal, 18.2% mid, 4.5% proximal, and 9.1% in the renal pelvis. The primary tumor pathology was urothelial cell carcinoma (UCC, 81.8%, n=18); additionally, there were two cases of renal cell carcinoma (RCC, 9.1%), one case of non-Hodgkin diffuse-type B-cell lymphoma (4.5%), and one case without malignancy only chronic and granulomatous inflammation with associated necrosis (4.5%). Of those with UCC, 66.7% had high grade pathology (n=12), 16.7% had low grade pathology (n=3), and 16.7% were unknown (n=3). The operative management comprised of 50.0% ureteroneocystostomy (n=11), 18.2% ureteroureterostomy (n=4), 4.5% ileal conduit (n=1), 22.7% nephroureterectomy (n=5), and 4.5% partial cystectomy (n=1). A median follow-up of 30 months from surgery was observed with a median of 24 months of recurrence-free follow-up. 3 patients died of cancer-related deaths a median of 15 months from surgery. 8 patients exhibited disease recurrence: 4 with low-grade UCC, 2 with high-grade UCC, and 2 with RCC with metastasis. Of those with disease recurrence, 2 cases had known positive margins at the time of surgery (1 high-grade UCC and 1 RCC).

CONCLUSIONS

Improved understanding of the surgical management of ureteral masses is imperative to balancing the goals of oncologic control and sparing renal function. This study is large compared to the other cases series exploring outcomes of ureteral neoplasm. It is unique for its inclusion of multiple ureteral tumor locations, both high- and low-grade pathology, and both segmental and radical surgical management. Future directions include using

genomic markers to determine the biologic behavior of these tumors to better inform the optimal surgical management and the role of neoadjuvant or adjuvant chemotherapy

41. Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy (HIPEC) for Management of colorectal Cancers with Peritoneal Dissemination: 30 Years of Experience at a Single Institution

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Introduction Cytoreductive surgery (CRS) is at the forefront of treatment for colorectal cancer with peritoneal metastasis (CRC-PM) with HIPEC as a promising adjunct. We report outcomes of the operative management of CRC-PM at a single center. Methods We retrospectively reviewed our prospectively managed database at a single center from 1991-2020. Kaplan-Meier method was used to estimate survival. Proportional hazards regression and multivariable models were used for assessments. Results This included 331 patients with mean age 53.6 years. In multivariate analysis, performance and resection status were independently associated with overall survival (OS) ($p < 0.001$). Within R0/R1 group, adverse impact

on OS was found with increasing PCI >13 (HR=2.44; CI:1.36-4.39, p= 0.003); the most significant increase at PCI >18 (HR=5.84; CI:2.23-15.3, p <0.001). Incomplete resection (R2) had significantly worse OS compared with complete CRS [R0/R1: 32.1 months (n=194) vs. R2a: 16.3 months (n=78), p <0.001]. When stratified by PCI for R0/R1 group, median OS for PCI<10, 10-15, and >15 was 34.4, 17.0, and 15.5 months, respectively (p=0.012 comparing PCI <10 and >15). Longitudinal analysis revealed improvement over time, mainly in patients with incomplete CRS starting in 2001 (HR=0.62; CI:0.43-0.90, p=0.013). Outcomes of R0/R1 subgroup remained largely stable (HR 1.36; CI 0.80-2.31, p=0.26). Clavien-Dindo complication (>3) rate was 22.1%. Conclusions CRS improves outcomes for CRC-PM compared to historic outcomes with nonoperative management. This benefit is greatest with R0 resection with lower disease burden. Results of CRS (+/-HIPEC) are improving over time, and surgery for CRC-PM should be routinely considered.

42. Oral Ascorbic Acid Supplementation Does Not Reverse Radiation-Induced Bone Loss in a Rat Model of Extremity Soft-Tissue Sarcoma Radiotherapy

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Introduction L-ascorbic acid (AA) exerts an anabolic effect on bone by promoting osteoblast differentiation and osteoclast apoptosis in vitro. Its safety profile and antioxidant properties make for an ideal therapeutic to prevent radiation-associated bone loss. The purpose of this study was to elucidate the in vitro and in vivo effects of AA using a clinically relevant model of sarcoma radiotherapy. Methods Osteoclast (RAW 264.7) and osteoblast (MC3T3-E1) precursors were cultured in conditions of increasing AA doses, then irradiated at 2-Gy after 24 hours. Cell differentiation and resorption activity was quantified. An in vivo study was performed in 68 adult female Sprague-Dawley rats divided into four groups: irradiated (n=18), non-irradiated (n=15), irradiated+AA treatment (n=17), and non-irradiated+AA treatment (n=18). AA supplementation (2mg/mL) was provided in drinking water to animal subjects for the entire study duration. The right hindlimbs were irradiated and harvested four weeks after irradiation for biomechanical (four-point bend test) and micro-computed tomography (microCT) analyses. Results Osteoclast differentiation (p=0.013) and resorption (p<0.01) significantly increased after radiation, which recovered with AA treatment in a dose-dependent fashion. Osteoblast mineralization was significantly lower after radiation in untreated control (p=0.002) and low-dose AA groups (p=0.049). Higher doses of AA resulted in similar mineralization between irradiated and non-irradiated cells. Neither radiation nor AA treatment exerted an effect on cortical bone biomechanical properties. Trabecular number significantly decreased on microCT after radiation (p<0.001), but did not recover in AA-treated rats. Conclusions Ascorbic acid attenuated the effects of radiation on mineralization, osteoclastogenesis, and bone resorption. Conversely, early prophylactic AA treatment in rats was not effective in reversing deleterious effects of radiation on trabecular bone compared to non-irradiated controls. The in vitro efficacy of AA treatment did not translate in rats receiving prophylactic AA treatment prior to hindlimb radiation.

43. Anti-CD47 Immunotherapy as a Therapeutic Strategy for the Treatment of Breast Cancer Brain Metastasis

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Triple-negative breast cancer (TNBC) is a highly aggressive subtype of breast cancer characterized by a lack of specific targets and a 35% incidence of brain metastasis. There is no targeted treatment for managing brain metastasis associated with TNBC; therefore, new strategies are urgently needed to overcome disease mortality. The presence of cell surface protein CD47 allows cancer cells to evade innate and adaptive immune surveillance resulting in metastatic spread. CD47 binds to and activates SIRPα on the surface of myeloid cells, inhibiting their phagocytic activity. On the other hand, CD47 binds the matricellular protein Thrombospondin-1, limiting T cell activation. Thus, blocking CD47 is a potential therapeutic strategy for the prevention of brain metastasis. To test this hypothesis, breast cancer patient biopsies were stained with antibodies against CD47 to determine differences in protein expression. An anti-CD47 antibody was used in a syngeneic model of orthotopic triple-negative breast cancer, and CD47 null mice were used in a breast cancer brain metastasis

model by intracardiac injection of the E0071-Br-Luc cell line. Brain metastatic burden was measured by the in vivo imaging system (IVIS) and quantified by luciferase luminescence. Immunohistochemical analysis was performed to quantify tumor-infiltrating macrophages, and gene expression analysis of tumors was carried out by RNA-sequencing. Immunohistochemical staining of patient biopsies revealed an 89% increase in CD47 expression in metastatic brain tumors compared to normal adjacent tissue ($p \leq 0.05$). Anti-CD47 treatment in mice bearing brain metastatic 4T1br3 orthotopic tumors reduced tumor volume and tumor weight by over 50% compared to control mice ($p \leq 0.05$) and increased F4/80 macrophage marker 5-fold in tumors compared to control ($p \leq 0.05$). CD47 null mice had a 60% increase in survival ($p \leq 0.05$) and an 89% decrease in metastatic brain lesions ($p \leq 0.05$) compared to control mice in a brain metastasis model. Additionally, RNA sequencing revealed 318 uniquely expressed genes and a significant reduction of genes related to extracellular matrix organization in tumors treated with an anti-CD47 antibody. Thus, CD47 blockade may be an effective therapeutic for triple-negative breast cancer brain metastasis.

44. Unmasking the Confounder - Inherent Physiological Variability in Swine During Automated Ischemia-Reperfusion Injury

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Background: Swine are often used in translational research of shock and resuscitation. To fully understand the effects of a given intervention, external variability must be minimized. The purpose of this study was to determine the magnitude of the inherent inter animal variability when external factors are minimized by automating a porcine experimental protocol of shock. Materials & Methods: Swine underwent a 30-minute controlled hemorrhage of 30% blood volume, followed by 30 minutes of complete REBOA to create an ischemic insult (ischemic phase). Automated reperfusion (REBOA modulated to maintain target proximal MAP of 65mmHg) occurred over five minutes and shed blood was transfused to produce the ischemia-reperfusion shock state. Physiologic parameters were collected and plasma was stored for later analysis. The variance between time points was analyzed retrospectively using an F-test ($p < .001$) and differences between gender or weights were measured with a t-test ($p < .05$). Results: There was no difference in baseline physiology. Proximal blood pressure trends showed that variability within groups increased slightly from baseline to the hemorrhagic phase, followed by a large increase in inter animal variability from the hemorrhagic phase to the ischemic phase and a drastic decrease from the time points after the balloon wean within the reperfusion phase. Variability in distal pressures generated by the automated REBOA catheter increased slightly from baseline to the hemorrhagic phase, followed by a steep decline during the ischemic phase, and a sudden increase and plateau after balloon weaning. Conclusion: Despite leveraging automation to minimal external variability, we noted that the greater the physiologic derangement, the greater the inter-animal hemodynamic variability. Given the significant role of swine in resuscitation research, the increasing inter-animal variability increasing physiologic compromise that we observed warrants further investigation.

45. Improving Access to Care: 3D printed nasal prostheses after subtotal rhinectomy

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Background: Carcinoma of the nose and paranasal sinuses may present at a locally advanced stage, either due to insidious growth or longstanding neglect. Surgical excision is the gold standard, with up to 82.5% obtaining loco-regional control with or without radiotherapy. Large nasal defects are severely disfiguring, and nasal reconstruction may be delayed. Nasal prostheses may be used while awaiting reconstruction or as a long-term solution.

Prostheses are traditionally created by anaplastologists, which can be prohibitively expensive and unavailable in certain areas. 3D printing provides a potential solution to create a low-cost prosthetic for patients.

Learning Objectives: To understand the feasibility, cost and logistics of 3D printed nasal prosthetics.

Study Objective: To create 3D printed nasal prostheses after subtotal rhinectomy. To analyze process and cost of 3D printed

prosthetics.

Method: Prospective study of rhinectomy patients who received a 3D printed prosthesis. Outcomes include the time to prosthetic creation, cost, and fit of the prosthetic.

Results: 3D printed nasal prostheses take 2-10 weeks to create compared to 10 weeks by local anaplastologists. 3D printed prostheses cost \$350-400 compared to around \$12,000.

Conclusion: Nasal appearance significantly affects self-image and defects contribute to poor quality-of-life after curative treatment. Reconstruction after rhinectomy improves quality-of-life, but may be delayed or not feasible in certain circumstances. The availability of 3D printed prostheses offer a faster, low-cost alternative as 3D printing capabilities become more widespread.

46. 3D printed ceramic scaffolds to reconstruct calvarial defects: a non-human primate model

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Background: Calvarial defects are a commonly encountered clinical problem. The gold standard for their repair is autologous bone (split calvarial graft or rib), however their use is limited to smaller defects. Larger defects require placement of custom alloplastic materials such as Medpor or PEEK, which carry a lifelong risk of infection, as they are not incorporated. An ideal solution is to repair these defects with a bone substitute that is rigid to protect the brain initially, and that has osteoinductive properties so that it is fully incorporated and replaced with healthy, living bone.

Methods:

8 Skeletally mature non-human primates were used for this study due to the similarity of skull anatomy when compared to humans. A 5cm calvarial defect was made in the top of the skull. 2 of the primates received treatment with no ceramic scaffold, 2 of the primates received a naked scaffold, 2 of the primates received a scaffold that was doped with dipyridamole, and 2 of the primates received a scaffold that was doped with BMP. The primates were followed for 2 months and received a CT scan to assess bone growth.

Results: using Mimics software, 3D models were created using the post operative CT scans and bone volume around the area of the defect was measured. At 2 months the primates with no ceramic scaffold had no appreciable bony ingrowth into the defect. The primates with the naked scaffold had minimal bony ingrowth, NS1 1667 mm³ NS2 1948 mm³. The primates with dipyridamole had more bony ingrowth, D1 2157 mm³ and D2 2128 mm³. The primates with the BMP had the most bony ingrowth B1 2423 mm³ B2 2516 mm³.

Conclusion: 3d printed scaffolds can safely be placed in cranial defects for a durable skull repair and encourage bone growth over 2 months. 5cm cranial defects are critical defects in our non-human primate model and do not regrow bone without scaffolding material. The addition of dipyridamole or BMP further stimulates bone growth. Longer follow up is required for to assess for integration of the scaffold

47. Use of Fetal Bovine Acellular Dermal Matrix to Treat Tunneling Diabetic Foot Wounds

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Introduction

Diabetic foot ulcers are difficult to heal, but tunneling infected wounds are particularly troublesome especially when they tunnel into joints or connect with a separate ulcer on a different part of the foot. Multiple treatments including NPWT have been suggested but such tunnels may delay time to closure. Fetal bovine acellular dermal matrix (FBADM) has the ability to generate robust granulation tissue and may be an adjunct to standard of care in managing tunneling wounds.

Methods

Patients treated at our wound care center or inpatient consult team with tunneling wounds, and in particular communicating with a second wound, were chosen for fetal bovine acellular dermal matrix application. The patients underwent sharp debridement of their wounds followed by fetal bovine acellular dermal matrix application. Negative pressure wound therapy was used until the dermal matrix was integrated. They were followed until wound or tunnel closure.

Discussion

We have encountered four patients whose diabetic limb wounds tunneled, two of which communicated with a second, separate wound, for a total of 6 external wounds. The two non-communicating wounds had exposed bone and one with exposed joint capsule. Patients followed for a mean of 6 months. All wound tunnels had closed, and three of the six wounds had closed. One patient went on to split thickness skin graft and the others healed or are healing by secondary intention.

Conclusion

Acellular fetal bovine dermal matrix promotes granulation tissue generation in tunneling wounds including those that tunnel to a separate defect. This product can promote closure of complex tunneling and communicating wounds. While reassuring, more controlled studies are needed to evaluate the matrix-assisted closure versus standard of care.

48. The Effects of Mechanical Tissue Resuscitation (MTR) for Treatment of Ischemia Reperfusion Injury in a Swine Model of Acute Myocardial Infarction

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Background: Heart disease is the leading cause of death in the US and worldwide. For those who suffer from heart attack, reperfusion of ischemic cardiac tissue is the primary objective. While necessary, reperfusion promotes various inflammatory processes that may ultimately lead to cardiomyocyte injury and death, otherwise called ischemia-reperfusion injury (IRI). Modern pharmacological interventions attempt to reduce the extent of damage by targeting specific and selective biochemical pathways. Yet due to the broad spectrum of mediators that contribute to IRI, these therapies have proven unsuccessful. Presently, no pharmacological treatment effectively attenuates IRI. Mechanobiology is an alternative intervention that involves physical manipulation of living tissues to elicit a biological change. Specifically, prior research directed toward reducing IRI has demonstrated that application of a uniform, negatively pressurized vacuum to ischemic tissue, or area at risk (AAR), mitigates inflammatory processes and the amount of necrosis within the AAR. This study aims to find the most effective length of MTR treatment - 60min (MTR-60), 120min (MTR-120), or 180min (MTR-180) - at a pressure of -125mmHg. **Hypothesis:** Preliminary work with MTR has indicated that moderation is necessary for effective treatment. In other words, balancing vacuum pressure and duration of treatment is essential for reducing IRI. For this reason, it is hypothesized that MTR-120 will provide the best therapeutic effect. **Methods:** A cohort of 34 Yorkshire swine were randomized to one of four groups: control (no treatment), MTR-60, MTR-120, or MTR-180. Each animal was placed under general anesthesia before instrumentation. Pressure catheters were inserted into the right femoral artery and left femoral artery for pressure monitoring. The right external jugular was isolated, and a catheter was placed for fluid administration. Next, a sternotomy was performed, and monofilament sutures were placed, but not secured, around several branches of the LAD. The left atrium was cannulated for microsphere administration to allow for measurements of regional myocardial blood flow. Ischemia was induced by securing rubber tourniquets around the selected LAD branches. The tourniquets were removed to allow for reperfusion after 70min, and the MTR device was applied to the AAR for the designated time. Hemodynamic, blood gas, and blood flow data were collected at regular time intervals throughout the five-hour study. After completion of the reperfusion phase, differential staining of the heart was performed to discriminate ischemic from non-ischemic tissue. The animal was then euthanized, the heart extracted, and further staining completed to help quantify non-necrotic ischemic tissue from necrotic tissue. **Results:** There were no statistically significant differences in the AAR among the control group, MTR-60, MTR-120, and MTR-180 ($16.86 \pm 0.7\%$, $15.86 \pm 0.6\%$, $16.40 \pm 0.4\%$, $14.29 \pm 0.6\%$ respectively). MTR-60 ($41.90 \pm 5.6\%$) and MTR-120 ($44.20 \pm 5.0\%$) reduced the AN relative to the control ($56.72 \pm 3.4\%$), though neither group reached statistical significance. However, infarct size was significantly reduced in MTR-180 ($37.90 \pm 4.5\%$; $p < 0.05$). **Conclusions:** Based on these findings, MTR-180 is the most effective option for reducing infarct size in the setting of IRI. This suggests that longer treatment times are necessary to obtain optimal benefits. It is suspected that over the course of reperfusion, the sustained vacuum helps clear edema and eliminate inflammatory mediators. While these results support

MTR as a viable treatment for IRI, it will be crucial to perform survival studies in the future to further characterize long term therapeutic benefits of MTR. Source of Funding: Cheek Foundation Endowment of the Department of Plastic & Reconstructive Surgery, Wake Forest Department of Cardiothoracic Surgery, Groskort (Lois I.) Heart Research

49. Dietary Intervention with Probiotics and Muscadine Grape Extract Shifts Western Diet-Associated Metabolic, Microbial, and Inflammatory Parameters to Reduce Breast Tumor Growth

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Background: Western diet (WD) consumption is associated with increased risk and poor prognosis for breast cancer (BC) due to altered inflammation, metabolism, and microbial colonization. This study will determine whether intervention with probiotics (prbx) and muscadine grape extract (MGE) reduces WD-induced risk. **Methods:** Female C57BL/6 mice were fed either control diet (CD) or WD (45% fat and 25% sugar) and randomized into six groups per diet: diet alone, antibiotics (abx), prbx, MGE, MGE + abx, and MGE + prbx (n=8). Prbx groups received 1x10⁵ CFU of a 10-strain probiotic 3x weekly. MGE (0.1 phenolics/mL) and abx (5 mg/mL streptomycin, 1 mg/mL ampicillin, 1 mg/mL colistin) were administered in drinking water. Female BALB/c mice consuming either CD or WD, were injected with 1.0 x10⁶ 4T1 triple negative breast cancer cells into the R4/5 mammary fat pad. Tumors progressed to 100 mm³ prior to treatment with MGE, prbx, or combined MGE + prbx. Size was monitored with calipers for 21 days. **Results:** MGE + prbx administration in WD-fed mice resulted in reduced body weight. All intervention groups displayed reduced visceral adiposity and mammary gland (MG) weight compared to WD-fed mice. Significant intervention-mediated gut microbial alterations were observed by fecal 16S sequencing and included changes in proportional abundance of Bacteroidetes, Lactococcus, Lactobacillus, and Bifidobacterium taxa. Interventions modulated inflammatory markers in the visceral adipose tissue and MG as observed by immunohistochemistry (MCP-1 and CD68). Dietary intervention with MGE, prbx, and MGE + prbx reduced 4T1 tumor growth rate in WD-fed mice, but not in CD-fed mice. **Conclusions:** Our data suggests that MGE + prbx modulates diet-induced metabolic, inflammatory, and microbial factors. Further analysis of tumor tissue will determine whether MGE + prbx altered the tumor microenvironment to improve WD-associated BC prognosis.

50. Immune-enhanced tumor organoid (iT0) model for the testing of oncolytic immunotherapy

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Introduction: Despite recent advances in therapeutics, cancer remains one of the leading causes of mortality in the United States. Immunotherapies are a new class of medication that have demonstrated great promise in treating many different types of cancer, of which one promising subclass are oncolytic immunotherapies, based on the use of viral strains that selectively lyse tumor cells and induce antitumor immune activation. The development of oncolytic immunotherapies, as with many cancer therapies, is limited by a lack of in vitro models that effectively mirror the in vivo tumor microenvironment and host physiology, however, tumor organoids, based on growth of tumor cells alongside other cell types in a 3-dimensional, physiologically relevant extracellular matrix (ECM), represent a potential solution to this problem.

Methods: Tumor organoids have recently been engineered to include different immune cell types, representing a potential avenue for testing of immunotherapy. Here we develop and subsequently test an immune-enhanced tumor organoid (iT0) model for the testing of oncolytic immunotherapy. The model consisted of the CT-26 murine colorectal cancer cell line and BALB/c splenocytes embedded in a MatrigelTM matrix. This model was found to best support infection by the M51R-GFP strain of vesicular stomatitis virus (VSV) and subsequent immune activation due to its host compatibility.

Results: This model demonstrated profuse tumor cell-selective infection peaking at 24 hours and gradually declining through 96 hours after viral incubation. This resulted in increased levels of apoptosis and decreased tumor cell viability in the iT0s as assessed by immunofluorescence and ATP assay, respectively. Multiple signs of immune activation were also demonstrated consistent with the expected immunotherapeutic mechanism of action, including marked upregulation of IL-6 and enrichment in immune cell populations expressing antigen presenting cell and T cell markers.

Conclusions: The iTOs developed here effectively support infection with oncolytic immunotherapy and demonstrate core facets of the immunotherapeutic mechanism of action. This model represents a basis for the development of future oncolytic immunotherapies and ultimately a platform for personalized medicine through incorporation of human patient-specific tumor cells.

51. Using a Crowdsourcing Platform to Determine the Preferred Cephalic Index of Infants

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The cephalic index (CI), the width divided by the length of the head, is commonly used to assess head shape, particularly in children. In infants, it is used to diagnose abnormal head shapes, in particular positional plagiocephaly or scaphocephaly (long head). A recent study (Phelan et al. 2021 Plast Reconstr Surg), recorded the CI of children without any craniofacial disorders, and found that the normative CI values had increased significantly over the last 40 years, presumably due to the Back-to-Sleep campaign. Interestingly, to date there are no studies that have determined what is considered the ideal CI, and it is not known if it is the same as the normative CI. We used Amazon Mechanical Turk (mTurk), a crowdsourcing platform, to distribute an IRB-approved survey designed to determine the preferred CI. The survey included 9 questions in which four 3D surface images of heads of patients from age 3-6 months having different CI were presented, and the respondent was asked to choose a preferred head shape; based on this we were able to calculate each respondent's preferred CI. There were 1020 responses to the survey, 58% female, 77% white, and 39% college graduates. The overall mean preferred CI was 81.8 (standard deviation 2.5) compared to the normative CI of 85.4 from Phelan et al. There were no significant differences in preferred CI related to age of the respondent. In a subgroup analysis of respondents of different ethnicities, the mean preferred CI of white respondents was 81.7, while it was 82.3 and 82.7 for Asian and black respondents, respectively (Anova, $p = 0.00062$). There were no significant differences in mean preferred CI in subgroup analysis of level of education, medical literacy, or working with children. This is the first study that attempts to determine the preferred CI in infants 3-6 months of age, which will help craniofacial surgeons compare their outcomes to the preferred CI.

52. Preoperative Activity Status Predicts Postoperative Head and Neck Wound Complications

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Introduction: Preoperative functional activity status (PFAS) is a key component of frailty, a known risk factor for postoperative complications. The association between PFAS and incidence of postoperative wound complications, however, has not been well described in head and neck (H&N) literature. The current study investigates if PFAS as measured by metabolic equivalents (METs) impacts wound complication incidence after H&N cancer surgery Methods: IRB-approved, retrospective review of patients from 2014-20 who underwent resection of non-esophageal, aerodigestive tract Squamous Cell Carcinoma at a single tertiary care center. A standardized MET calculation questionnaire was utilized. METs measure energy cost of activities compared to basal metabolic rate. One (1) MET equates to energy used when sitting. Ten (10) METs correspond to energy used with vigorous activity. Patients were divided into 3 MET groups: 7-10 (Group 1), 5-6 (Group 2), or 1-4 (Group 3). Chart-documented wound complications included flap failure, dehiscence, infection, incisional breakdown, hematoma, and chyle leak. Wound complication incidences were compared to discern if low (<4) MET subgroup patients developed more complications than higher MET subgroup patients. Statistical analysis was done via Welch t-test. A p value <0.05 comprised statistical significance Results: Out of 233 patients, 46 (19.7%) had <4 METs (Group 3), 145 (62.2%) had 5-6 (Group 2), and 42 (18%) had >7 METs (Group 1). Wound complications occurred in 24.4% of patients. Of these, 12.2% were in Group 1, 66.6% in Group 2, and 21.0% in Group 3. Group 1 (METs >7) patients had a significantly lower wound complication incidence compared to Group 2 or 3 ($p=0.02$). The difference remained significant after adjusting for tobacco or alcohol use, preoperative albumin, and prior chemoradiation Conclusion: Patients with high PFAS (METs >7) had significantly lower incidence of postoperative wound complications compared to patients with METs <7 after adjusting for common risk factors. Functional status, defined by METs, may predict wound complications after H&N cancer surgery

53. Initial Evaluation & Risk Stratification of Orbital Fractures

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Purpose: To evaluate demographic characteristics, clinical and radiographic signs, symptoms, concomitant injuries and management of patients with acute orbital fractures in order to determine the degree to which initial evaluation of orbital fractures by ophthalmologists in the emergency department (ED) setting resulted in significant change of management and to explore the possibility of creation of a risk stratification tool **Methods:** A retrospective chart review of 2019 ED visits with initial orbital fractures involving ophthalmology consultation. Fracture details, imaging, comorbid ocular injuries, surgical reports, and management recommendations by ophthalmology were gathered and analyzed. **Results:** Intervention was recommended by ophthalmology in 27.9% of patients with orbital fractures. Ruptured globe, lateral canthotomy, and concern for entrapment being the most common associated injuries requiring emergent intervention. Several variables (decreased visual acuity ($p < 0.0001$), extraocular motility deficit ($p < 0.0084$), retrobulbar hemorrhage ($p < 0.0011$), and eyelid laceration requiring repair ($p < 0.0001$)) were associated with increased risk of concomitant, serious ocular injury. Retrospective application of these four variables as part of a risk stratification tool appears to effectively screen patients without compromising patient safety. **Conclusions:** The majority of orbital fractures seen by ophthalmology required no intervention. Application of a four-variable risk stratification tool by non-ophthalmology providers may result in safely risk stratifying patient consultation/visits safely decreasing unnecessary consultations in the ED.

54. Characterizing Blood Transfusion on Distal Aortic Blood Flow during Supraceliac Complete Aortic Occlusion in Swine Animal Model

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Background: Resuscitative endovascular balloon occlusion of the aorta (REBOA) is an endovascular procedure that can be used to provide hemodynamic support to hemorrhagic shock patients with non-compressible truncal hemorrhage. During REBOA, patients often receive blood transfusions to improve hemodynamics and correct hypovolemia before definitive surgical hemostasis. As cardiac output and aortic pressure increase in response to aortic occlusion and fluid and blood transfusion, aortic diameter will increase as a function of aortic compliance. This may result in unintended flow around the aortic balloon. To date, this leakage phenomenon has not been fully characterized and must be mitigated by progressive balloon inflation to maintain complete occlusion and to avoid ongoing hemorrhage. **Hypothesis:** We hypothesized that unintended blood flow around the REBOA balloon would occur following the initial establishment of aortic occlusion and during resuscitation, requiring continued inflation of the balloon to maintain complete aortic occlusion (AO). **Methods:** Yorkshire swine were anesthetized and instrumented to collect proximal mean arterial blood pressure (pMAP), distal MAP (dMAP), balloon pressure (bP), balloon volume (bV), and aortic flow (AF). A 7 Fr compliant aortic balloon was positioned in the supra-celiac aorta via femoral arterial access. Animals underwent 30% total blood volume hemorrhage over 30-min (T0-T30). At T30, the balloon was inflated to complete AO, defined by distal aortic flow of $<100\text{ml/min}$. Automated balloon inflation occurred from T30-T60 when downstream flow was detected. At T55, blood was transfused over 18-min (T55-T73). At T60, automated balloon deflation ensued to maintain a pMAP $>65\text{ mmHg}$ over 15 minutes. P values were calculated using a Mann-Whitney U test. **Results:** Hemodynamics were analyzed for 10 animals (weight $72.94 \pm 5.36\text{ kg}$). At T30, T50, T55, and T60 the mean pMAP was $31.29 \pm 7.86\text{ mmHg}$, $91.10 \pm 21.20\text{ mmHg}$, $89.20 \pm 19.60\text{ mmHg}$, and $129.54 \pm 15.08\text{ mmHg}$. During complete AO and ongoing blood transfusion (T55-T60), mean pMAP was $108.5 \pm 16.17\text{ mmHg}$ and mean dMAP was $12.44 \pm 2.79\text{ mmHg}$. The mean AF at T30, T50, T55, and T60 was $15.53 \pm 7.53\text{ mL/min/kg}$, $0.90 \pm 0.79\text{ mL/min/kg}$, $0.95 \pm 0.71\text{ mL/min/kg}$, and $2.00 \pm 0.90\text{ mL/min/kg}$. During steady state complete AO (T35-55) mean AF was $0.84 \pm 0.60\text{ mL/min/kg}$. This increased statistically significantly to $1.57 \pm 0.77\text{ mL/min/kg}$ during T55-T60 ($p=0.035$). Mean bV at T30, T50, T55, and T60 was $0.00 \pm 0.00\text{ mL}$, $5.57 \pm 1.61\text{ mL}$, $5.61 \pm 1.65\text{ mL}$, and $7.00 \pm 1.52\text{ mL}$. During steady state AO, mean BV was $5.49 \pm 1.57\text{ mL}$, which increased to $6.11 \pm 1.56\text{ mL}$ ($p=0.353$) during AO with concurrent transfusion (T55-T60). The mean bP at maximum AO during blood transfusion was $253.53 \pm 62.54\text{ mmHg}$. During T55-T60, there were 21 balloon inflations

among the 10 animals analyzed compared to 5 inflations during the preceding 15-min of steady state AO. Conclusions: Our data demonstrated that during REBOA with concurrent blood transfusion, progressive balloon inflation was required to maintain aortic occlusion due to increasing pMAP and AF. In clinical practice, following initial establishment of AO in the context of hemorrhagic shock, progressive balloon inflation may be required to maintain AO in response to intrinsic and transfusion mediated increases in cardiac output, blood pressure, and aortic diameter. This is particularly important when definitive hemostasis has not been achieved, as loss of aortic occlusion with blood flow beyond the balloon may result in ongoing hemorrhage and hemodynamic collapse. Funding Source: Funding for this study was provided by the US Army Medical Research and Development Command. Award Number: W81XWH-18-0072. Funding was also provided by The Dubie H. Holleman Fund for Cancer and Heart Research.

55. #Laryngology: A Standardized Hashtag Ontology

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Background: In the past decade, there has been a rise in social media applications and usage among individuals in the otolaryngology community. Hashtags (#), used to identify posts relating to similar topics, are utilized by patients and providers to search medical information, build a network, find providers, and discuss research. Previous otolaryngology literature includes a standard ontology, or list of hashtags, developed for otology. To date, the ontology of laryngology hashtags has not been created. The objective of this study is to propose a standardized ontology to use when discussing topics in laryngology on social media to maximize reach and effect. **Methods:** Using a combination of previously published techniques, along with some laryngology specific adjustments, the authors developed a list of suggested hashtags. An initial list was systematically culled from laryngology Instagram accounts including academic programs, professional societies, conferences, and expert social media laryngologists (fellowship-trained laryngologists with publically available professional accounts with greater than 500 followers). The list was narrowed down using current rate of use, specificity, and expert opinion. These were then categorized to include general terms, diseases and diagnoses, and treatment strategies

Results: Across all culled Instagram posts, there were 242 unique laryngology hashtags used and 1145 total hashtags were applied. The authors derived unique terms to be included in the ontology for laryngology by expert opinion of fellowship-trained laryngologists. **Conclusion:** Laryngology is in the early stages of utilization of social media. Developing a specific ontology of hashtags will optimize the reach and connections of term specific searches.

56. Quantifying the Hemodynamic Impact of REBOA vs. P-REBOA During Hemorrhagic Shock Using CFD

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Introduction: Traumatic injuries account for 5 million deaths per year globally, with hemorrhage responsible for 30-40% of all trauma-related fatalities [1]. In particular, non-compressible torso hemorrhage (NCTH) contributes to 34% of early fatalities, necessitating rapid lifesaving interventions. To address this problem, Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA), has been developed to mitigate internal bleeding by inflating balloon catheters to create a temporary aortic occlusion. While successful at augmenting pressure and perfusion proximal to the balloon, REBOA is associated with various distal complications including ischemia-reperfusion injury (IRI) and multi-organ failure [2]. To reduce collateral injury, partial inflation of the balloon (i.e., p-REBOA) has been recommended [3,4]. Yet, there remains no optimized implementation of p-REBOA. Towards this goal, we aimed to utilize computational fluid dynamic (CFD) models of the aorta to assess the hemodynamic impact of varying degrees of p- REBOA.

Materials and Methods: A three-dimensional (3D) anatomically representative geometry of a porcine thoracic aorta was constructed from CT scans within CRIMSON® (v1.4.5 Ann Arbor, MI). Varying degrees of aortic occlusion with a REBOA balloon catheter were modelled, ranging from 50-100% occlusion. The aortic geometry was thereafter discretized, generating meshes ranging from 2.9-4.7 million elements for each simulation. Pressure and flow boundary conditions were

set based on porcine experimental values during phases of baseline, hemorrhagic shock, and aortic occlusion. Cardiac output was prescribed as the inlet aortic velocity while three-element Windkessel models were prescribed to simulate the systemic vascular resistance and compliance at each arterial outlet. For all models, flow was assumed to be steady, Newtonian, and incompressible with a no-slip condition prescribed at all walls. Additionally, arterial walls and the REBOA device were assumed to be rigid.

Results and Discussion: Average blood pressure dropped from 75 mmHg to 54 mmHg during hemorrhage, corresponding to a 43% reduction in velocity. During 100% REBOA, pressure rose to 129 mmHg with areas of high recirculation proximal to the occlusion site. At 90% p-REBOA, significant pressure gradients (101/2 mmHg) were observed across the balloon, with an average flow of 0.12 L/min to the descending aorta. Meanwhile, 50% p-REBOA displayed an average pressure relatively similar to hemorrhage values but presented greater distal flows (an average of 2.08 L/min to the descending aorta). High wall shear stress (WSS) and shear rate, greater than 10 Pa and 8000 s⁻¹, respectively, were observed during 100% REBOA and 90% p-REBOA at the site of occlusion and in the brachiocephalic artery. 90% p-REBOA displayed not only the largest magnitude of WSS (>20 Pa), but also the largest WSS gradient across the balloon, potentially contributing to vascular endothelial damage.

Conclusions: This study resulted in the first in silico model simulating altered hemodynamics during various physiologic stages of hemorrhagic shock, and the impact of REBOA implementation. The resultant hemodynamic descriptors allow us to compare the impacts of varied percent occlusions under steady state conditions. During 90% p-REBOA, elevated WSS was observed around the site of occlusion; however, during a lower gradient partial occlusion (50%), WSS was observed to be near baseline values. These data suggest that optimal partial occlusion may be between 50 and 90%. Future work is needed to validate these simulations and to incorporate the shear-mediated physiologic response to REBOA with the ultimate goal to optimize REBOA implementation clinically.

57. Monitoring Early Postoperative Mobility at Scale

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Background: Early mobilization is considered an important component of postoperative recovery in the hospital; however, a large portion of patients fail to ambulate during their hospitalization, even with mobility initiatives and dedicated mobility aides. Real-time system-wide objective monitoring of patient mobility could play a central role in evaluating mobility programs and identify patients at higher risk for postoperative complications due to low mobility. The current study aimed to evaluate the feasibility of large-scale posture monitoring and the role of posture in measuring of postoperative mobility. **Hypothesis:** We hypothesized that existing continuous vital sign patient monitoring (VISI Mobile®) technology can objectively characterize the postural behavior of patients in the early postoperative period and identify patients at risk for adverse postoperative outcomes, like readmission. **Methods:** In this study, the accuracy of VISI Mobile in recording patient posture was evaluated and the feasibility of monitoring posture data at scale was evaluated. To evaluate VISI posture data (lying, reclining, upright) accuracy in detecting change in posture, five patients were monitored at fixed intervals over five hours comparing observed posture to VISI monitor real-time posture data. VISI monitor posture position was also recorded for 11 patients during ambulatory events. Retrospective accelerometer-based posture data from a cohort of postoperative patients between January and November 2019 was analyzed. Patients who had undergone major cancer surgery, were monitored for at least 24 hours, and had a length of stay longer than 24 hours were included. VISI Mobile posture was recorded and evaluated over the patient's postoperative recovery. Duration of upright posture was compared with postoperative outcomes including 30-day readmission. **Results:** 562 patients (60.7 mean age, 40.6% female) were identified with posture monitoring. The majority of patients monitored were ENT (26.0%) or Surgical Oncology (20.5%) patients with mean length of stay of 6.9 days (SD 6.1 days). Mean duration of posture monitoring was 77 hours (SD 49 hours) with mean number of posture changes being 18,495 (SD 11,692). VISI monitoring data recorded mean time spent upright per day of 206.2 minutes (SD 190.1 minutes) representing only 14.3% (SD 13.2%) of the observation period. Without adjusting for type of operation or other factors, no significant difference in the upright duration was identified between patients who were readmitted and those who were not ($p > 0.05$). During in-room posture change, VISI recorded posture was identical to observed posture with sensitivity and specificity of 1.0. During out-of-room ambulation, VISI monitoring was less reliable with accurate record of upright posture in 84% of ambulatory events. **Conclusion:** Real-time posture data from continuous vital sign patient monitoring (VISI Mobile®) technology was shown to be valuable for monitoring patients' mobility after surgery on a large scale.

58. The Impact of Autoimmune and Peripheral Vascular Disease on Sympathectomy Outcomes- An Update

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Purpose: To compare outcomes between autoimmune and non-autoimmune peripheral vascular disease (PVD) patients following periaarterial sympathectomy (PAS). **Methods:** A retrospective review of patients with autoimmune disorders or PVD who underwent PAS from 1997-2017 was performed. Primary outcomes included non-healed digital ulcers, recurrent digital ulcers, amputations and a composite outcome of total adverse events. **Results:** During the study period, 123 hands in 88 patients were identified. Mean age was 54 ± 14 years and median follow-up was 9 months. There were 65 patients (97 hands) with autoimmune disorders and 23 patients (26 hands) with PVD. There was a significantly higher rate of vaso-occlusive disease in PVD patients, occurring in 100% of PVD patients and 54% autoimmune patients. PAS with revascularization was performed in 12% (N=8) of autoimmune patients and 39% (N=9) of PVD patients. Autoimmune patients had a significantly higher rate of bilateral disease requiring bilateral PAS, occurring in 49% (N=32) autoimmune patients and 13% (N=3) of PVD patients. On univariate analysis, there were no significant differences in the primary outcomes between the two groups. Total adverse events occurred in 42% (N=27) of autoimmune patients and 13% (N=3) of PVD patients. Symptomatic improvement was comparable, with 18% of autoimmune and 16% PVD patients experiencing persistent symptoms. Multivariate analysis was performed and controlled for disease state, presence of revascularization and bilateral hand PAS. This demonstrated that PVD patients had a lower likelihood of having postoperative adverse events in comparison to autoimmune patients. **Conclusion:** In comparison to autoimmune patients, PVD patients are at a lower risk of developing adverse postoperative events including non-healing ulcers, recurrent ulcers and amputations.

59. Donor Derived Cell Free DNA Monitoring in Kidney and Kidney Pancreas Transplant Recipients- Initial Wake Forest Experience

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Donor-derived Cell-free DNA monitoring In Kidney and kidney Pancreas Recipients - Initial Wake Forest experience Berjesh Sharda, MD, Matthew Garner MD, Alan C Farney, MD, PhD, Jeffrey Rogers, MD, Giuseppe Orlando, MD, PhD, Colleen Jay, MD,, Robert J Stratta, MD **Abstract:** ***Purpose:** Percutaneous renal allograft biopsy is the current gold standard for detecting acute rejection after kidney transplantation (KT). Noninvasive tests such as plasma-based donor-derived cell-free DNA (dd-cfDNA) assays have been proposed as an alternative to biopsy. We sought to examine the value of dd-cfDNA testing at one month following KT in different donor and recipient categories. ***Methods:** We performed a single center retrospective review of all adult KT and simultaneous pancreas-KT (SPKT) patients (pts) who underwent dd-cfDNA testing between January 2018 and September 2020. The diagnosis of acute rejection was based on histopathology obtained from percutaneous, ultrasound-guided, needle biopsies. Our center's standard practice included dd-cfDNA testing and performing surveillance kidney biopsies at 1 month following KT. The dd-cfDNA test was considered elevated if $>1.0\%$. ***Results:** During the study period, 3157 dd-cfDNA tests were performed in 695 de novo pts; only 2% of samples were unacceptable. I Higher mean 1-month values (range 0.72-2.2%); 22-44% of patients have 1-month values $>1.0\%$ seen in: - Highly sensitized patients (panel reactive antibody level $\geq 98\%$) - Retransplants - Patients with early re-operations - SPK transplant recipients Lower mean 1-month values (0.45-0.56%); 7-14% have 1-month values $>1.0\%$ seen in: Primary kidney alone transplant recipients (standard criteria donor (SCD) expanded criteria donor (ECD), donation after cardiac death (DCD), living donor (LD), dual KT (DKT), acute kidney injury (AKI) donors, $\pm$ delayed graft function (DGF). n 58 primary KT pts with negative 1-month surveillance biopsies, corresponding mean 1-month dd-cfDNA levels were 0.49 ± 0.4 . In 10 pts with positive 1-month surveillance biopsies, corresponding mean 1-month dd-cfDNA levels were 1.5 ± 1.8 . In 26 pts with a 1-month dd-cfDNA level >1.0 , the subsequent incidence of acute rejection was 27%; in 22 pts with a 1-month dd-cfDNA level ≥ 2.0 , the subsequent incidence of acute rejection was 50% (mean follow-up 14 months). ***Conclusions:** We noted a bimodal distribution of 1-month dd-cfDNA levels. Higher mean 1-month dd-cfDNA levels (range 0.72-2.2) were associated with retransplants, high PRA pts, SPKTs, and pts with early reoperations; 22-44% of pts in these categories had 1-month

dd-cfDNA levels >1.0. Conversely, primary KT alone pts (DCD, living donor, AKI donor, SCD, ECD, dual KT, those with DGF) had lower 1-month dd-cfDNA levels (range 0.45-0.56) and only 7-14% had 1-month dd-cfDNA levels >1.0. One-month surveillance biopsy results correlated with corresponding dd-cfDNA levels. Elevated 1-month dd-cfDNA levels occur in pts at a higher risk for acute rejection, suggesting that these pts need to be monitored more closely.

60. Immuno-Reactive Cancer Organoid Models to Examine Microbiome Metabolite Effects on Immune Checkpoint Blockade Efficacy

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Introduction: As the number of available immunotherapies for solid tumors increase, their prevalence in the clinic continues to rise as well. While the results are promising and immunotherapies have benefits over traditional chemotherapeutics, a sizable percentage of patients are non-responders to all types of immunotherapy as a treatment option. These differences in sensitivity can be either innate or acquired. It is well accepted that specific diets have a significant impact on our health including effects on different therapies for cancer and other diseases. Although much progress was made recently in developing models of cancer, there has been limited in vitro models to assess tumor immune-reactivity. Such models would be ideal for isolating specific molecular mechanisms that dictate cell behavior and interactions. We have recently created tumor organoid model containing cancer cells paired with cytotoxic T-cells in order to model immune checkpoint blockade (ICB) efficacy. Our goal is to use this model to examine novel microbiome-ICB interactions that were shown to alter therapeutic response levels in patients. **Methods:** We created tumor organoids consisting of matched tumor and immune cells, embedded in extracellular matrix (ECM)-like hydrogels. Organoids were treated with therapeutic equivalent doses of anti-PD-1 and anti-CTLA-4. The organoids were also exposed to physiologic concentrations of metabolites 3-indolepropionic acid derived from the bacterial species *Clostridium sporogenes*, hippurate derived from *Clostridiales*, *Faecalibacterium prausnitzii*, and *Eubacterium*, pyocyanin derived from *Pseudomonas aeruginosa*, butyrate derived from *Faecalibacterium prausnitzii*, and inosine derived from *Bifidobacterium pseudolongum*. Each of these bacterial species and the associated metabolite represent a likely effector of host immune function described in literature and therefore a potential effector of ICB response. Organoids were analyzed with cell viability assays, flow cytometry, RT-qPCR, and immunohistochemistry staining to determine the effects of the metabolites on ICB response. **Results and Discussion:** We showed that ICB therapy stimulated internally localizing T-cells, inducing T-cell-mediated tumor cell killing. ICB treated samples resulted significant loss of viability with corroborating readings from the other methods of characterization. RT-qPCR and flow cytometry demonstrated the cellular changes due to bacterial metabolite co-administration. These results include increased expression of CD-8 T-cell co-receptor, increased cytokine production, and increased effector T-cell viability. **Conclusion:** We have created an ex-vivo tumor immune-reactive organoid model for studying immunotherapy. We are working to elucidate the effects of microenvironment factors, such as microbiome metabolites, and observe their impacts on immunotherapy efficacy to better understand what conditions are conducive or detrimental to successful ICB treatment.

61. A1 Pulley Tenderness as a Modification to Tenderness along the Flexor Sheath in Diagnosing Pyogenic Flexor Tenosynovitis

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Background: Pyogenic flexor tenosynovitis (PFT) is frequently diagnosed by physical examination according to the Kanavel signs. However, these signs have had varying sensitivity and specificity for PFT. This study proposes a modification of the Kanavel sign “tenderness over the course of the flexor sheath” by including palpation of the A1 pulley to increase specificity. **Methods:** A retrospective review was performed over eight months for patients in the emergency department who received a consult to hand surgery to rule out PFT. Two cohorts, non-PFT infections and PFT infections, were studied for the presence or absence of the four Kanavel’s signs, as well as specifically over the A1 pulley on the affected digit(s) or T1 pulley of the thumb. **Results:** There were a total of 33 patients in the two cohorts (21 non-PFT, 12 PFT) with statistically

significant differences with regards to the presence of all the Kanavel signs. A1 pulley tenderness had the greatest odds ratio, positive predictive value, specificity, and accuracy when compared to all Kanavel signs. When used in conjunction with each Kanavel sign, there was an increase in specificity in all four signs. Receiver Operating Characteristic (ROC) analysis revealed increased area under the curve (AUC) with A1 pulley tenderness added, indicating improved ability to classify hand infections as PFT vs. non-PFT. Conclusions: While the classic Kanavel signs have shown reliable clinical utility, this study finds that tenderness at the A1 pulley can be a useful specification of “tenderness over the course of the flexor sheath.”

62. Feasibility of Deep Learning Combined with Multispectral Imaging for Intra-Operative Guidance in Burn Excision Surgery

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Purpose: In burn surgery the goal is to accurately excise the non-viable burned tissue to expose a healthy wound bed for skin grafting. The surgeon must estimate the required depth of excision and evaluate the viability of the wound bed prior to grafting. Currently, clinician judgment is the only method used to delineate viable from non-viable tissue. We investigated the effectiveness of a non-invasive multispectral imaging system to aid clinician judgment in a porcine model of burn excision. **Methods:** Multispectral imaging data was obtained from serial tangential excisions of thermal burn injuries and used to train two deep learning algorithms. One algorithm was developed to identify the location of non-viable tissue in the wound bed, the other was to estimate the depth of non-viable tissue. Histology of the excised tissue was used as the gold standard for determining the presence and depth of non-viable tissue. Following algorithm development, we studied the ability of two surgeons to estimate burn depth and wound bed viability both unaided and aided by the device. **Results:** The Deep Learning algorithm significantly improved the surgeons' abilities to determine the viability of the wound bed by 25%. In addition, when the surgeons updated their initial estimates of burn depth after seeing the device output, there was an 85% probability that the new estimate would be more accurate. **Conclusions:** This investigation shows the feasibility for image guided burn excision that involves understanding how clinician judgment would be impacted when aided by a device during surgery. This initial work shows promise for a real-time imaging system in burn surgery.

63. The Virtual Interview Experience: Advantages, Disadvantages, and Trends in Applicant Behavior

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Plastic and Reconstructive Surgery
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Introduction: Residency programs and applicants were forced to hold virtual interviews during the 2020-2021 application cycle. Inability to evaluate a program and/or applicant in person has intangible drawbacks. However, there are obvious advantages: cost, convenience, and comfort. Do the advantages outweigh the disadvantages? How have applicant behaviors changed to learn about programs in a virtual-only interview process?

Methods: A survey was distributed to 302 applicants to a single plastic surgery residency program during the 2020 application cycle. Demographics, social media presence and utilization, and experience with the virtual application and interview process were analyzed. A 2018 survey from our institution was compared to a subset of questions for longitudinal analysis.

Results: Seventy-six respondents (25.2%) completed the survey. Most applicants (88.2%) spent less than \$1000 during the interview and application cycle. Over half (56.6%) did not receive letters of recommendation from outside their home program. A significant minority (27.6%) of applicants attended more than one interview in a single day. Compared to 2018, applicants in 2021 were significantly more likely to access alternative digital resources (forums/discussion boards, social media, and podcasts) when learning about programs. Average number of interviews remain in the range of pre-COVID studies, but the percentage of interviews attended increased.

Conclusion: Applicants spent substantially less money on interviews and relied on alternative digital sources to learn about residency programs. This study objectively quantifies the advantages of virtual interviews. Disadvantages include inability to assess “fit” and lack of non-verbal communication.

64. CD47 Blockade Limits Immunosuppressive Checkpoint Molecules in the Tumor Microenvironment to Sensitize Triple-Negative Breast Cancer Tumors to Immune Checkpoint Blockade Therapy

Elizabeth Stirling, MS

David R. Soto-Pantoja, PhD

Adam Wilson; Katherine L. Cook; Alexandra Thomas; Pierre L. Triozzi; Glenn J. Lesser;
David R. Soto-Pantoja
Cancer Biology
BASIC SCIENCE - Student

Triple-negative breast cancer (TNBC) lacks druggable targets and has high metastatic incidence. Immune checkpoint blockade (ICB) antibodies are FDA approved for TNBC treatment, but therapeutic response and biomarkers are limited. Therefore, additional therapeutic targets and biomarkers are needed to sensitize TNBC tumors to immune checkpoint blockade therapies and improve patient response. CD47 is an integral membrane protein overexpressed on cancer cells that alters anti-tumor immunosurveillance, resulting in tumor progression. CD47 is involved in metabolic reprogramming but whether CD47 is a marker of progression and its role in ICB response for TNBC remains unknown. Human TNBC biopsies were subjected to immunohistochemical analysis to determine CD47 role in TNBC progression. Human matched primary, and metastatic TNBC biopsies increased immunoreactivity to CD47, signifying a potential therapeutic target. To determine CD47 impact on tumor burden, a carcinogen-induced TNBC model was performed in female wild type (WT) and cd47 null (cd47^{-/-}) C57Bl/6 mice. CD47 deficiency in the carcinogen-induced DMBA model decreased tumor incidence, weight, and area compared to WT. Since CD47 can regulate metabolism, tumors underwent metabolomic analysis. Principal component analysis displayed differentially regulated metabolites between WT and cd47^{-/-} tumors. Decreased carnitine conjugated fatty acids and ketone bodies were observed in cd47^{-/-} tumors compared to WT, suggesting decreased fatty acid availability and/or metabolism. TNBC cell respiratory measurements validated that targeting CD47 shifted metabolic dependency from fatty acid oxidation to glycolysis. Kynurenine/tryptophan pathway metabolites, which catabolize Indoleamine-2,3-dioxygenase (IDO1) and are involved in anti-PD-1/PD-L1 resistance, were decreased in cd47^{-/-} tumors compared to WT. To evaluate immune infiltrate signaling, tumors underwent spatial tissue proteomics by multiplexing photo-cleavable antibodies in Formalin-Fixed Paraffin-Embedded samples. Spatial proteomic analysis determined that cd47^{-/-} tumors had elevated immune cell infiltration (CD45⁺, CD3⁺), suggesting CD47 absence enhances tumor immunogenicity and immune-mediated tumor ablation. Multiplexing of photo-cleavable antibodies increased protein expression of immune checkpoint molecules (PD-L1, VISTA, B7-H3, BatF3) and immunosuppressive cell types (CD11b⁺, Ly6c⁺) in WT tumors compared to cd47^{-/-}, suggesting CD47 absence limits immunosuppressive signaling. Since anti-PD-L1 therapies are approved to treat TNBC and WT tumors from our DMBA model show PD-L1 upregulation, we examined how targeting CD47 would impact tumor burden of mice receiving anti-PD-L1 therapy through an orthotopic EMT-6 murine TNBC model. Targeting CD47 or PD-L1 as monotherapy decreased tumor burden; however, in combination it further reduced tumor burden compared to anti-PD-L1 treatment due to increased intratumoral granzyme B secreting cytotoxic T cells. Our data indicate that CD47 may serve as a marker of anti-PD-L1 response, and targeting CD47 enhances immunogenicity and decreases immunosuppressive molecules, sensitizing TNBC tumors to anti-PD-L1 therapy to reduce tumor burden.

65. Volumetric Analysis of Sagittal Synostosis Surgical Outcomes Using Three-Dimensional Stereophotogrammetry

Marion Tapp, MD

Lisa David, MD

Griffin Bins, MD
Plastic and Reconstructive Surgery
CLINICAL RESEARCH-Resident

Craniosynostosis is the premature fusion of one or more cranial sutures with the most common being sagittal craniosynostosis that effects 1 in 4000 live births. These patients present with abnormal head shape (scaphocephaly) characterized by frontal bossing, sagittal ridging, bitemporal narrowing and occipital bulging. The sequela of untreated craniosynostosis include skull deformity, cranial growth restriction and delayed neurocognitive development. Operative interventions can largely be divided into strip craniectomy and cranial vault remodeling. Strip craniectomy with the utilization of spring dis-

traction (termed Spring assisted suturectomy, SAS) was a further modification popularized in the United States by our own Dr. Lisa David.

Cephalic index is a measurement of cranial head-shape and over time the use of this objective scale has been called into question due to its limitation of calculation from two-dimensional measurements. CT scans in the past have been available for the calculation of volumetric changes in craniofacial surgery; however, use has largely fallen out of favor due to unnecessary exposure to radiation in the infant. This has opened the door to increasing use of noninvasive three-dimensional stereophotogrammetry allowing surgeons to draw more definitive conclusions about calvarial shape and outcomes. Prior literature quantifying these volumetric differences between surgical techniques is largely based on CT scans and portable 3D imaging.

Our institution now routinely obtains non-invasive three-dimensional stereophotogrammetry on all patients presenting to our clinic with abnormal head shape or clefting allowing us a large collection of data. Our purpose is to analyze the volumetric differences in head shape between cranial vault remodeling, spring assisted suturectomy and endoscopic strip suturectomy with helmeting, using three-dimensional stereophotogrammetry.

Since 2018, we have had 46 patients undergo surgery for sagittal craniosynostosis including pre-operative and post-operative imaging with the 3dMDface System. Early analysis of imaging strengthens previous results from our own institution suggesting spring assisted suturectomy results in greater improvement in total cranial volume as opposed to frontal volume which translates to improvement in overall head shape that can be not be fully appreciated from cephalic indices alone. Our hope is the results of our study will further elucidate the volumetric impact of sagittal craniosynostosis intervention and will further the movement towards non-invasive three-dimensional stereophotogrammetry as the gold standard of measurement in craniofacial surgery.

66. Salvage Resections for Oropharyngeal Cancer in the HPV-Era

Sydney Thomas, MD

Joshua Waltonen, MD

J. Dale Browne; Christopher Sullivan; Gregory Russel; Joshua Waltonen
Surgery-Otolaryngology (Dentistry)
CLINICAL SCIENCE – Resident

Introduction The incidence of oropharyngeal squamous cell carcinoma (OPSCC) has risen in the last decade with a majority of new cancers now attributed to human papillomavirus infection (HPV). If initial management of a primary tumor fails, salvage surgery is the mainstay of treatment. Before the onset of the HPV-era, previous studies have shown a poor prognosis for salvage surgeries in oropharyngeal carcinoma. In this study, we aim to identify prognostic factors for patients treated with salvage surgery for OPSCC, specifically that of HPV-positive status. **Methods** A retrospective review of all definitive resections performed at our institution for OPSCC between 2010-2018 was conducted. Thirty-two patients were identified who had previously undergone radiation or chemo-radiation for OPSCC and later required salvage surgery at Atrium Health Wake Forest Baptist Hospital. Data on demographics, prior therapy, surgery, pathology findings, and outcomes were collected. Cox proportional hazard regression models were used to assess the association between independent measures with overall survival and time to recurrence. **Results** Smaller tumors were associated with improved overall survival and disease-free interval ($p=0.0082$, $p=0.011$). The ability to perform endoscopic or transoral surgery was also associated with improvement in survival and lack of recurrence ($p=0.0044$, $p=0.017$). Just over half of the cancers were HPV-positive ($n=17$, 53%); HPV-status was not associated with improvement in survival or disease-free interval. Fifteen patients recurred after surgery salvage surgery: six with distant metastases and local recurrence, eight with only local recurrence, and one with only distant metastases. Of these, only three remain alive. **Conclusions** Previous studies have demonstrated that tumors that survive initial chemo-radiation therapy have an especially aggressive biology (1). The two-year survival rate ranges greatly in prior studies, from 27-49% (2-3). At 47%, this study demonstrates a survival rate at the upper-limit of this range, though this outcome is still grim. While HPV-positive primary tumors tend to be associated with better outcomes, we found no impact in HPV-status and outcomes of salvage surgery. Because of the high morbidity and poor functional outcomes that can arise with salvage surgery, patients must be carefully selected.

67. Resident and Medical Student Perspectives on Future Training in Otolaryngology during the Covid-19 Pandemic

Cameron Todd, MD

Brian Downs, MD

Brian Downs, MD
Surgery-Otolaryngology (Dentistry)
CLINICAL SCIENCE - Resident

Objective: To survey the attitudes of medical students on their decision to apply to otolaryngology residency, and otolaryngology residents on their decision to apply to fellowships in light of the Covid-19 pandemic. **Methods:** A cross-sectional survey was sent to medical students and current otolaryngology residents via otomatch.com and through distribution via email by residency program coordinators from July 2020 to August 2020. **Results:** 36 medical students and 24 residents completed the survey. For medical students, 6 of 36 (17%) respondents indicated that the Covid-19 pandemic changed their decision to apply for an otolaryngology residency. The change in the application process and changes at their home medical school were cited as the most common reasons for not applying. For residents, only 1 (4%) respondent indicated the Covid-19 pandemic had changed their decision to apply for fellowship due to the large number of aerosolized cases. **Conclusion:** There appears to be a portion of medical students who have either delayed their decision to apply to residency or applied to other specialties due to the changes in the application process in the 2020-2021 cycle caused by the Covid-19 pandemic. This may impact the future application process as students apply with later cycles or apply to other fields due to lack of exposure. Residents applying to fellowship do not appear to have been impacted though.

68. Shear-Wave Elastography of the Testis in Pediatrics, Establishing the Standard Values

Abinav Udaiyar, BS

Hooman Sadri-Ardekani MD, PhD

Robert Russell Wilson; Stanley Kogan; David Childs; Marc Colaco; Marshal Schwartz; Steve Hodges; Anthony Atala; Hooman Sadri Ardekani
Surgery-Urology
CLINICAL SCIENCE – Student

Introduction/Background Shear-wave elastography (SWE) is a technique that measures sonographic quantification of tissue elasticity. Previous studies provide evidence of apparent structural and histological differences in testicular tissue elasticity for certain testicular diseases. SWE provides a noninvasive investigation of the stiffness of the testicular tissue as a primary diagnostic tool for certain testicular disorders with the potential to replace biopsies and exploratory surgical procedures. While studies are investigating normal shear wave elastography values for testis in adult men, no studies have provided standardized normal range values for shear wave elastography for the pediatric testis. The purpose of this study is to establish the normal threshold ranges of shear-wave velocity in pediatric patients (0 - 18 years). **Methods/Materials** Patients from one clinic location were screened for the study, excluding those with a known history of testicular diseases, sex chromosome abnormalities, or testicular surgery. Fifty-four volunteers (mean age: 6.12 ± 4.57 , range: 3 months - 18 years) were chosen and underwent routine B-mode sonography and simultaneous multi-frame shear-wave elastography of both testes. Patients were divided into two age groups: 3 months - 9 years and 10 - 18 years ($n = 40$ and $n = 14$ respectively). The volume of each testis and the shear-wave velocity at the testis' superior, center, and inferior poles were measured and collected. **Results** The mean shear-wave velocity for the patients under and over 10 years old was 1.24 ± 0.035 m/s and 1.098 ± 0.074 m/s respectively ($p = 0.0654$). However, when age groups were analyzed by anatomical pole, a statistically significant decrease in the shear-wave velocity was found between groups at the inferior, central, and superior pole with p -values of 0.0317, 0.0006, and 0.024, respectively. **Conclusions** From the 54 patients, preliminary data to determine normal shear-wave velocities for a pediatric testis population was collected. Significant decreases in shear-wave velocities found between the age groups at each anatomical pole may indicate tissue elasticity differences as the testes mature and grow. We will continue to enroll more patients to better define standards for comparison.

69. Short Term Outcomes with Early Weightbearing Utilizing Willits Protocol Following Haglund's Surgery

Bryanna Vesely, DPM MPH

Ashleigh Wells, DPM

Ashleigh Wells; Brennan Reardon
Surgery-Orthopedics
CLINICAL SCIENCE – Resident

Background: Insertional achilles tendinopathy is a common foot and ankle condition that can cause severe, debilitating pain. When conservative treatment fails, surgical options are offered to patients. While literature has been published regarding surgical techniques for insertional achilles tendinopathy, there has been little published regarding postoperative protocol following surgery. We hypothesize that the Willits protocol will allow for early mobilization and decreased postoperative complications in regards to pain and reoperation rate. **Methods:** A retrospective chart review was conducted of 7 patients who underwent surgical treatment for insertional achilles tendinopathy with Haglund's deformity by a single foot and ankle surgeon. Following surgery, Willits protocol was initiated for early mobilization. **Results:** The patients had an average decrease in pain from 7 to 3 postoperatively. One patient or 14% required reoperation. There were no postoperative ruptures or avulsion fractures. No patients required a brace long term. **Conclusion:** The Willits protocol, though initially created for achilles tendon ruptures, provides an early mobilization protocol for patients after insertional achilles tendinopathy procedures. Our study found low reoperation rate and improved pain level while allowing patients to mobilize earlier than previously reported in literature.

70. Intermediate to long-term Follow up of the Salto Talaris Fixed Bearing Total Ankle Prosthesis

Bryanna Vesley, DPM MPH

Aaron Scott, MD

Matthew King; Aaron Scott
Surgery-Orthopedics
CLINICAL SCIENCE – Resident

Background: Total ankle arthroplasty is an alternative procedure for end-stage ankle arthritis. We hypothesize with exacting patient selection, the Salto Talaris arthroplasty will demonstrate as a favorable alternative to an ankle arthrodesis at a long term follow up. **Methods:** In this retrospective study, intermediate- to long-term outcome measures (VAS pain scale, survival rate, postoperative use of brace and patient satisfaction) of 19 consecutive fixed bearing Salto Talaris total ankle arthroplasties between August of 2009 and August of 2018 were analysed and compared before and after surgery. Medical records and radiographs were reviewed. **Results:** The average follow up in our study was 6.9 years. Our study showed a 21% complication rate according to the Glazebrook classification system. The reoperation rate was low at 10.5% with a 100% survivorship of the total ankle implant. Sixteen percent reported using a brace postoperatively. The average pain decreased from 9.1 preoperatively to 2.6 postoperatively. Patients reported a 95% satisfaction rate. **Conclusion:** The Salto Talaris arthroplasty provides a good alternative to ankle arthrodesis with low complication and reoperation rates and high survivorship. We believe with stringent patient selection, the Salto Talaris system shows great promise at a long term follow up.

71. Breast Cancer Organoids as a Model for Testing Personalized Therapies

Nadeem Wajih, PhD

Konstantinos Votanopoulos, MD, PhD and Shay Soker, PhD

Nadeem Wajih, Libby McWilliam, Konstantinos Votanopoulos, and Shay Soker
Surgery-Oncology
BASIC SCIENCE-Fellow

Introduction: Breast cancer is one of the most frequently diagnosed cancer in women with a high mortality rate. More than 20 different subtypes of breast cancer are identified. Advancement in patient-derived organoid technology makes it possible to preserve cellular, structural, and tissue microenvironment which mimics the tissue in vivo.

Method: We developed patient derived breast organoids both from normal and cancer biopsies recapitulate the structure of breast tissue. Breast biopsies were enzymatically digested to yield a single cell suspension. About 1x10⁵ cells were

encapsulated in a 3:1 collagen I (Col I) and hyaluronic acid (HA) mixture. For breast tumor immune enhanced organoids (iTOs), 2 x 10⁵ patient matched PMBCs were mixed with the breast cancer cells and encapsulated as described above.

Results: Histological analyses of the breast organoids shows the characteristics of the breast tissue with well-defined acini in H&E. In tumor organoids acini were somewhat perturbed compared to normal breast organoids. Immuno-fluorescence staining shows the expression of breast biomarkers including EGF receptor 2 (HER2), Progesterone receptor (PR), Estrogen receptor (ER). Zona occludin 2 and keratin 19 expression in luminal cells and expression of Keratin 14 and P63 in basal cells suggested correct polarization in the organoids. Immunofluorescence staining of (iTOs), with T cell markers including CD3, CD4, and CD8 indicated that immune cells remained viable in the iTOs. Drug responses to Doxorubicin, Paclitaxel and a combination of Doxorubicin-Paclitaxel showed significant inhibition of cell growth in normal and tumor organoids ($p < 0.04$) except for Paclitaxel failed to inhibit tumor cell growth. Immunotherapy with nivolumab (anti PD-1) immune check point inhibitor showed no significant effect on cell growth.

Conclusions: Breast cancer organoids recapitulate the histological features of breast tissue in culture and response to chemotherapies. In the future, patient-derived tumor organoids can provide a platform for personalized medicine.

72. Can Old Imaging Alter the Preoperative and Operative Course of Patients Undergoing Parathyroidectomy for Primary Hyperparathyroidism?

Hope Werenski, BS

Reese W. Randle, MD

Christopher J. Nguyen; Erik D. Johansson; Paul M. Bunch; Reese W. Randle
Surgery-General
CLINICAL SCIENCE – Student

Introduction Surgical intervention provides the only definitive treatment for primary hyperparathyroidism (PHPT). Although imaging plays no role in diagnosis, it is essential for preoperative localization when a focused parathyroidectomy is planned. We hypothesized that identification of enlarged parathyroid glands on imaging obtained prior to the diagnosis of PHPT has the ability to impact the preoperative evaluation and intraoperative course of patients undergoing parathyroidectomy. **Methods** The study included adult patients with a diagnosis of PHPT who underwent parathyroidectomy between 10/2015 and 10/2020 and had contrast-enhanced CT imaging of the lower neck and upper chest prior to diagnosis for unrelated indications. A neuroradiologist retrospectively viewed these prior scans blinded to the operative findings, and a surgeon compared the imaging findings to preoperative notes and operative reports to determine whether and how information derived from prior imaging might have impacted the preoperative work-up and intraoperative course of these patients. **Results** We identified at least one visibly enlarged parathyroid gland on a prior contrast-enhanced CT in 30 (75%) of 40 included patients. The average time between the oldest scan where an enlarged parathyroid was visible and parathyroidectomy was 4.6 years (range 0.9 to 11.4). Despite old imaging enabling correct localization, 16 of these 30 (53.3%) underwent a sestamibi scan and 2 (6.7%) underwent a parathyroid CT prior to parathyroidectomy. Additionally, knowledge of the enlarged parathyroid(s) on prior imaging might have allowed a more focused approach in 3 (10.0%) and prevented 1 unnecessary thyroid lobectomy performed in search of disease. Similarly, localizable disease on old imaging might have prompted a more thorough exploration in 4 (13.3%) and possibly prevented missed disease and failure to cure in 3 (10.0%). We determined that viewing prior imaging could potentially change the preoperative evaluation in 70.0% of patients with localizable disease on old imaging and the operative course in 23.3%. When considering the entire cohort with relevant old contrast-enhanced imaging available, conservative estimates indicate reviewing these scans might alter the preoperative work-up in 52.5% of patients presenting with PHPT and the operative course in 17.5%. **Conclusion** The identification of enlarged parathyroid glands on imaging that predates a diagnosis of PHPT has the potential to impact the preoperative evaluation and intraoperative course of patients undergoing parathyroidectomy. When available, prior contrast-enhanced CT imaging should be reviewed prior to obtaining additional imaging or planning the operative approach.

73. Pulsed Electromagnetic Field Therapy is Effective for Pain Reduction and Symptom Improvement in Patients with Interstitial Cystitis/Bladder Pain Syndrome

Dylan Wolff, MD

Stephen J Walker, PhD

Peyton Lee; Christina Ross; Gopal Badlani; Robert J. Evans; Tyler Overholt; Raymond Xu;
Catherine A. Matthews; Stephen J. Walker
Surgery-Urology
CLINICAL SCIENCE – Resident

Introduction: Interstitial cystitis/bladder pain syndrome (IC/BPS) is a chronic pelvic pain condition (bladder and beyond) that affects millions of (mostly) women in the United States. Despite the wide range of available treatment options for IC/BPS, effective pain management continues to be a significant clinical challenge for these patients. Recent evidence suggests that an alternative novel strategy, pulsed electromagnetic field (PEMF) therapy, proven to be effective for pain reduction in other related chronic pain conditions, may provide pain relief in some IC/BPS patients. Therefore, the primary objective of this pilot study was to evaluate the efficacy of PEMF therapy for pain management in women with IC/BPS.

Methods: Women 18-80 years old with a confirmed diagnosis of non-bladder-centric IC/BPS (i.e., with an anesthetic bladder capacity >400cc) and a numeric rating scale (NRS) score for pelvic pain ≥ 6 were recruited for this prospective interventional trial. Following their initial study visit and training, participants were sent home with a PEMF device consisting of: (1) a central console pre-programmed to deliver the same therapeutic dose each session, (2) a whole-body mat, and (3) a long "belt" for targeted therapy over the pelvic region. Participants were instructed to use the device twice daily (8 minutes per pre-programmed session), once in the morning and evening - at least 8 hours apart - over the 4-week treatment period. Patient assessments occurred at enrollment and 1-day post-treatment period. The primary outcome measure was a change in the NRS score for pelvic pain; a change of ≥ 2 points was considered significant improvement. Secondary outcome measures were assessed by validated IC/BPS questionnaires including the O'Leary Sant Interstitial Cystitis Symptom and Problem Indices (ICSI/ICPI), Pain and Urgency/Frequency (PUF) Patient Symptom Scale, Female Genitourinary Pain Index (F-GUPI), and the Short Form-36 (SF-36) Quality of Life Questionnaire. In this proof-of-concept study, all participants (N = 10) received the full therapy (i.e., no sham control). Median difference in outcomes were assessed by the Wilcoxon signed rank test and $p < 0.05$ was considered significant.

Results: Of 10 enrollees, 8 women completed the 4-week therapeutic regimen and were eligible for analysis. Based on the primary outcome measure, 7/8 patients (87.5%) reported a significant reduction in pelvic pain; no participants reported an increase in pain. Significant improvement based on secondary outcomes were apparent from a decrease in mean scores for nocturia (2.38 to 1.75; $p = 0.025$), and mean symptom scores including ICSI (13.88 to 8.00; $p = 0.011$), ICPI (13.00 to 9.13; $p = 0.046$), PUF (25.50 to 18.25; $p = 0.02$), and GUPI scores (35.25 to 23.44; $p = 0.012$). Additionally, patients showed a significant increase in mean SF-36 quality of life sub-scores including energy/fatigue (34.38 to 60.16; $p = 0.018$), social functioning (45.31 to 73.43 $p = 0.042$), and pain (38.44 to 63.13; $p = 0.028$). Finally, mean urinary frequency scores decreased numerically but did not reach statistical significance (2.5 to 1.75; $p = 0.059$). No adverse events were reported.

Conclusion: This proof-of-concept interventional trial evaluating the efficacy of PEMF therapy for pain management and symptom improvement in IC/BPS found measurable benefit in 7 of the 8 patients that completed the study. Randomized, sham-controlled trials in a larger cohort are necessary to validate these findings.

74. Differential Gene Expression Analysis to Elucidate the Mechanism of Testicular Fibrosis in Klinefelter Syndrome

Mark Xu, MD

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Aaron Bradshaw, MD; Mohammad Darzi, PhD; Abinav Udaiyar, BSc; Stephen J Walker, PhD;

Stanley Kogan, MD; Stuart Howards, MD; Thomas McLean, MD; Anthony Atala, MD;

Hooman Sadri-Ardekani, MD PhD

Surgery-Urology

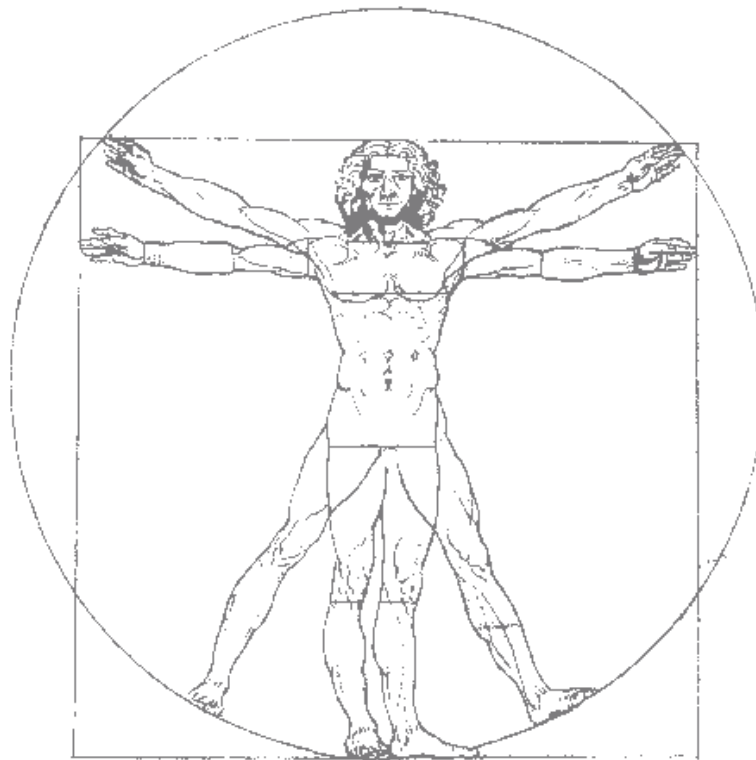
BASIC SCIENCE – Resident

Introduction/Background Klinefelter's Syndrome (KS) is characterized by widespread testicular fibrosis, germ cell loss, and seminiferous tubule degeneration during puberty. The exact mechanism of this process is unknown. However, alterations of the blood-testis barrier, loss of contractile function in peritubular myoid cells, and derangement in testicular blood flow have all been proposed as possible mechanisms. Macrophages and mast cells are increased in KS testes relative to normal testes, suggesting that inflammation may contribute to the fibrotic process. This study aimed to characterize changes in gene expression underlying testicular fibrosis in human KS testes. **Methods/Materials** Total RNA was extracted from homogenized, age-matched (patients aged 8-38 years old), paraffin-embedded testicular biopsies from five KS and four control (46XY) patients and analyzed with the NanoString nCounter Fibrosis Panel, which included 770 genes. Raw data was analyzed through R-based software. Change in gene expression was significant if the absolute fold change was >1.4 or <0.7 with a p -value < 0.05 . Using Ingenuity Pathways Analysis (IPA) software, we analyzed the identified up- and down-regulated transcripts to map functional activity and gene networks. IPA generated p -values < 0.05 indicated statistically significant, non-random association, and z -scores > 2 and < -2 indicated activation or deactivation of a functional process,

respectively. Weighted gene correlation network analysis (WGCNA) was applied to find co-expressed gene modules. Results The NanoString analysis found 19 genes differentially expressed in KS testes compared to controls, with 17 upregulated and 2 downregulated. WGCNA identified six modules of co-expressed genes. 14/17 upregulated genes clustered in the “blue” module, which included 109 genes with significant membership ($p < 0.05$). “Blue” module hub genes included PNPLA3, ELOVL6, and EGFR. IPA showed that key functional categories of differentially expressed genes in KS testes were cellular function/maintenance, immunological disease, hematological system development/function, and inflammatory response. The most highly activated functional processes in KS testes involved vascular development and mobilization of immune cells. Conclusions This study indicates that the development of testicular fibrosis in Klinefelter’s syndrome is a complex process that involves immune cell mobilization and vascular development. Inflammation may contribute to the derangement of the testis microenvironment in KS, leading to hypogonadism and infertility. Further understanding of this process may help prevent or treat testicular dysfunction in KS patients.

Surgical Sciences
Thirtieth Annual
Residents' and Fellows'
RESEARCH DAY

WAKE FOREST UNIVERSITY SCHOOL OF MEDICINE



NOVEMBER 15, 2022

Research Day Chairperson
James Jordan, PhD



**Wake Forest University
School of Medicine**

In keeping with the mission of the School of Medicine to maintain extensive research programs, Surgical Sciences is proud to announce its 30th Annual Research Day. From its humble beginning in the early 1990's to the very large symposium of today, the Residents' and Fellows' Research Day has grown with the Surgical Sciences. This day is an opportunity to display and recognize the depth and breadth of research within Surgical Sciences; not only to our peers in the surgical departments, but to the entire population of the Medical Center. Students from both medical and graduate programs; residents, and fellows present data on activities, projects and applications which cover a broad spectrum ranging from the very basic to clinically applied research and the testing of innovative procedures or medications in patients. While the posters are presented by the trainees of Surgical Sciences, this is a celebration of the research carried out by residents, fellows, graduate students, medical students, Ph.D. researchers, surgeons and other dedicated research staff.



In recognition of the need to balance the dual goals of promoting effective scientific collaborations through open sharing of early stage results, on the one hand, and promoting commercialization in the public interest through intellectual property of research developments, on the other, the Surgical Sciences Research Day is conducted as a "closed meeting." Accordingly, you acknowledge and agree that by participating in the event, you will receive and maintain any unpublished information or materials in confidence until such time as the information or materials are published or otherwise made publicly available by the originating investigator.

SCHEDULE OF ACTIVITIES

11:30 am – 1:00 pm.....	Set Up Posters <i>Commons Conference Rooms 1, 2, & 3</i> <i>G and E Floor, Nutrition Center</i>
1:00 pm – 2:00 pm.....	Research Lecture Prasad S. Adusumilli, MD, FACS “(CAR) T-Cell Therapy for Solid Tumors” <i>Babcock Auditorium</i> <i>E Floor, Gray Building</i>
2:00 pm – 4:00 pm.....	Judging of Posters and Reception <i>Commons Conference Rooms 1, 2, & 3</i> <i>G and E Floor, Nutrition Center</i>
7:00 pm.....	Recognition Dinner Awards Presentation <i>Old Town Club</i>

KEYNOTE SPEAKER



Prasad S. Adusumilli, MD, FACS
Deputy Chief and Professor, Thoracic Surgery
Vice Chair, Dept. of Surgery
Head, Solid Tumors Cell Therapy,
Cellular Therapeutics Center
Director, Mesothelioma Program
Memorial Sloan Kettering Cancer Center, New York, NY

Prasad S. Adusumilli, MD, FACS is the Deputy Chief and Attending thoracic surgeon at the Memorial Sloan Kettering Cancer Center with expertise in the surgical management of cancers in the chest, and direct the research activities of 12 faculty members. He is a thoracic surgeon with expertise in thoracic cancers management. In addition to complex oncological resections, he performs minimally-invasive resections as well as robotic bronchoscopic procedures. As Vice Chair in the Dept. of Surgery, he develops translational research programs, and coordinates the research activities of >75 trainees and 150 faculty members. In his role as Head of Solid Tumor Cell Therapy in the Cellular Therapeutics Center, he leads the development and conduct of cell therapy for solid tumors. His responsibilities as the Director of Mesothelioma Program comprises coordinating multi-disciplinary clinical and research interactions among the mesothelioma working group.

His clinical research is focused on early-stage lung cancer biology and thoracic cancers (lung, esophageal cancers and malignant pleural mesothelioma) tumor immunology. His laboratory research, supported by NIH R01 and DoD awards, focuses on tumor immunology and chimeric antigen receptor (CAR) T-cell immunotherapy for cancers.

SURGICAL SCIENCES

DEPARTMENT CHAIRMEN:

Edward H. (Ted) Kincaid M.D.Department of Cardiothoracic Surgery
J. Wayne Meredith, M.D.Department of General Surgery
Charles L. Branch, Jr., M.D.Department of Neurosurgery
Craig M. Greven, M.D.Department of Ophthalmology
L. Andrew Koman, M.D.Department of Orthopaedic Surgery and Rehabilitation
J. Dale Browne, M.D.Department of Otolaryngology
Lisa David, M.D.Department of Plastic and Reconstructive Surgery
Anthony Atala, M.D.Department of Urology
Matthew Edwards, M.D.Department of Vascular and Endovascular Surgery

RESEARCH DAY 2022 PLANNING COMMITTEE

HOST DEPARTMENT- CARDIOTHORACIC SURGERY

Edward H. (Ted) Kincaid, M.D.Chair, Department of Cardiothoracic Surgery
James Jordan, Ph.D.Chairperson, Department of Cardiothoracic Surgery
Hossam Shaltout, Ph.D.....Co-Chairperson, Department of Surgery-Hypertension

Committee Members

Lydia Durr.....Hypertension & Vascular Research
Shanna J. Ellison.....Hypertension & Vascular Research
Michelle Gammons.....Department of Cardiothoracic Surgery
Shea Gilliam-Davis, Ph.D.....Hypertension & Vascular Research
Kenya Little.....Hypertension & Vascular Research
Kaitlin NametDepartment of Cardiothoracic Surgery
Pam Stafford.....Hypertension & Vascular Research

PAST KEYNOTE SPEAKERS

1993	Frank W. LoGerfo, M.D. Harvard Medical School	2008	Raphael Lee, M.D. University of Chicago Medical Center
1994	James A. O'Neill, Jr., M.D. University of Pennsylvania School of Medicine	2009	Alexander W. Clowes, M.D., The University of Washington
1995	James Patrick O'Leary, M.D. LSU School of Medicine	2010	Jonas T. Johnson, M.D. University of Pittsburgh School of Medicine
1996	Joseph A. Smith, Jr., M.D. Vanderbilt University School of Medicine	2011	Marco Zarbin, M.D., Ph.D., F.A.C.S. New Jersey Medical School
1997	Robert Martuza, M.D. Georgetown University Hospital	2012	Paul Sobotka, M.D., F.A.C.P., F.A.C.C. The Ohio State University
1998	John M. Fredrickson, M.D. Washington University School of Medicine	2013	Vindo H. Thourani, M.D. Emory University School of Medicine.
1999	Joseph E. Murray, M.D. Harvard Medical School	2014	Regis J. O'Keefe, M.D., Ph.D. Washington University School of Medicine
2000	C. Thomas, Caskey, M.D., F.A.C.P. Cogene Biotech Ventures	2015	Ralph V. Clayman, M.D. University of California, Irvine School of Medicine
2001	Elizabeth G. Nabel, M.D. National Heart, Lung and Blood Institute	2016	Andres Lozano, M.D., Ph.D., F.R.C.S.C., F.R.S.C., F.C.A.H.S. University of Toronto
2002	W. Randolph Chitwood, Jr., M.D. East Carolina University School of Medicine	2017	Micheal T. Longaker, M.D, M.B.A., F.A.C.S. Stanford University School of Medicine
2003	L. D. Britt, M.D., M.P.H. Eastern Virginia Medical School	2018	Todd E. Rasmussen, M.D., F.A.C.S. Uniformed Services University School of Medicine
2004	Arthur Kellermann, M.D., M.P.H. Emory University	2019	Andreas K. Lauer, M.D. Oregon Health & Science Universtiy
2005	James Urbaniak, M.D. Duke University Medical Center	2020	Ana H. Kim, M.D. Columbia University Medical Center
2006	William D. Steers, M.D., F.A.C.S. University of Virginia	2021	Rebecca Sippel M.D., F.A.C.S. University of Wisconsin-Madison
2007	Mitchell Berger, M.D. University of California San Francisco		

PREVIOUS AWARD RECIPIENTS

CLINICAL RESEARCH

GOLD MEDAL

1993	Tim Dersch, M.D. Plastic and Reconstructive Surgery
1994	Raymond Poore, M.D. Urology
1995	Preston R. Miller, M.D. General Surgery
1996	L. Andrew Eskew, M.D. Urology
1997	S. Iyer, Ph.D. Hypertension Center
1998	Alan Burke, M.D. Otolaryngology
1999	Charles J. Rosser, M.D. Urology
2000	Gregory S. Cherr, M.D. General Surgery Dean DeRoberts, M.D. Plastic Surgery Resident
2001	Matthew S. Edwards, M.D. General Surgery Fellow
2002	Jonathan C. Hundley, M.D. General Surgery Resident

SILVER MEDAL

R. Bradley Thomasson, M.D. General Surgery
Anthony Seaton, M.D., Ph.D. Urology
L. Andrew Eskew, M.D. Urology
John P. Little, M.D. Otolaryngology
A. J. C. Burke, M.D. Otolaryngology
Dom Coric, M.D. Neurosurgery
Jonathon Deitch, M.D. General Surgery
Todd R. Reulbach, M.D. Otolaryngology
Sanford G. Duke, M.D. Otolaryngology
Marc. M. Malek, M.D. Plastic and Reconstructive Surgery
Steven D. Wray, M.D. Neurosurgery Resident
Tina Singh, M.D. Ophthalmology Fellow
Jeffrey McNeil, M.D. CT Surgery Fellow

CLINICAL RESEARCH continued

GOLD MEDAL

- 2002 Phillip S. Moore, M.D.
 General Surgery
 Resident
- Claire Sanger, M.D.
 Plastic and Reconstructive Surgery
 Resident
- James D. Maloney, M.D.
 CT Surgery
 Fellow
- 2003 J. A. Veys, M.D.
 Urology
 Resident
- D. Wilson, M.D.
 General Surgery
 Fellow
- 2004 Catherine J. Rees, M.D.
 Otolaryngology
 Resident
- Jeffrey A. Travis, M.D.
 Cardiothoracic Surgery
 Fellow
- Annemarie Relyea-Chew, B.S.
 Emergency Medicine
 Student
- 2005 Dean DeRoberts, M.D.
 Plastic and Reconstructive Surgery
 Resident
- Eric S. Gwynn, M.D.
 Urology and Sticht Aging Center
 Resident
- Barnaby Dedmond, M.D.
 Orthopaedics
 Fellow

SILVER MEDAL

- Michael R. Goins, M.D.
 Otolaryngology
 Resident
- Matthew M. Mondt, M.D.
 General Surgery
 Resident
- Jeffrey A. Travis, M.D.
 General Surgery
 Fellow
- Jeffrey David Pearce, M.D.
 General Surgery
 Resident
- David Cole, M.D.
 Orthopaedics
 Resident
- Hiroshi Yokoyama, M.D.
 Hypertension and Vascular Disease Center
 Fellow
- R. Shayn Martin, M.D.
 General Surgery
 Resident
- Christina M. Plikaitis, M.D.
 Plastic and Reconstructive Surgery
 Resident
- Graham Bundy, M.D.
 Cardiothoracic Surgery
 Fellow

CLINICAL RESEARCH continued

GOLD MEDAL

2006	Oliver Adrian Varban, M.D. General Surgery Resident
	Adrian Lata, M.D. Cardiothoracic Surgery Fellow
2007	Christina M. Plikaitis, M.D. Plastic and Reconstructive Surgery Resident
	Rajinder Singh, M.D. General Surgery and Internal Medicine Fellow
	Cheryl Onwuchuruba Orthopaedics Student
2008	Jeff Carter, M.D. General Surgery Resident
	Rajinder Pal Singh, M.D. General Surgery Fellow
	Joshua Matthew Cooper Orthopaedic Surgery Student
2009	Jeff Carter, M.D. General Surgery Resident
	Luke Neff, M.D. General Surgery Resident
	Phillip Moore, M.D. Vascular and Endovascular Surgery Fellow

SILVER MEDAL

2006	Daniel Barnes, M.D. Emergency Medicine Resident
	George D. Chloros, M.D. Orthopaedic Surgery and Neurology Fellow
	Matthew T. Cline Orthopaedics Student
2007	Ellen Chance Sanders, M.D. Ophthalmology Resident
	William Todd Stoeckel, M.D. Plastic and Reconstructive Surgery Resident
	Joe Gonzalez-Engle Emergency Medicine Student
2008	Christina M. Plikaitis, M.D. Plastic and Reconstructive Surgery Resident
	Rajinder Pal Singh, M.D. General Surgery Fellow
	Stephanie Lareau Emergency Medicine Student
2009	Jordan Wallin, M.D. Otolaryngology Resident
	Roche de Guzman, Ph.D. Institute for Regenerative Medicine Fellow

CLINICAL RESEARCH continued

GOLD MEDAL

2009	Kerry Danelson Plastic Surgery Student
2010	Robert D. Becher, M.D. General Surgery Resident Thomas Sarlikiotis, M.D. Orthopaedics Fellow Kevin Shamburg Orthopaedics Student
2011	Jade M. Nunez, M.D. General Surgery Resident Billy G. Chacko, M.D. Vascular and Endovascular Surgery Fellow W. Parker Abblitt, B.S. Orthopaedic Surgery Student
2012	Mark Witcher, M.D. / Ph.D. Neurosurgery Resident Billy G. Chacko, M.D. Cardiology, Ophthalmology, Cardiovascular Epidemiology Fellow Richard Kao Otolaryngology Student

SILVER MEDAL

Babak Yekta Emergency Medicine Student
Jeffrey Carter, M.D. General Surgery Resident Jaehyun Kim, Ph.D. Institute for Regenerative Medicine Fellow Amber Campbell Plastic Surgery Student
James T. O'Neil, M.D. Otolaryngology Resident Hamza Rana, M.D. Vascular and Endovascular Surgery Fellow Bronwyn Russell, B.S. Orthopaedic Surgery Student
Tim Fife, M.D. Otolaryngology Resident JaNae Joyner, Ph.D. Hypertension and Vascular Research Center Fellow Wayne Chen Orthopaedics Student

CLINICAL RESEARCH continued

GOLD MEDAL

2013	Benjamin Schmidt, MD Cardiothoracic Resident
	Kelly Kempe, MD Vascular and Endovascular Fellow
	Ashley Wagoner, BS Hypertension & Vascular Research Center Student
2014	Andrea Doud, M.D. General Surgery Resident
	Alejandro Marquez-Lara, M.D. Orthopaedics Fellow
	Ashley Wagoner, B.S. Hypertension and Vascular Research Center Student
2015	Brian Bones, M.D. Radiology Resident
	Hany El-Hennawy, M.D. Surgery - Transplant Fellow
	Amber Carrier, Ph.D Surgery - Transplant Student

SILVER MEDAL

Andrea Doud, MD General Surgery Resident
Imran Choudhry, MD Orthopaedics Fellow
Matthew Rohlfing, BS Orthopaedics Student
Reese Randle, M.D. General Surgery Resident
Mark Witcher, M.D. Neurosurgery Resident
Hany El Hennawy, M.D. General Surgery Fellow
Jia Hao Liang, B.S. General Surgery Student
Ryan Rebowe, M.D. Plastic and Reconstructive Surgery Resident
Bruce Chung, M.D. General Surgery - Trauma Fellow
Ashley Wagoner, B.S. Hypertension and Vascular Research Student

CLINICAL RESEARCH continued

GOLD MEDAL

2016	Konstantinos Chouliaras, MD General Surgery-Oncology Resident
	Nima Pourhabibi Zarandi, MD Institute for Regenerative Medicine Fellow
	Hayden Holbrook, BS Orthopaedic Surgery Student
2017	Olivia Priest, MD Plastic and Reconstructive Surgery Resident
	David Harriman, MD General Surgery-Transplant Fellow
	Tyler Callese, BS Radiology/Vascular and Interventional Radiology Student
2018	Robert C. Siska, MD Plastic and Reconstructive Surgery Resident
	David Harriman, MD General Surgery-Transplant Fellow
	Mike C. Lin, BS Cardiothoracic Surgery Student
2019	Christine Velazquez, MD Plastic and Reconstructive Surgery Resident
	Adam Campman Nelson, MD General Surgery Fellow
	R. Andrew Hesse, BS Surgery-Ophthalmology Student

SILVER MEDAL

Mija Khan, MD Plastic and Reconstructive Surgery Resident
Baha Alradawna, MD General Surgery-Transplant Fellow
Alexandra Goodwin, BS Orthopaedic Surgery Student
Konstantinos Chouliaras, MD General Surgery-Oncology Resident
Robert Ferguson, MD Cardiothoracic Surgery Fellow
Heather Barber, BS Institute for Regenerative Medicine Student
Konstantinos Chouliaras, MD General Surgery-Oncology Resident
Ioannis Kontopidis, MD Cardiothoracic Surgery Fellow
Tracey Pu, BS Cardiothoracic Surgery Student
Suman Medda, MD Orthopaedic Surgery Resident
David Hobson, MD Cardiothoracic Surgery Fellow
Harper Wilson, BS/BA Otolaryngology Student

CLINICAL RESEARCH continued

GOLD MEDAL

2020 Mija Khan, MD
Plastic and Reconstructive Surgery
Resident

Christine Velazquez, MD
General Surgery
Fellow

Vanessa Lukas, BA
General Surgery-Urology
Student

2021 Jacob Maus, MD
Plastic and Reconstructive Surgery
Resident

Griffin Bins, MD
Plastic and Reconstructive Surgery
Fellow

Rohin Gawdi, BS
General Surgery- Oncology
Student

SILVER MEDAL

Jungwon Park, MD, PhD
Plastic and Reconstructive Surgery
Resident

Shiny Rajan, PhD
Institute for Regenerative Medicine
Fellow

Ishetta Madeka, BA
General Surgery-Oncology
Student

Sydney Thomas, MD
Surgery-Otolaryngology (Dentistry)
Resident

Berjesh Sharda, MD
General Surgery – Transplantation
Fellow

Symonne Martin
General Surgery- Trauma
Student

BASIC RESEARCH

GOLD MEDAL

1993	Dudley Hudspeth, M.D. Cardiothoracic Surgery
1994	David Pollock, M.D. Orthopaedic Surgery
1995	James Jordan, B.S. Cardiothoracic Surgery
1996	Stephen Troum, M.D. Orthopaedic Surgery
1997	David Major, M.S. Plastic and Reconstructive Surgery
1998	Wade J. Sexton, M.D. Urology
1999	Jung-Soo Kim, M.D. Otolaryngology Dickson Schaeffer, M.D. Orthopaedic Surgery
2000	D. Nicole Deal, M.D. Orthopaedic Surgery
2001	Claire Sanger, D.O. Plastic Surgery and Reconstructive Surgery Resident LioMar A. Alvarez, Ph.D. Hypertension & Vascular Research Center Fellow
2002	Cassandra A. Lee, M.D. Orthopaedic Surgery Resident Atsushi Sakima, M.D. Hypertension & Vascular Disease Center Fellow

SILVER MEDAL

Ibrahim Benter, Ph.D. Hypertension and Vascular Research Center
Virginia Newman, M.D. General Surgery
Xiao Wei Lu, M.D. Hypertension and Vascular Research Center
Robert D. Riley, M.D. General Surgery
Zhongyu Li, M.D. Orthopaedic Surgery
Timothy Oskin, M.D. General Surgery
M. Todd Kirby, Ph.D. Neurosurgery
Cassandra Lee, M.D. Orthopaedic Surgery Resident
Tina Singh, M.D. Neurobiology & Anatomy Fellow
Jason A. Castle, M.D. Orthopaedic Surgery Resident
Ojas Shah, M.D. Urology Fellow

BASIC RESEARCH continued

GOLD MEDAL

- 2002 Jason Hong
Hypertension & Vascular Disease Center
Student
- 2003 Cassandra Lee, M.D.
Orthopaedic Surgery
Resident
- R. Richmond, Ph.D.
Hypertension & Vascular Disease Center
Fellow
- P. Garabelli
Hypertension & Vascular Disease Center
Student
- 2004 Jian Shen, M.D., Ph.D.
Orthopaedic Surgery
Resident
- Anastasios Papadonikolakis, M.D.
Orthopaedic Surgery
Resident
- Michiya Igase, M.D.
Hypertension and Vascular Disease Center
Fellow
- David R. Soto-Pantoja, B.S.
Hypertension and Vascular Disease Center
Student

SILVER MEDAL

- Jing Li
General Surgery
Student
- Matt Camp
Plastic Surgery
Student
- G. A. Elsaidi, D.O.
Orthopaedic Surgery
Resident
- A. Sakima, M.D.
Hypertension & Vascular Disease Center
Fellow
- Stevco Stefanoski
Otolaryngology
Student
- L. Anton
Hypertension & Vascular Disease Center
Student
- Jill Wykosky, B.S.
Neurosurgery
Resident
- Liliya M. Yamaleyeva, M.D.
Hypertension and Vascular Disease Center
Fellow

BASIC RESEARCH continued

GOLD MEDAL

- 2005
- Matthew Bolinger, M.D.
Otolaryngology
Resident
- Yagna Jarajapu, Ph.D.
Regenerative Medicine
Fellow
- Jill Wykosky, B.S.
Neurosurgery
Student
- Steven J. Newton
Hypertension and Vascular Disease Center
Student
- Benjamin C. Wood
Plastic and Reconstructive Surgery
Student
- 2006
- Patrick William Whitlock, M.D., Ph.D.
Orthopaedic Surgery and
Wake Forest Institute for
Regenerative Medicine
Resident
- Pedro Miguel Baptista, M.D.
Wake Forest Institute of
Regenerative Medicine
Fellow
- Jyotsana Menon
Hypertension and Vascular Disease Center
Student
- Jill Wykosky
Neurosurgery and Radiation Oncology
Student

SILVER MEDAL

- Cassandra Lee, M.D.
Orthopaedic Surgery
Resident
- Normann B. Cabrera, M.D.
Orthopaedic Surgery
Fellow
- William Frazier, M.D.
Otolaryngology and
Wake Forest Institute for
Regenerative Medicine
Resident
- Tao Xu, M.D.
Wake Forest Institute of
Regenerative Medicine
Fellow
- Maxwell Kenneth Langfitt
Orthopaedics
Student

BASIC RESEARCH continued

GOLD MEDAL

- 2007
- Peter J. Apel, M.D.
Orthopaedics
Resident
- Enzo S. Palma, M.D.
Neurosurgery and Radiation Oncology
Fellow
- Jill Wykosky
Neurosurgery
Student
- 2008
- Patrick W. Whitlock, M.D.
Orthopaedic Surgery
Resident
- Pedro M. Baptista, M.D.
Regenerative Medicine
Fellow
- Hetal Pandya
Neurosurgery
Student
- 2009
- Hossam Shaltout, Ph.D.
Hypertension & Vascular Research Center
Resident
- Benjamin Corona, Ph.D.
Regenerative Medicine
Fellow
- Kyle Binder
Regenerative Medicine
Student

SILVER MEDAL

- Katheryne J. Stabile, M.D.
Orthopaedics and WFIRM
Resident
- George Chloros, M.D.
Orthopaedics
Fellow
- Jyotsana Menon
Hypertension
Student
- Andy Stevens, M.D.
Neurosurgery, Infectious Disease & Pathology
Resident
- Bryan Tillman, M.D.
Regenerative Medicine &
Vascular & Endovascular Surgery
Fellow
- David Ricardo Soto-Pantoja
Hypertension & Vascular Research Center
Student
- Luke Neff, M.D.
Regenerative Medicine
Resident
- TanYa Gwathmey, Ph.D.
Hypertension & Vascular Research Center
Fellow
- Katherine Cook
Hypertension & Vascular Research Center
Student

BASIC RESEARCH continued

GOLD MEDAL

2010	Sandeep Mannava, M.D. Orthopaedics Resident
	Roche de Guzman, Ph.D. Regenerative Medicine Fellow
	Carla Maria Lema Tome, Ph.D. Neurosurgery Fellow
	Hetal Pandya Neurosurgery Student
2011	Kyle David Wood, M.D. Urology Resident
	Wenhong Chen, M.D., Ph.D. Neurosurgery Fellow
	Van T. Nguyen Neurosurgery Student
2012	Austin Stone, M.D. Orthopaedic Surgery Resident
	Christopher MacNeil, Ph.D. Plastic and Reconstructive Surgery Fellow
	Elizabeth Miller Cardiothoracic Surgery Student

SILVER MEDAL

Luke Neff, M.D. General Surgery Resident
Manisha Nautiyal, Ph.D. Hypertension & Vascular Research Center Fellow
Shantaram Bharadwaj, Ph.D. Institute for Regenerative Medicine Fellow
Van Nguyen Neurosurgery Student
Charles Peyton, M.D. Institute for Regenerative Medicine Resident
Christopher M. MacNeill, Ph.D. Plastic and Reconstructive Surgery Fellow
Amanda Beauchamp Neurosurgery Student
Reese Randle, M.D. General Surgery Resident
Norihito Moniwa, M.D. Hypertension and Vascular Research Center Fellow
Tabitha Rosenbalm Plastic and Reconstructive Surgery Student

BASIC RESEARCH continued

GOLD MEDAL

- 2013 Mark Witcher, M.D., Ph.D.
Neurosurgery
Resident
- Sara Ferluga, Ph.D.
Neurosurgery
Fellow
- Rui Wang
Plastic and Reconstructive Surgery
Student
- 2014 Austin Stone, M.D., Ph.D.
Orthopaedics
Resident
- Tabitha Rosenbalm, Ph.D.
Plastic and Reconstructive Surgery
Fellow
- Elizabeth Graham, B.S.
Plastic and Reconstructive Surgery
Student
- 2015 Alejandro Marquez-Lara, M.D.
Orthopaedic Surgery
Resident
- Hooman Sadri-Ardekani, M.D., Ph.D.
Wake Forest Institute for Regenerative Medicine
Fellow
- Eleanor McCabe-Lankford, B.S.
Plastic and Reconstructive Surgery
Student

SILVER MEDAL

- Daniel Bracey, M.D.
Orthopaedics
Resident
- Christopher MacNeil, Ph.D.
Plastic and Reconstructive Surgery
Fellow
- Alison Arter
Hypertension and Vascular Research Center
Student
- Cara Lorentzen, M.D.
Orthopaedics
Resident
- Ian Hutchinson, M.D.
Orthopaedics
Fellow
- Bryce Robinson, B.S.
Cardiothoracic Surgery
Student
- W. Keith Ballentine III, M.D.
Urology
Resident
- Joao Paulo Zambon, M.D., Ph.D.
Wake Forest Institute for Regenerative Medicine
Fellow
- Guorui Deng, B.S.
Hypertension and Vascular Research
Student

BASIC RESEARCH continued

GOLD MEDAL

- 2016 Benyam Yoseph, MD
Institute for Regenerative Medicine
Resident
- Guillermo Galdon, MD
Institute for Regenerative Medicine
Fellow
- Renata Magalhaes, MD
Institute for Regenerative Medicine
Student
- 2017 Daniel Bracey, MD, PhD
Orthopaedic Surgery
Resident
- Nima Pourhabibi Zarandi, MD
Institute for Regenerative Medicine
Fellow
- Catherine Moore, BS
Plastic and Reconstructive Surgery
Student
- 2018 Lily Velet, MD
Urology
Resident
- Nima Pourhabibi Zarandi, MD
Institute for Regenerative Medicine
Fellow
- Omeed Rahimi, MS
Hypertension and Vascular Research
Student
- 2019 Amy P. Trammell, MD
Orthopaedic Surgery
Resident
- Tomohisa Yamashita, MD, PhD
General Surgery
Fellow

SILVER MEDAL

- Ryan Rebowe, MD.
Plastic and Reconstructive Surgery
Resident
- Xue Ma, MD, PhD
Orthopaedic Surgery
Fellow
- Eleanor McCabe-Lankford, BS
Plastic and Reconstructive Surgery
Student
- Taylor Peak, MD
Urology
Resident
- Ronald Nelson, Jr., PhD
Institute for Regenerative Medicine
Fellow
- Marianne Collard, BS
Hypertension and Vascular Research
Student
- Edward J. Doyle, III, MD
Otolaryngology
Resident
- Manuel U. Ramirez, PhD
Hypertension and Vascular Research
Fellow
- Elizabeth R. Stirling, MS
Hypertension and Vascular Research
Student
- Robert Siska, MD
Plastic and Reconstructive Surgery
Resident
- Omar A. Abdelaal, MD
Institute for Regenerative Medicine
Fellow

BASIC RESEARCH continued

GOLD MEDAL

2019 Jordan Forte, BS
Plastic and Reconstructive Surgery
Student

2020 Aaron Bradshaw, MD
General Surgery-Urology
Resident

Brittany Liebenow, BA
Neurosurgery
Student

2021 Robert Siska, MD
Plastic and Reconstructive Surgery
Resident

Nadeem Wajih, PhD
General Surgery-Oncology
Fellow

Ethan Shelkey, BS
Institute for Regenerative Medicine
Student

SILVER MEDAL

Adam Jorgensen
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Student

Tyler Overholt, MD
General Surgery-Urology
Resident

Ishetta Madeka, BA
General Surgery-Oncology
Student

Richard A. Erali, MD
General Surgery-Oncology
Resident

Anastasiya Gorkun, PhD
Institute for Regenerative Medicine
Fellow

Yismelin Feliz-Mosquea, BS
General Surgery- Hypertension
Student

EDUCATIONAL RESEARCH

GOLD MEDAL

- 2018 Lindsay Jones Allred, MD
 Plastic and Reconstructive Surgery
 Resident
- 2019 Thomas N. Steele, MD
 Plastic and Reconstructive Surgery
 Resident
- 2021 Michael Boyajian, MD
 Plastic and Reconstructive Surgery
 Resident

SILVER MEDAL

- Thomas N. Steele, MD
Plastic and Reconstructive Surgery
Resident

ABSTRACTS

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1. Incidence of Clinically Relevant Perioperative Hypotension among Surgical Hip Fracture Patients

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Incidence of Clinically Relevant Perioperative Hypotension among Surgical Hip Fracture Patients Student: Taylor Abouhaif, Class of 2025 Faculty Mentor and Department: Dr. Doug Jaffe, DO, Anesthesiology Funding Source: The Dubie H. Holleman Fund for Cancer and Heart Research ABSTRACT Background: With an increasing life expectancy, there is a rise in the number of individuals experiencing hip fractures, particularly in the elderly population. For these cases, surgical repair is the treatment of choice. The increasing number of these procedures opens the door for a variety of postoperative complications including major adverse cardiac events, acute kidney injury, and cerebrovascular injuries. Myocardial injury, the leading cause of mortality within the first month following surgery is strongly linked to postoperative hypotension. Postoperative hypotension commonly goes undetected with the traditional once every 4-6 hours check on vital signs as is the norm all over the world. At Atrium Health Wake Forest Baptist, ViSi monitors are currently deployed in patient care units, which allow for measuring of patient vital signs up to every 15 seconds, a frequency that has not consistently been reported in the available literature. Hypothesis: It is hypothesized that the rate of perioperative hypotension following hip fracture repair is higher than that reported in current literature. Methods: A retrospective study with data collected from the electronic medical record of Atrium Health Wake Forest Baptist was performed. We queried the electronic medical records of patients who had surgical repair of hip fractures from 1/1/2016 through 12/31/2021. Demographics, perioperative data and vital signs were extracted and de-identified to permit analysis. Hypotension was defined as systolic blood pressure (SBP) <90mm Hg or mean arterial pressure (MAP) <65mm Hg for greater than 15 minutes. SBP and MAP values were summarized for each patient, counting the total time monitored, the number of minutes monitored with each marker below specific thresholds, and the maximum amount of time spent below specific thresholds during the monitoring period. We counted the number and percentage of patients who recorded at least 1 SBP or MAP event below each threshold, computed the mean number of minutes per hour beneath each threshold, and computed the mean of the longest episode below each threshold. Results: A total of 663 patients were analyzed and monitored for incidences of hypotension lasting longer than 15 minutes. Over 50% of the sample experienced approximately 0 minutes per hour with SBP <90mm Hg and 25% of the sample experienced it for 1 minute or more per hour. Similarly, over 75% of the sample had 0 minutes per hour with MAP <65mm Hg. Conclusions: Although the incidences of hypotension are a lower number than anticipated, this may be due to the use of ViSi monitors, which automatically alerts healthcare teams of perturbations in vital signs. This allows the healthcare team to rapidly respond to acute changes in patient vital signs, which may reduce the incidence of hypotensive events and may reduce the risk for postoperative complications, such as myocardial injury, acute kidney injury, and cerebrovascular injuries. It remains to be determined if sophisticated monitoring alone reduces the incidence or if there are other factors that influence the frequency of hypotensive episodes. Further research is warranted to investigate potential causality. Source of mentor's funding or other support that funded this research: Department of Anesthesiology, Atrium Health Wake Forest Baptist

2. Correlation between Total knee arthroplasty (TKA) implant sizes and patient demographics

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Background: When cartilage wear becomes significant (osteoarthritis), it is accompanied by significant pain which then leads to a serious loss of mobility. In most of the cases of osteoarthritis, the last resort is a total knee arthroplasty. Total knee arthroplasty (TKA) is one the most common procedures worldwide. Total knee arthroplasty is not completely risk free, and some of the procedures can result in complications which might require several revisions. One of the most common cause of complications is aseptic loosening which might be prevented with an accurate preoperative planning, specifically the selection of proper implant size. Indeed, with the increase in healthcare cost, an accurate preoperative planning can be the solution to avoid an increase in economic burden and improve patients' quality of life. Even though traditional preoperative planning has been successful, they have shown variability in efficiency; thus, explaining the projected increase in total

knee arthroplasty (TKA) revisions. Decreasing the economic burden and improving the outcomes of TKA procedures have led surgeons to seek out methods of templating in TKA based on demographics such height, weight, and sex. Hypothesis: Implant sizes can be predicted with patient's BMI and sex alone. Methods: A retrospective chart review was performed to identify eligible patients 18 years and older who have undergone total knee replacement at the Wake Forest Baptist Health Medical Center. Participant data was recorded from medical records. Study staff recorded age, sex, race, and ethnicity. The implant component sizes were also recorded in the patient's chart. Height and weight were also recorded and used to calculate body mass index (BMI). Results: For this study, 260 chart of patients that have had TKA from July 2020 to September 2022 chart were reviewed. The size reported was based on the sizing used by the following manufacturers: Stryker orthopedics and smith and nephew. The femoral implant size ranged from 2 to 7, the tibial implant size ranged from 1 to 7, and the patellar implant size was between 29 mm and 38 mm. Most of the patients were female. The calculated BMI was between 23 kg/m² and 46 kg/m². Overall, there was a stronger correlation between implant sizes and height alone compared to the calculated BMI. Conclusions: Our results show that demographic variables such as height, weight, and sex can be used to predict final TKA implant size to within one size for manufacturers such as Stryker orthopedics. Based on these results, a database can be created that will allow surgeons to have an idea of the implant size by purely looking at demographics, and thus to simplify the preoperative planning process while concomitantly reducing unnecessary trays, trials, and implant storage. This may result in significant process streamlining and potential cost reduction in hospitals.

3. Risk Stratification Triage Tool for Orbital Fractures by Non-Ophthalmologists

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Purpose: To evaluate the efficacy of a risk stratification triage tool for orbital fractures and their concomitant injuries by non-ophthalmologists through comparing the accuracy of collected data (ocular exam and ocular symptoms) by non-ophthalmologists needed for practical application of the Wake Forest Screening Criteria Tool and the UT Houston Screening Criteria tool. The secondary purpose was to roughly compare the two screening criteria tools put forth by Wake Forest and by UT Houston (acknowledging different endpoints to those tools) Methods: Prospective data from emergency department (ED) providers and staff were gathered along with a retrospective chart review of all ED orbital fracture consultations from August 2021 to February 2022 (n = 135). Reported data by ED staff, fracture details, comorbid ocular injuries, and recommendations by ophthalmology were gathered and analyzed, comparing reported findings of both the ED staff and the ophthalmologist being consulted. Results: A profile orbital fracture injuries and co-morbidities was gathered along with assessment data from ED providers and ophthalmologists. Moderate agreement of assessment (51.0-70.6%) was found in subjective measures included in the screening criteria. Stronger agreement was found with more objective criteria of the screening measures (74.5-94.1%). Both screening criteria showed good capture of patient's with serious injury needing to be seen in the ED. Conclusions: Use of either UT Houston's criteria or Wake Forest's criteria would help identify serious injuries than need to be seen in the ED and risk stratify patients that could be seen safely in clinic. Education programs to help further refine ED providers skills in ophthalmologic exam and data would likely improve the efficacy of any risk stratification tool and help identify high-risk patients who are likely to benefit from ophthalmology consultation while in the ED.

4. Endocrine-targeting therapy shifts the breast microbiome to reduce estrogen-receptor-a breast cancer risk

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Background: Studies indicate breast tissue has a distinct microbiome that is shifted by malignant tumors or diet. However, whether orally administered endocrine-targeting therapies used post-surgery in the adjuvant setting to reduce ER+ breast cancer recurrence modifies the breast microbiome is unknown. We demonstrate endocrine-targeted therapies, such as tamoxifen, modulate the breast microbiome, suggesting a potential role for specific bacterial species to enhance therapeutic responsiveness and reduce breast cancer risk. Methods: DNA isolated from female C57BL/6 mouse mammary gland (MG) tissue administered tamoxifen citrate for 16 weeks and breast tissue from ovariectomized (OVX) non-human

primates (NHP) or OVX NHP administered tamoxifen citrate for 2.5 years was used to perform 16S bacterial sequencing. Western diet-fed MMTV-PyMT mice were injected with *Lactobacillus* bacteria into the MG. 16S sequencing was performed on DNA isolated from ER+ breast tumors from patients that did or didn't display tumor recurrence on endocrine-targeted therapies within 10 years from initial diagnosis. Breast tumor sections from ER+ patients treated in the neoadjuvant setting with aromatase inhibitors (AI), Faslodex, or combination were stained for Gram-positive bacteria (lipoteichoic acid; LTA), Gram-negative bacteria (lipopolysaccharide; LPS), or Ki67. Results: In both models, tamoxifen significantly shifted β -diversity and was associated with increased Firmicutes phyla proportional abundance. Tamoxifen elevated proportional abundance of *Lactobacillus* spp., *Streptococcus luticea*, and *Staphylococcus sciuri* compared to untreated animals. Immunohistochemistry revealed differences in anti-inflammatory macrophage and Gram-positive bacteria abundance with oral endocrine therapy. Elevating MG *Lactobacillus* presence reduced tumorigenesis and multiplicity with an associated decrease in Ki67 tumor proliferation. Elevated intratumoral LTA positivity was associated with decreased proliferation. Conclusions: Results suggest oral endocrine targeting therapies promote breast Gram-positive bacterial presence, increase the anti-inflammatory macrophage infiltration, and bacterial-processed metabolites that decrease proliferation, which may reduce mammary cancer risk.

5. Neonatal mandible cephalometric changes following mandibular distraction osteogenesis for infants with Robin Sequence

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Background: Upper airway obstruction (UAO) in infants with Robin Sequence (RS) is secondary to micrognathia and resultant posterior displacement of the tongue. Mandibular distraction osteogenesis (MDO) is a safe and effective treatment for significant UAO, but there is a paucity of data examining associated cephalometric changes. This study carefully examines mandibular cephalometric changes of infants with RS who underwent MDO using internal devices to more deeply understand both immediate and longer-term effects of distraction on mandibular shape. Methods: Consecutive infant MDO cases (n=53) performed by the same surgeon were analyzed using preoperative and postoperative lateral cephalograms and CT scans of the mandible. Population averages for preoperative and postoperative time points were assessed using a two-sample t-test with equal variance. Results: Significant post-operative morphologic changes were seen in 19 of 21 cephalometric parameters. Length, height, width, and airway parameters improved on average by 20.3 mm (60.7%), 9.8 mm (49.7%), 12.6 mm (36.1%), and 211%, respectively. Conclusions: Cephalometric measurement is a powerful tool that provides a concrete metric to understand how MDO affects not just the immediate but also long-term growth of the mandible. Understanding the more quantifiable effects of mandibular distraction will allow for fine-tuning of surgical practice and optimization of outcomes.

6. Infection-driven migration in osteomyelitis

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Background: The incidence of osteomyelitis in the United States is estimated to be approximately 50,000 cases annually, or 1 in every 675 hospital admissions. It is most commonly diagnosed following trauma, ischemia due to diabetes mellitus or pressure ulcerations, or after implantation of foreign bodies (Dudareva et al.). Following such events, bone becomes susceptible to opportunistic microorganisms. Osteomyelitis is defined as an acute or chronic bone infection that is typically colonized by *Staphylococcus aureus*, a facultative intracellular anaerobe. Intracellular *S. aureus*, may disrupt homeostasis by stimulating osteoclastogenesis and decreasing osteoblast mechanisms that form bone matrix. Because osteoblast and osteoclast homeostasis play such an important role in bone integrity, increased activity of osteoclasts and decreased activity of osteoblasts is believed to be a leading cause of osteonecrosis in osteomyelitis. Once bacteria are internalized by osteoblasts they can evade the host immune system, and sustained infection within the bone is resistant to antibiotics. However, osteoblasts still secrete cytokines, chemokines, and growth factors, including inflammatory markers include IL-6, IL-8, IL-12, CCL2, CCL3, and CCL5 that mobilize macrophages and potentially osteoclasts. Hypothesis: This study

proposes that infected osteoblasts secrete factors that recruit osteoclasts to the site of infection, thus leading to osteonecrosis. The study aims to explore what mediators are secreted by infected osteoblasts, and the impact of intracellular infection with *S. aureus* on osteoclast recruitment. Methods: Human osteoblasts were cultured and subsequently infected with *S. aureus* (Xen40) with a multiplicity of infection of 0.1 and 1. Human osteoclast precursor cells were differentiated and cultured on transwell migration inserts. These inserts were placed in 24-well plates containing uninfected and infected osteoblasts to determine whether infection induced greater migration of osteoclasts toward osteoblasts over 7 days. qRT-PCR analysis was utilized to quantify the presence of IL-6 and CCL2 from infected osteoblasts as potential mediators of osteoclast migration. Results: After 1 day of exposure to uninfected and infected osteoblasts, there was a 630% increase in osteoclast migration toward the infected osteoblasts with an multiplicity of infection(MOI) of 0.1 and a 540% increase in migration toward an MOI 1 as compared to undifferentiated osteoclast controls. After 7 days of exposure, there was only a 4% increase in osteoclast migration toward MOI of 0.1 and a 176% increase in osteoclast migration toward MOI of 1 as compared to undifferentiated controls. qRT-PCR data for quantification of IL-6 and CCL2 was inconclusive and further works needs to be completed in order to understand their potential roles in osteoclast migration in osteomyelitis. Conclusions: *S. aureus*-infected osteoblasts enhance the migration of osteoclasts towards the infection, thereby demonstrating the potential role of intracellular infection in osteomyelitis, and subsequent bone necrosis. This suggests potential therapy targets for preventing intracellular signaling responsible for this migration increase. Source of mentor's funding or other support that funded this research: The project was supported by the Department of Plastic and Reconstructive Surgery at Wake Forest School of Medicine.

7. Photothermal Cytotoxicity of Silver Nanoparticles on Melanoma

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More people are diagnosed with skin cancer in the U.S. than all other cancers combined, with melanoma being a leading cause of mortality. The annual cost of treating melanoma cancers in the U.S. is estimated at \$3.3 billion and even though most melanomas are caused by the sun, intratumoral bacteria might indicate that infection may play a role in its aggressiveness. *Staphylococcus aureus* is a well-established pathogen associated with skin lesions, including skin cancer. *S. aureus* has recently been discovered within melanoma cells, and novel strategies to eliminate and evaluate downstream effects are needed. Photothermal therapy (PTT) has been used as an alternative approach for treating different diseases by focally applying heat. Nanoparticles such as gold, stimulated with near-Infrared lasers have previously shown a cytotoxic effect on cancer cells. Other nanoparticles like silver nanoparticles (AgNPs) have been used independently as a treatment for their antimicrobial effect against bacteria, fungi, and viruses. However, AgNPs can absorb light and transform it into heat making localized thermal therapy possible. The present work evaluates the cytotoxicity of photothermal AgNPs in infected and non-infected melanoma cells. To assess the relationship bacteria may have on cancer growth and treatment inhibition, melanoma cells were infected with *S. aureus*. Silver nanoparticles were created and characterized to have an optical absorption of 800 nm to generate heat when stimulated with this wavelength of infrared light. Different thermal doses were used by varying laser power (1-5 W), time (36-180 S), and energy (180-540 J), with different concentrations of AgNPs (10 µg/mL, 25 µg/mL, 50 µg/mL, 100 µg/mL, 250 µg/mL). Cell viability following exposure to AgNPs without laser stimulation decreased by 19% and 51% in non-infected cells with 10 µg/mL, and 250 µg/mL of AgNPs respectively, whereas infected cells showed an increase in viability of 28-12% from 10 µg/mL, to 100 µg/mL up to the highest concentration of AgNPs (250 µg/mL), when a 29% decrease was observed. Meanwhile, when incubated at 42 °C for 2 hours with 10 µg/mL, and 25 µg/mL cell viability decreased 7% and 13% in non-infected and increased 4% in infected for both concentrations. On the other hand, both non-infected and infected cells showed a greater decrease in viability with 250 µg/mL when PTT was applied at 3 W for 60 s, 62% and 57% respectively, with the infected cells being the most resistant to therapy. Additionally, increasing laser power from 3 W to 5 W with 10 µg/mL, raised temperature from 47 °C to 50 °C and further decreased infected cells viability from 92% to 71% without decreasing non-infected cells viability, while increasing laser power from 3 W to 5 W with 25 µg/mL did not raise the temperature, but decreased infected cells viability from 62% to 3% and non-infected cells viability from 47% to 21%. Furthermore, by increasing laser's energy from 180 J to 540 J at 3 and 5 W, infected cells showed 31% and 43% reduction with 10 µg/mL and 49% and 55% with 25 µg/mL respectively. Also, non-infected cells showed 25% and 40% reduction with 10 µg/mL; and 30% and 61% with 25 µg/mL. In comparison to the control group, AgNPs plus laser irradiation had no decrease in bacteria with any concentration. These results demonstrate that AgNPs effectively reduce melanoma cell viability, and that AgNPs plus laser irradiation are more cytotoxic. In addition, infected melanoma cells are more resistant than non-infected melanoma cells for almost all treatments, but an increase in energy affects infected cells more than non-infected. These results also show that both lower laser power and time of exposure, within same energy range, are equally effective for non-infected, but do show a decrease in infected cells, but

higher laser energy increases cytotoxicity for both non-infected and infected. The proposed treatment is currently being evaluated to determine bacterial toxicity and cell recovery after exposure. This work represents a new frontier for the use of AgNPs, which are currently used clinically, for killing melanoma cells, especially those which may have an intracellular infectious component that could be driving aggressive cell phenotypes.

8. Regional and Global Measures for Craniosynostosis

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Introduction: Craniosynostosis is the premature fusion of the skull's bones. This results in both impaired brain growth as well as atypical cranial aesthetics. Clinical evaluation attempts to evaluate the presence and severity of abnormality; however, objective metrics are needed to assist in appropriate diagnosis and postoperative evaluation. Single-center studies are ill-equipped to generate sample sizes needed to power the quantification of these abnormalities. Further, the cranium has few reproducible anatomic landmarks, therefore, impeding reproducible measurement. For these reasons, no tool yet exists for improved diagnosis outside of CT imaging for direct observation of suture fusion. For tools to be clinically useful, they must be simple enough for interpretation, backed by population data to aid in comprehension, automated to allow for integration into rapid clinical workflow, and finally not dependent on radiation to allow for implementation in a pediatric population. Here we describe the creation of measurement tools for sagittal craniosynostosis (SC) which is difficult to differentiate from typical head shape and lambdoid craniosynostosis (LC) which is difficult to differentiate from deformational plagiocephaly. **Methods:** A multicenter database was utilized to identify CT scans or 3D photographs of patients with SC, LC, deformational plagiocephaly, and typically developing individuals. These images were then used to create models of scalp anatomy. Three sets of 11 equidistant planes were created based on cranial length, width, and height. Plane overlay creates a Cartesian grid on the scalp's surface with intersections acting as reproducible surface landmarks. Patterns in cranial posterior length, anterior length, width, and height were described, and differences in symmetry and overall displacement were used to create metrics with the ability to differentiate SC and typical individuals as well as LC and plagiocephaly. The performance of these tools was evaluated using area under the curve analysis (AUC). These metrics were then automated. **Results:** Image series were identified for 360 individuals with SC were identified, 53 individuals with LC, 210 typical individuals, and 64 individuals with deformational plagiocephaly. Individuals with SC had elongated skulls with a flattened anterior and a pointed posterior cranium. Width was reduced globally with superior regions showing the most severe restriction. Regional metrics were created capturing these trends in SC with their combination having high diagnostic performance with AUC of 0.999, sensitivity >99%, and specificity >99% relative to typical controls. LC and plagiocephalic populations illustrated classically described trends with the LC population showing restricted anterior growth on the side of suture fusion while those with plagiocephaly showed parallel anterior shifting of the entire lateral hemisphere. Further, as expected, in both populations the posterior cranium was more affected than the anterior. With regard to height and width, those with plagiocephaly showed lower degrees of asymmetry globally. These trends were trialed on a variety of measurement tools. Tools involving aspects of posterior length were consistently lower performing, indicating that while LC typically has a greater effect on posterior length, those with severe plagiocephaly likely approach a similar degree of abnormality. Thus, a final tool was selected which captures the differential degrees of anterior growth, height asymmetry, and width asymmetry. This measure functions well with an AUC of 0.983, sensitivity of 92.5%, and specificity of 95.3%. **Conclusions:** By evaluating objective population trends in cranial growth, conserved patterns are observed which allow effective identification of those with craniosynostosis without the need for radiation. Most simply these assists in diagnosis and limit unnecessary radiation exposure. By applying these metrics to post-operative data, surgeons can better understand their patients' long-term outcomes and make evidenced-based decisions for future patients.

9. 3D Spheroids of Human Primary Urine-Derived Stem Cells in the Assessment of Drug-Induced Mitochondrial Toxicity

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Mitochondrial toxicity (Mito-Tox) risk has increased due to the administration of several classes of drugs, particularly some

life-long antiretroviral drugs for HIV+ individuals. However, no suitable in vitro assays are available to test long-term Mito-Tox (≥ 4 weeks). The goal of this study is to develop a 3D spheroid system of human primary urine-derived stem cells (USC) for the prediction of drug-induced delayed Mito-Tox. The cytotoxicity and Mito-Tox were assessed in 3D USC spheroids 4 weeks after treatment with antiretroviral drugs: zalcitabine (ddC; 0.1, 1 and 10 μM), tenofovir (TFV; 3, 30 and 300 μM) or Raltegravir (RAL; 2, 20 and 200 μM). Rotenone (RTNN, 10 μM) and 0.1% DMSO served as positive and negative controls. Despite only mild cytotoxicity, ddC significantly inhibited the expression of oxidative phosphorylation enzyme Complexes I, III, and IV; and RAL transiently reduced the level of Complex IV. A significant increase in caspase 3 and ROS/RNS level but a decrease in total ATP were observed in USC treated with ddC, TFV, RAL, and RTNN. Levels of mtDNA content and mitochondrial mass were decreased in ddC but minimally or not in TFV- and RAL-treated spheroids. Thus, 3D USC spheroid using antiretroviral drugs as a model offers an alternative platform to assess drug-induced late Mito-Tox.

10. Angiogenesis development within Gelatin Methacrylate Hydrogels

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Angiogenesis is important to the majority of regenerative medicine techniques for repair or replacement of damaged tissues. Endothelial cells can naturally form tubular structures depending on the supportive media they are maintained. The difficulty arises when they are placed into a 3D construct to visualize them through standard brightfield microscopy. Utilization of green fluorescent protein (GFP) transfected to be expressed by these endothelial cells is important for visualizing and tracking cells in culture. The principal aim of this project is to develop a 3D angiogenesis model from gelatin methacrylate (GelMA) hydrogels. Additionally, incorporating this 3D construct into a chip model that incorporates a lumen to determine adherence of cells to form a fully functional microvascular structure. Moreover, 3D hydrogels can be notoriously difficult to visualize GFP depending on the geometric shapes they are polymerized into. Fixation protocols tend to be very harsh on cell membranes that sustain GFP within the cytoplasm of cells. Subsequently, permeabilization causes significant damage to the cell membrane allowing transfer of GFP from the cell to the hydrogel. In order to find the least destructive method to preserve GFP within cells, this study performed various tests with the aim of determining the optimal fixation and permeabilization steps. This will maintain the GFP expression in cells and prevent GFP leaking out into solution. Specifically, for this experiment, gelatin methacrylate (GelMA) droplets were seeded with HUVECs transfected with GFP to visualize their activity in culture. Typically, once these cultures are terminated, standard fixing protocols cause GFP-HUVECs to leak GFP into the GelMA hydrogel, weakening the fluorescent signal. Using this study's protocol found that reducing the concentration of paraformaldehyde (PFA) to 1% along with incubating for 5 minutes at 4C resulted in more GFP stayed within the cytoplasm of HUVECs within GelMA droplet. By altering the typical permeabilization procedure, switching from typical 0.02% trypsin incubation to a tris buffered salt with 0.2% tween-20 (TBST) solution for 10 minutes, significant strengthening of the GFP signal within cells was visualized from fluorescent imaging. These changes allow for better evaluation of the cells ability to form vascular structures.

11. Introducing the “Surgical Subspecialties Certificate Program” for Medical Students

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Objective: The objective of the “Surgical Subspecialties Certificate Program” is to provide lecture, simulation, and clinically based learning to preclinical medical students to aid them in 1) defining their interest in surgery and 2) connecting them with resident and faculty mentorship in specialties of interest. **Setting:** A Plastic Surgery resident and a medical student facilitator developed and administered the certificate program with the Plastic Surgery Residency Program Director serving as a faculty mentor. An application was sent to all first-year medical students at Wake Forest School of Medicine via RedCap. **Participants:** Applications were blinded and 8 students (4 women, 4 men) were selected. Students in the program were required to attend class sessions, observe surgical cases, shadow a resident on call, and attend a surgery department grand rounds. To facilitate access to clinical settings, students were paired with two residents from different surgical specialties of their choosing. A total of 8 class sessions were conducted over 4 months during Fall 2021. **Results:** A Kenevsky methodology based on Post-Pre Survey was administered at the program's final class session. Following

completion of the certificate program, all but one student had a change in their level of interest in surgery from before the program to after. Students reported increased comfort in the operating room setting and had developed meaningful relationships with surgical residents and faculty. Participants attended an average of 6.0 (+/- 1.8) surgical cases, and met with their resident mentors 3.8 (+/- 1.1) times. Conclusions: A formalized program for exposing preclinical students to surgical specialties is effective for helping students define their interest in surgery and connect with surgical mentors.

12. Effects of Amniotic Fluid Stem Cells Conditioned Media for Treating PTOA in a Rat Model

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INTRODUCTION: Osteoarthritis (OA) is a chronic disease with few treatment options. Many of the treatments on market for OA are broad in their effect and contain underlying mechanisms that are unclear. Similar to OA, posttraumatic osteoarthritis (PTOA) is a progressive disease with surgery being the only definitive treatment option. Amniotic fluid stem cells (AFSCs) have the potential to be a promising new treatment for both OA and PTOA. AFSCs derive much of their therapeutic potential from the growth factors and cytokines they contain. These growth factors and cytokines can be isolated in the media of conditioned AFSCs. Preclinical and Clinical studies with intra-articular injections of AFSC-conditioned media (AFSC-CM) have shown mitigation of PTOA and OA symptoms. However, the precise mechanisms by which AFSC-CM functions remain poorly understood. In this study, we used a rat PTOA model evaluating the effects of AFSC-CM on functional and histological outcomes. We also measured cytokine levels to elucidate the inflammatory pathway AFSC-CM specifically targets. **METHODS:** All animals used for the study were approved by IACUC at Wake Forest University School of Medicine. PTOA was introduced in both female and male rat cohorts (n=12 per group) with destabilization of the medial meniscus (DMM) and anterior cruciate ligament (ACL) transection on the left knee. Right knee was used as contralateral control. Intra-articular injection of AFSC-CM or saline was administered at 2 weeks post injury. Animals were followed up for 1, 2, or 3 months for outcomes (n=4 per time point in AFSC-CM and saline group, respectively). Gait analysis was performed using Digigait Imaging system (Mouse Specifics Inc.) to calculate various kinematic and gait dynamics related to the rat's motion. Microcomputed tomography (microCT80, Scanco Medical AG) was used to scan the knees. MicroCT data were analyzed using Mimics Innovation suite (v.18.0x64) for cartilage volume on the medial tibial plateau. After microCT imaging, the knees were decalcified, embedded then sectioned for histological staining. Slides were stained with hematoxylin and eosin (H&E; Abcam) and safranin-O (SigmaAldrich) for Osteoarthritis Research Society International (OARSI) scoring to evaluate arthritis severity. Multiplex cytokine analysis was performed on the serum at different time points following treatment. To compare differences in saline control versus AFSC-CM cohorts, unpaired and paired t-tests were performed on OARSI score and microCT analysis. T- tests were also performed on Cytokine levels 2 weeks post injury prior to saline administration versus AFSC-CM. One-way analysis of variance test was performed on Digigait parameters between groups. Probability level of 0.05 was considered significant for both tests. **RESULTS:** Gait analysis showed a difference in mean paw length, paw area and increased paw variability in saline control in comparison to AFSC-CM treatment at 1 month and 3 months (p=0.010, p=0.043, p=0.038 respectively). OARSI score comparing safranin-O staining of medial tibial plateau cartilage between AFSC-CM and saline treatments at 1 month (1 month AFSC-CM vs. Saline, p=0.205) and at 2 months (AFSC-CM vs. Saline, p=0.040) showed decreased OARSI score with AFSC-CM treatment. Sagittal and cross-sectional microCT analysis of Saline vs. AFSC-CM treatment at 1 month (sagittal analysis p=0.020; cross-sectional analysis p=0.030) and at 2 months (sagittal analysis p=0.770; cross-sectional analysis p=0.791) showed increased cartilage volume at 1 month with AFSC-CM treatment. Cytokine analysis of IL-1 α and TNF- α at 1 month, 2 months and 3 months post AFSC-CM treatment compared to 2 weeks post injury (IL-1 α 1 month AFSC-CM vs. 2 weeks post injury, p=0.086, 2 month AFSC-CM vs. 2 weeks post injury p=0.309, 3 month AFSC-CM vs. 2 weeks post injury p=0.413; TNF- α 1 month AFSC-CM vs. 2 weeks post injury, p=0.881, 2 month AFSC-CM vs. 2 weeks post injury, p=0.468, 3 month AFSC-CM vs. 2 weeks post injury, p=0.052) showed decreased IL-1 α at 1 month and decreased TNF- α at 3 months both approaching significance. **DISCUSSION:** Improved cartilage volume was significant at 1 month on microCT analysis and at 2 months on histological safranin-O staining. Decrease in cytokine inflammation approached significance at 3 months for TNF- α and 1 month for IL-1 α , a finding that would likely be significant if the sample size were larger, but a promising response to AFSC-CM treatment given the widely reported effects of TNF- α and IL-1 α driving OA pathology. Gait analysis is a validated method of analyzing locomotive parameters such as mechanical allodynia and evaluating the functional effects of biomechanical pathophysiology as in the case of DMM and ACL transection with AFSC-CM treatment. Differences in paw length, paw area and increased paw variability all suggest possible temporal and spatial differences in gait due to increased pain in the absence of AFSC-CM treatment in rats. **SIGNIFICANCE/CLINICAL RELEVANCE:** PTOA of the knee has few treatment options with the only curative treatment being joint replacement. AFSC-CM is a promising new therapy for the treatment of PTOA and may be used to temporize both PTOA and OA pathology before eventual surgical intervention.

13. Ketorolac Safety in Breast Free Flap Surgery

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Background: Ketorolac is a well described adjunct in peri-operative pain control and enhanced recovery after surgery (ERAS) protocols. Ketorolac can decrease peri-operative opioid use. Ketorolac's mechanism of action functions as analgesic and platelet aggregation inhibitor. Ketorolac is yet to become fully adopted in free tissue transfer surgery due to operations that involve large surface areas, extensive soft tissue undermining, and donor site morbidity. Complications related to ketorolac administration remain poorly described in free flap breast surgery. Our study aims to examine the impact of ketorolac on complications and free flap outcomes in breast surgery. **Methods:** With institutional IRB approval, a retrospective chart review of 520 patients who underwent DIEP flap breast reconstruction from January 2019-March 2022 at Atrium Health was completed. Patient demographics, medical history, operative course, and postoperative complications were collected. Patients were separated based on whether they received ketorolac during their initial hospitalization or not. Descriptive statistics were performed and further analysis was completed using Chi-Squared testing. **Results:** We describe results from 520 patients, and 863 free flaps for breast reconstruction. 89 patients received ketorolac peri-operatively and 431 patients did not. When assessing clinical hematoma, patients who received ketorolac developed hematoma 5.6% compared with 5.1% in the non-ketorolac group ($p > 0.05$). When assessing hematoma that required operative intervention, patients who received ketorolac developed hematoma requiring operative intervention 4.5% compared with 2.5% in the non-ketorolac group ($p > 0.05$). When comparing free flap failure as a global measurement between groups, there was no difference in free flap failure rates between groups. **Conclusions:** No statistically significant differences in hematoma rate were identified when comparing patients who received ketorolac compared to those who did not. The concern for increased bleeding complications is not borne out in a large data set. There was no difference in overall free flap failure. Ketorolac is an important adjunct to consider in peri-operative pain management for breast free flap surgery.

14. Mitochondria Infusion to Mitigate Ischemia Reperfusion Injury in Porcine Kidney Models

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Aim – to mitigate IRI in ex vivo porcine kidney model using autologously derived mitochondria.

Background: Many kidneys are rejected for transplantation due to a variety of reasons. One such reason is the hypoxic conditions created by the mode of death. Mitochondria have a naturally occurring ability to transfer from healthy cells to damaged or stressed cells; ischemia-reperfusion injury presents an opportunity to investigate artificial mitochondrial transfer (AMT). This study aims to assess the impact of autologously derived mitochondria delivered directly to excised porcine kidney vasculature.

Methodology: – For the ex vivo experiment, three pairs of porcine kidneys were procured from 60kg pigs. Each kidney was subjected to 30 minutes of warm ischemia (37°C) to simulate ischemia-reperfusion injury (IRI). Meanwhile, mitochondria were isolated from 1g of psoas muscle of the same pig. For each pair, one kidney was injected with 10^8 mitochondria in PBS and the other injected with PBS only. Both organs were then housed in the CaVESWave perfusion system and perfused for 24 hours. Samples of the perfusate were collected every six hours and biopsies were taken at 0 and 24 hours. After 24 hours, KIM1 and NGAL concentrations were evaluated by ELISA. The mitochondrial content of 1g of psoas muscle was assessed by fluorescence microscopy, protein and ATP extraction. BCA, Bradford assay, and nanodrop were performed for protein quantification and cell titer-glo 2.0 was used for ATP quantification.

Results – ELISA results show that each treated kidney presents a lower concentration of renal damage markers than its control counterpart. Cell Titer-Glo assay, BCA, Bradford, and nanodrop all show presence of protein and indicate that respiration competent mitochondria are present.

Conclusion/discussion – This study shows the isolation process produces viable mitochondria, isolated mitochondria are taken up by injured kidney cells, and they are able to provide protection to the damaged cells. The next steps are to better understand the mechanisms by which the mitochondria enter into damaged cells and to investigate the effects of mitochondrial dosing and timing using human islets.

15. ARE BREAST CANCER PATIENTS PRESENTING WITH HIGHER STAGE SINCE THE COVID-19 PANDEMIC?

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The impacts of the COVID-19 pandemic have been far reaching in many aspects of healthcare, particularly oncologic detection and cancer care. As much of the progress in reducing morbidity and mortality related to breast cancer have resulted from screening and public health measures, we analyzed the stage at which patients with breast cancer presented for surgery from 2019 to 2021. From 2019-2021, retrospective analysis was performed on breast cancer patients, comparing differences in patient demographics and cancer stage pre- and post- recommendation to postpone mammographic screening on March 26, 2020 (pre- vs. Covid-era). Proportion analysis was performed to identify similar percentages for each stage and a weighed stage severity score with sign test was crafted to compare overall stage for a given timeframe. Overall, 1,107 breast cancer patients were included in the breast cancer surgery registry. Four hundred and forty-nine patients were included in the pre-pandemic phase from 2019 to March 26, 2020 and 658 patients since the COVID pandemic era from March 26, 2020 to 2021. These groups were similar demographically; the average age was 63 in pre- and 61 in the COVID-era. The majority of patients were female pre- 99.6% and 99.5% Covid-era. In both groups, the majority of patients were white, non-Hispanics 78.2% pre- vs. 79% COVID-era, 19.7% black patients pre- vs. 18.8% COVID-era, 1.36% Asian/other patients in pre- vs. 1.12% COVID-era, 1.0% white, Hispanic patients pre- vs. 0.89% COVID-era. We performed analysis comparing pre- COVID and COVID-era stage severity score. This showed a statistically higher stage presentation of disease when comparing pre-COVID to COVID-era data ($p=0.0027$). Additionally, we identified a higher rate of stage 3 disease presentation or greater in the COVID-era with 7.79% pre- vs. 12.3% COVID-era ($p=0.016$). However, we did not identify a difference in DCIS rates pre- vs. COVID-era, 17.5% vs 14.7% ($p=0.28$). We found that in comparing pre- to COVID-era data that breast cancer patients presented with higher stages, in particular, stage 3 or more disease. This analysis reveals the impact COVID is having on the multidisciplinary treatment of breast cancer patients. Further efforts are needed to address the stage migration, the disproportionate burden of disease, and the access to care.

16. Trending: Liver Function Tests after Laparoscopic Common Bile Duct Exploration are not Similar to Post-Endoscopic Retrograde Cholangiopancreatography Lab Trends

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Introduction: Choledocholithiasis treatment is often a two-stage process consisting of endoscopic retrograde cholangiopancreatography (ERCP) followed by laparoscopic cholecystectomy (LC). Increasingly, a single stage approach consisting of LC with laparoscopic common bile duct exploration (LCBDE) is gaining traction, with equivalent safety profiles and shorter hospitalizations. Clinical presentation of choledocholithiasis is typically associated with elevated liver function tests (LFTs). Yet, it is unknown whether the choice of therapeutic intervention impacts LFT trends in similar fashions. We compared periprocedural LFTs in ERCP vs LCBDE. **Methods:** We retrospectively reviewed 115 patients over the age of 18 who underwent either ERCP or LC+LCBDE for choledocholithiasis. We excluded 28 patients due to insufficient laboratory data, a diagnosis of cholangitis, or unsuccessful LCBDE or ERCPs. eighty-seven patients were included, 53 of which had ERCPs and 34 had successful LC+LCBDEs. Biochemical data obtained included total bilirubin (Tbili), aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP). All patients had one LFT prior to the procedure. All patients had at least one pre- and one post-procedural LFTs, while all of the ERCP patients and 20 of 34 LC+LCBDE patients had a second set of post-procedural LFTs. Statistical analysis was done using Wilcoxon signed-rank tests. **Results:** In patients undergoing ERCP, there was a consistent and significant decrease in all LFTs post procedure ($n = 53$; $p = <0.001$ for all) with a continued downtrend on the second set of LFTs ($n = 53$; $p = <0.001$ for all). For successful LC+LCBDEs, the Tbili, AST, ALT, ALP did not consistently downtrend and were similar between the preoperative baseline and 1st post-operative labs ($n = 34$; $p = 0.505$, $p = 0.694$, $p = 0.151$, and $p = 0.675$, respectively) and the 2nd post operative labs ($n = 20$; $p = 0.227$, $p = 0.412$, $p = 0.246$, and $p = 1.000$, respectively). **Conclusion:** These two therapeutic approaches

for choledocholithiasis have different post-procedural LFT profiles. After ERCP, LFTs consistently downtrend. In contrast, there is no consistent direction in LFTs following LC+LCBDE, which may be explained by increased pressurization of the biliary system during LCBDE due to flushing and the lack of sphincterotomy. This is an important distinction to note as clinicians may be expecting a rapid LFT normalization after LC+LCBDE similar to the one observed with ERCPs. This appreciation will decrease reliance on laboratory tests and shorten length of stay.

17. Evaluating Surgical Residents' Attitude Toward Laparoscopic Colorectal Simulation: A Porcine Model

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Introduction: Minimally invasive surgical techniques have replaced open approaches in many of the most commonly performed surgical procedures. Several factors pose challenges in mastering laparoscopic techniques during resident surgical training, such as: 80 hour work week restrictions, decreased autonomy, case competition with fellows, and the steep learning curve associated with laparoscopic techniques. Therefore, with our study, we aimed to determine the effectiveness of utilizing porcine models to improve surgical resident comfort with standard hemostatic and laparoscopic colorectal techniques. **Methods:** Nine surgical residents between PGY2 and 5 completed a course focused on colorectal laparoscopic technique and the proper use of hemostatic agents. The course was designed by colorectal faculty with input from industry sponsors who also assisted with funding and supplementation of laparoscopic instruments and hemostatic agents. The course started with a pretest evaluation, followed by a didactic lecture, and a skills session using a porcine model to practice laparoscopic hemostatic and colorectal techniques. Participants performed laparoscopic procedures such as a right hemicolectomy and sigmoidectomy with a variety of laparoscopic staplers and energy devices. Then, residents attempted hemostatic techniques utilizing hemostatic agents after a structured series of bleeding injuries occurred. The lab concluded with the completion of a post-test survey focusing on competency and confidence surrounding laparoscopic colorectal techniques and hemostasis adjuncts. **Results:** Nine residents completed training using the porcine model. There was a 100% pretest and 100% posttest evaluation completion. Pretest surveys demonstrated that 8/9 residents had an intermediate level of confidence in using hemostatic adjuncts in laparoscopic surgery, while 1/9 had a beginner level. Regarding laparoscopic bowel resection and anastomosis, 6/9 residents had a beginner level of experience with the remaining 2/9 reporting an intermediate level. Post-test surveys showed that 8/9 residents strongly agreed that porcine models were useful for resident training in laparoscopic colorectal and hemostatic techniques. All residents (9/9) felt the lab provided valuable improvements to their surgical abilities and would recommend the lab to their peers. **Conclusion:** Our study shows that surgical residents' level of comfort with laparoscopic and hemostatic technique is often suboptimal regardless of the post graduate year of the resident. A paired didactic and porcine lab model for laparoscopic colorectal and hemostatic techniques is a valuable method for improving resident knowledge and skills in a low-stakes environment. **Funding:** This work was supported by Ethicon US, LLC, Cincinnati, OH

18. Health Care Disparities in Surgical Management of Facial Trauma

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Introduction While many studies have demonstrated healthcare disparities and access inequalities, few have elucidated the impact of disparities within surgical management of facial trauma. Facial fractures are found throughout demographic cohorts, but disproportionately affect those of lower socioeconomic status, making the importance of addressing health care disparities as they relate to social determinants of health all the more necessary. Literature within otolaryngology regarding health disparities in facial trauma patients is not existent. The aim of this project is to investigate treatment disparities in patients with facial fractures as it relates to surgical management. **Methods** A retrospective review of the North Carolina Trauma Registry state database from 2013-2021 was performed. The primary aim was to compare demographic features of patients treated nonoperatively to those who underwent surgical intervention. Age, gender, race, ethnicity, comorbidities, type of surgical management, and primary payer were extracted for analysis. Zip code and county residence were utilized in socioeconomic (SES) calculations. **Results** 19,244 patients with facial bone fractures were identified within the database. Comparing patients treated nonoperatively versus operatively, the patients treated operatively were younger

(46 vs 42, $p < 0.0001$), more likely to live in a county above the state poverty line (56.8% vs 50.7%, $p=0.0094$), have multiple medical comorbidities (87.9% vs 82.4%, $p=0.0004$), and have private insurance (39.7% vs 33.8%, $p<0.0001$). There was no statistically significant difference in treatment as it relates to race or Hispanic ethnicity. Discussion Our study suggests that disparities as they relate to age, socioeconomic status, insurance status, and co-morbidities may exist within facial trauma surgical care. Of the few published studies on facial trauma disparities, this study provides the most expanded set of variables of social determinants of health to date.

19. Health Disparities in Facial Trauma Management

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Introduction While many studies have demonstrated healthcare disparities and access inequalities, few have elucidated the impact of disparities within surgical management of facial trauma. Facial fractures are found throughout demographic cohorts, but disproportionately affect those of lower socioeconomic status, making the importance of addressing health care disparities as they relate to social determinants of health all the more necessary. Literature within otolaryngology regarding health disparities in facial trauma patients is not existent. The aim of this project is to investigate treatment disparities in patients with facial fractures as it relates to surgical management. **Methods** A retrospective review of the North Carolina Trauma Registry state database from 2013-2021 was performed. The primary aim was to compare demographic features of patients treated nonoperatively to those who underwent surgical intervention. Age, gender, race, ethnicity, comorbidities, type of surgical management, and primary payer were extracted for analysis. Zip code and county residence were utilized in socioeconomic (SES) calculations. Results 19,244 patients with facial bone fractures were identified within the database. Comparing patients treated nonoperatively versus operatively, the patients treated operatively were younger (46 vs 42, $p < 0.0001$), more likely to live in a county above the state poverty line (56.8% vs 50.7%, $p=0.0094$), have multiple medical comorbidities (87.9% vs 82.4%, $p=0.0004$), and have private insurance (39.7% vs 33.8%, $p<0.0001$). There was no statistically significant difference in treatment as it relates to race or Hispanic ethnicity. Discussion Our study suggests that disparities as they relate to age, socioeconomic status, insurance status, and co-morbidities may exist within facial trauma surgical care. Of the few published studies on facial trauma disparities, this study provides the most expanded set of variables of social determinants of health to date.

20. Development of a Synthetic Extracellular Matrix for Augmentation of Placental-Derived Stem Cell Central Nervous System Therapy

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Background: In the United States, there are approximately 300,000 people living with paralysis secondary to spinal cord injury. Stem cell therapy to treat spinal cord repair has been widely studied; however, a clinically effective stem cell therapy to treat paralysis has yet to be developed. After spinal cord injury, a glial scar forms, which acts as a barrier to neuronal axons. These axons, which transmit signals from the brain to muscles to induce movement, cannot reconnect through the glial scar, leaving patients with permanent paralysis. Recent studies have shown that placental-derived stem cells (PSCs) are able to induce neurogenesis and angiogenesis. Development of a therapeutic, injectable synthetic extracellular matrix (sECM) that reverses the inhibition of the glial scar on axonal repair and augments stem cell therapy may prove to be beneficial to patients with paralysis secondary to spinal cord injury. In this study, we develop a hyaluronic acid-based sECM with bioactive peptides that transitions from a liquid to a hydrogel at 37°C and augments PSC therapy to overcome the inhibitory properties of glial scars to facilitate neural repair. **Hypothesis:** We hypothesize that a modified hyaluronic acid-based hydrogel with peptides that induce neurogenesis and angiogenesis can be used in conjunction with PSCs to induce neuronal cell spreading and network formation in vitro. **Methods:** Hyaluronic acid (HA-60,000 Da, Genzyme, Cambridge, MA) was functionalized with an acrylate group using a two-step process spanning over four weeks and lyophilized, with HA-AC as the end product. Adhesion peptides were added to 3% w/v HA-AC and incubated at 37°C for 30 minutes. A linkage/cleavage peptide was added to the mixture and incubated at 37°C for 30 minutes. Neurons and PSCs in experimental groups of neurons, PSCs, and neurons and PSCs were incubated in sECM in a non-adherent 96-well plate at 37°C for

30 minutes then EGM-2 media was added. Cells in sECM were kept in a 37°C incubator for 7 days with daily monitoring under microscope before being fixed and immunostained for analysis. Rheology was also conducted to determine the stiffness of the sECM/hydrogel. Results: The current sECM composition transitions from a liquid to a hydrogel at 37°C (body temperature), has a stiffness of 350-400 Pa which emulates the softness of the brain and spinal cord, and forms a hydrogel at 37°C with cells present within the initial liquid solution. Neurons co-cultured with PSCs in the sECM formed tissue in which neurons spread and formed neurites and neuronal networks. Conclusion: In combination with neurons and PSCs, this novel sECM supports in vitro tissue formation with viable neurons, neurites, and most importantly, the formation of neuronal networks.

21. Clinical Results of Endoscopic Gluteus Medius Repair

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Background: Gluteus medius tears are common causes of greater trochanteric pain. Tears to this muscle occur after trauma or through everyday wear and tear and are predominantly seen in women (4:1 versus males) between ages 40-60 years. Gluteus medius tears are typically suspected in female patients with persisting lateral hip pain, decreased strength and range of motion, and a positive Trendelenburg sign. Due to the generic nature of these symptoms, the condition can sometimes be misdiagnosed as bursitis or iliotibial band syndrome. Further evaluation of these tears with magnetic resonance imaging (MRI) can confirm the diagnosis and expand the possible interventions to include surgery for the patient's pain. Based on the complexity and nature of the tear determined by MRI and the patient's pain and functional impairment, open versus endoscopic repair approaches are thoroughly evaluated for each patient. Overall, the endoscopic approach is fairly new, first formally introduced in 2009 by Voos et al's report. Of the limited studies analyzing the outcomes of endoscopic gluteus medius repair, the largest sample size is less than 60 hips. This study will aim to further evaluate the effectiveness of the endoscopic approach and help standardize this repair method by analyzing the short-term outcomes of a 100-patient cohort. Hypothesis: After an endoscopic gluteus medius repair procedure, patients are anticipated to experience improved hip pain levels and overall functionality compared to before surgery. Methods: The study consists of an over-the-phone conversation with patients who are at least six months post-endoscopic gluteus medius repair surgery with Dr. Hubbard. The first section assesses pain level on a 0-10 scale before surgery, 1-week after and at least 6months after surgery. Then, two modified Harris Hip Score assessments are used to further evaluate pain and functionality before surgery versus 6months after surgery. The results will be analyzed using descriptive statistics and additional inferential statistical analysis as appropriate upon the completion of enrollment. Results: This study is ongoing and continuing to enroll patients. Based on preliminary patient responses, the overall trend demonstrates improved modified Harris Hip Scores and pain level following the procedure. Conclusions: The overall goal of this project is to understand the endoscopic gluteal repair approach and its efficacy amongst patients. As the study continues to enroll new patients, we will further evaluate the effectiveness of the endoscopic approach and help standardize the method of gluteus tears repairs.

22. Dietary patterns associated with increased abundance of *Akkermansia muciniphila* potentiate anti-PD-L1 immune checkpoint blockade response in triple-negative breast cancer

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Immune checkpoint blockade (ICB) therapies targeting programmed cell death protein 1 pathway (PD-1/PD-L1) have advantageously impacted triple-negative breast cancer (TNBC) patient survival; however, there remains a need to improve therapeutic response. Recent studies from our lab, and in collaboration with others, have associated gut *Akkermansia muciniphila* as a therapeutic-response related microbe in breast cancer models, independent of diet. As diet is a main modifier of the gut microbiome, we investigated if we could harness diet-gut microbiome interactions to potentiate ICB response in TNBC. Using EMT-6 (n=5-7/group) and E0771 (n=8-10/group) syngeneic models of TNBC, tumor-bearing mice consuming either a low-fat control, high-fat Western, or Mediterranean diet, were treated with 3 doses of 200 µg of IgG or anti-PD-L1 antibodies. Tumor progression was monitored throughout the study by caliper measurement and response to therapy was determined using the final tumor volume at the end of the study. To assess modulation on the gut bacterial

microbiome by diet and ICB, 3M read depth metagenomic sequencing was performed on DNA isolated from fecal samples from both models. To further implicate the microbiome, we performed a fecal microbiota transplant (FMT) model (n=8-10/group), where mice consuming a control diet were supplemented via oral gavage with either a control diet-derived FMT, a Western diet-derived FMT, or Mediterranean diet-derived FMT. EMT-6 bearing-mice on each FMT were treated with IgG or anti-PD-L1 antibodies. In our E0771 model, immune response (F4/80 macrophages, granzyme B, and CD8+ cytotoxic T cell infiltrate) in the tumor microenvironment (TME) were examined in residual tumor tissue by immunohistochemistry (n=9/group). Regulation of PD-L1 protein by diet was assessed by Western blot hybridization in corresponding tumor sample lysates (n=9/group) and short chain fatty acid (SCFA) analysis was measured in plasma samples from this model (n=8/group) by LC/MS-MS metabolomics. In EMT-6 bearing-mice, PD-L1 treatment and consumption of a Western or Mediterranean diet significantly reduced both tumor volume and tumor weight when compared to control diet-fed mice ($p<0.05$). In E0771 bearing-mice, consumption of a Western diet and PD-L1 treatment resulted in a modest increase in ICB response (56%), with the highest efficacy observed in Mediterranean diet-fed mice (70%), when compared with IgG control animals. Western and Mediterranean-fed mice in both models displayed a 25-45% increase in gut *Akkermansia muciniphila* proportional abundance. Anti-PD-L1 therapy in EMT-6 bearing-mice given an *A. muciniphila* enriched FMT showed enhanced ICB responsiveness ($p<0.05$, 70-80%). Mediterranean-diet fed E0771 tumor-bearing animals treated with anti-PD-L1 antibodies showed elevated plasma butyrate SCFA metabolites. E0771 model results also show Western and Mediterranean diet intake regulated expression of PD-L1, macrophages, and cytotoxic T cell function proteins in the TME. Taken together, these data indicate PD-L1 response in TNBC is potentiated by diet-microbiota interactions and suggests increasing levels of *Akkermansia* may enhance ICB efficacy.

23. Influence of Donor and Recipient Sex on Outcomes Following Simultaneous Pancreas-Kidney Transplantation in the New Millennium: Single Center Experience and Review of the Literature

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The influence of sex on outcomes following simultaneous pancreas-kidney transplantation (SPKT) in the modern era is uncertain. Methods: We retrospectively studied 255 patients undergoing SPKT from 11/2001 to 8/2020. Cases were stratified according to donor (D) sex, recipient (R) sex, 4 D/R sex categories, and D/R sex-matched vs mismatched. Results: D-male was associated with slightly higher patient ($p=0.08$) and kidney ($p=0.002$) but not pancreas ($p=0.23$) graft survival rates (GSR) compared to D-female. There were no differences in recipient outcomes other than slightly higher pancreas thrombosis (8% R-female vs 4.2% R-male, $p=0.28$) and early relaparotomy rates in female recipients (38% R-female vs 29% R-male, $p=0.14$). When analyzing the 4 D/R sex categories, the two D-male groups had higher kidney GSRs compared to the two D-female groups ($p=0.01$) whereas early relaparotomy and pancreas thrombosis rates were numerically higher in the D-female/R-female group compared to the other three groups. Finally, there were no significant differences in outcomes between sex-matched and sex-mismatched groups although overall survival outcomes were lower in the sex-mismatched group ($p<0.10$ for pancreas GSR). Conclusions: The influence of D/R sex following SPKT is subject to multiple confounding issues but survival rates are highest in D-male/R-male and lowest in D-female/R-male categories.

24. Fluorescent Intracellular Nanoparticles for Tracking Adipose Derived Stromal Cells

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Background: Adipose derived stromal cells (ADSC) are a recent topic of interest in regenerative plastic surgery due to their relative ease of collection, rich quantity of stem cells, and ability for long term in vivo retention. The application of ADSCs has been particularly useful in procedures such as fat grafting, facial rejuvenation, and wound healing. However, after ADSCs are implanted, it is not entirely understood what happens to them and where they go. Tissue migration and reabsorption are always possibilities. It is essential to be able to monitor these implanted cells to determine long term safety and efficacy of these procedures. To safely track implanted ADSCs, it is essential to find a marker that is non-toxic, easily imaged, and retained well in target cells. Hypothesis: Fluorescent polymer nanoparticles will remain associated with ADSCs and can be used for in vivo tracking preferentially compared to unlabeled cells or other fluorescent means. Methods: Green

fluorescent protein (GFP)-labelled ADSC cells were cultured in vitro with fluorescent polymer nanoparticles, using 50 µg nanoparticles/mL of media. Discarded media was imaged using UV/VIS to quantify the number of nanoparticles in the supernatant to determine intracellular concentration. Nanoparticle-containing GFP labeled ADSCs were then prepared for intra-peritoneal injection into C57/BL6 strain mice, along with control samples of GFP labelled ADSCs without nanoparticles, and samples of 50 µg/mL nanoparticles only. Each of these three groups contained 5 animals, all of which were imaged using a fluorescent detection in vivo imaging system (IVIS) once a week for five weeks. After five weeks, all animals were euthanized, following which an intra-peritoneal lavage was performed to collect cells remaining in the abdomen. Samples of the lungs, liver, spleen, inguinal lymph nodes, and peritoneal tissue were also collected and analyzed using UV/VIS and IVIS to quantify GFP cells or nanoparticles. Results: Fibrotic masses were found attached to tissues of the intraperitoneal space in all animals belonging to trial groups containing GFP-labelled ADSCs, with or without nanoparticles. Imaging with IVIS and UV/VIS showed that these masses were positive for both GFP and nanoparticle signal. In nanoparticle only trials, the highest concentration of nanoparticle signal was seen in the liver, with trace amounts in peritoneal tissue and the spleen. Conclusions: After intraperitoneal injection, ADSCs became attached to various intraperitoneal sites, which underwent fibrotic change. In the absence of GFP cells, nanoparticles are retained primarily in liver tissue. IVIS imaging showed trace signals from nanoparticles contained in the liver but was not sensitive to the lower concentrations of nanoparticles in other tissues. The fluorescent polymer nanoparticles indicated that ADSCs were retained near the injection site, with limited migration due to an inherent fibrotic response to the cells, regardless of whether the ADSCs contained nanoparticles or not. The fluorescent nanoparticles facilitated visualization of the lack of ADSC migration following injection. Source of mentor's funding or other support that funded this research: WFSOM Department of Plastic and Reconstructive Surgery

25. A Dopamine-functionalized Hydrogel System for Therapeutic Delivery of Extracellular Vesicles

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Extracellular vesicles (EVs) are small nanovesicles that are involved in cell communication, protein transfer, the delivery of small RNAs to the surrounding cells and exhibit therapeutic potential for tissue engineering and regenerative medicine applications. Current hurdles such as large-scale production and low delivery efficiency reduce their efficacy for regenerative medicine applications. Systemically delivered EVs are rapidly cleared from the target site before delivering their bioactive molecules, so in order to enhance therapeutic efficacy there is a need for improved delivery methods of EVs. Herein, we describe a novel hydrogel material that is capable of sustained EV delivery which can thereby improve outcomes of EVs. Hyaluronic acid (HA) was functionalized with dopamine (Dopa), the adhesive molecule responsible for marine mussel adhesion. The catechol groups of Dopa have strong adhesive properties and exhibit the capability to adhere to both proteins and lipids which are exhibited on the EV surface. Next, two copper-free click chemistry molecules were conjugated to HA-Dopa to allow for in situ formation of the hydrogel. The material properties were then characterized via UV-Vis spectroscopy, H-NMR, and rheological analysis. Release kinetics were modeled with two model molecules in order to simulate EV release. Next, the Dopa-functionalized hydrogel system was validated with placental stem cells (PSCs) in terms of their viability and differentiation capacity using osteogenic EV delivery. Dopamine functionalization was achieved at two concentrations: HA-Dopa 4% and HA-Dopa 14% and click chemistry crosslinkers were conjugated at 15, 30, and 60 mmols. For the storage modulus, HA-Dopa 4% had 675.0 ± 30.9 , 871.63 ± 18.7 , and 893.4 ± 134.9 Pa for 15, 30, and 60 mmol crosslinker concentrations respectively. For HA-Dopa 14% the storage modulus was 790.1 ± 47.8 , 992.7 ± 27.8 , and 1498.72 ± 117.2 Pa for 15, 30, and 60 mmol crosslinker concentrations respectively. Dopa functionalization increased the total time of release to 10 and 14 days for HA-Dopa 4% and HA-Dopa 14% respectively, compared to total release of <24h with the non-dopamine functionalized control group. The hydrogel exhibited viability over 80% and the addition of osteogenic EVs lead to enhanced osteogenic differentiation. Herein, we have developed and characterized a platform delivery system that can sustain the release of multiple types of bioactive molecules. We plan to use this system to sustain release of therapeutic EVs at a target site. By sustaining release of EVs at the target site, limitations associated with EVs can be greatly reduced and clinical outcomes of EVs can be improved. The hydrogel system allows for both non-invasive delivery to a target site or the creation of patient specific scaffolds through 3D bioprinting. Our next steps are to validate this novel hydrogel system in an in vivo rat calvarial model. In this model we will deliver 100ug/mL of previously characterized osteogenic-EVs to the defect site and analyze bone mineral deposition and bone volume of a 16-week treatment period.

26. Prepectoral, Direct-to-Implant Breast Reconstruction: The Role of Autologous Dermal Flaps in the Setting of Obesity and Breast Ptosis

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Background: Direct-to-implant prepectoral breast reconstruction is becoming increasingly favored, though many are reluctant to perform this procedure in obese women due to a concern for increased perioperative morbidity. The goal of this study was to review surgical outcomes after direct to implant, prepectoral breast reconstruction in a patient population with a wide range of body mass indices (BMI). **Methods:** A retrospective chart review identified all patients who underwent prepectoral, direct-to-implant breast reconstruction from May 2019 - July 2022 by a single surgeon. Patient demographics, medical history, operative course, and postoperative complications were reviewed. Patients were subdivided into groups by BMI of less than or greater than 30 kg/m². **Results:** Thirty-one patients (54 breasts) were reviewed with an average BMI of 30 kg/m². Mastectomy type included wise pattern skin reducing (55%), skin sparing (33%), and nipple sparing (9%). Immediate reconstruction occurred in 58% of cases, while 42% required a vascular delay (less than 30 days) before implant placement. Sixteen patients' body mass indices were less than 30 kg/m², while 15 patients were greater than 30 kg/m². Major complication rates were similar in the lower BMI and higher BMI groups, respectively 32% versus 20%. A summary of the results is shown in Table 1. **Conclusions:** This study demonstrates that prepectoral direct-to-implant reconstruction is a viable option for women with a higher BMI. The complication rate in this cohort of patients remains similar to those previously described.

27. The Role of PKC β II Inhibition in Skeletal Muscle Oxidative Stress

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Disclosures: None. **INTRODUCTION:** Tourniquets are widely used in orthopedic surgeries to reduce intraoperative blood loss and improve surgical visualization. While beneficial, tourniquet use can cause ischemia-reperfusion (I/R) injury leading to muscle atrophy, impaired contractility, and delayed functional recovery [1]. Tourniquet-induced I/R injury is mediated by excess mitochondrial reactive oxygen species (ROS) production to induce apoptosis of skeletal muscle [2]. Protein kinase C beta-II (PKC β II) regulates mitochondrial ROS production by phosphorylating redox p66shc protein, which translocates and accumulates in mitochondria to induce apoptosis. Ruboxistaurin (RBX) is a selective PKC β II inhibitor that has been shown to block PKC β II-mediated p66shc activity to protect against ROS-mediated I/R injury in the heart by reducing infarct size and improving cardiac function [3]. PKC is represented by a family of serine/threonine kinases that mediate a range of physiological functions that can vary among different cell types [4]. The aim of this study is to determine if PKC β II modulates ROS production in skeletal muscle. We hypothesize that mouse myoblasts treated with Ruboxistaurin (RBX) will decrease ROS levels using an in vitro model of chemically induced oxidative stress. **METHODS:** C2C12 mouse myoblasts were incubated with a broad-spectrum PKC activator, phorbol 12-myristate 13-acetate (PMA), for 1h at variable concentrations (100 nM - 1 μ M) to stimulate ROS production. Pre-treatment with 200 nM RBX was 30-min prior to and at the onset of PMA stimulation. Cell viability was evaluated with a colorimetric assay. Diacetyldichlorofluorescein (DCFH) detection of intracellular ROS was quantified using a fluorescent microplate reader. Live-cell imaging was performed with Hoechst nuclear stain and DCFH for visualization of nuclei and ROS using fluorescent microscopy. Fluorescence intensity for nuclei and ROS regions of interest were quantified using ImageJ. The corrected total cell fluorescence (CTCF) was calculated by subtracting the background intensity from the integrated fluorescence density within the regions of interest. All data were tested for normality and homogeneity of variance with Levene's test. Student-test and ANOVA Tukey method were used to compare means between groups with an alpha level of 0.05 to determine significance. **RESULTS:** PMA stimulation resulted in a four-fold increase in ROS levels at all tested concentrations compared to untreated controls (n=3, p<0.05). PMA concentrations (100 nM - 1 μ M) were not significantly different from each other. Cell viability of cells (n=4) stimulated with PMA (100 nM) with and without RBX were similar to untreated controls. In ROS regions of interest in DCFH-positive cells, RBX (n=5) significantly attenuated ROS by 45% compared to PMA controls (n=7; p<0.05). CTCF units for nuclei regions of interest were similar for PMA and RBX-treated samples. **DISCUSSION:** The data suggests that treatment of C2C12 mouse myoblasts with RBX attenuates PMA-stimulated ROS production. Reductions in ROS were

not likely due to cell death since neither PMA nor RBX were toxic to cells. Selective PKC β II inhibition may represent a novel therapeutic approach for the prevention of tourniquet I/R injury of skeletal muscle. In future studies, we will further characterize ROS production using a mitochondrial-specific fluorescent ROS indicator. Western blots of cytosolic and membrane fractions will be compared to confirm PKC β II redistribution and p66shc activity in C2C12 myoblasts. SIGNIFI-CANCE/CLINICAL RELEVANCE: Tourniquet use is often necessary but can induce I/R injury to skeletal muscle, ranging from impaired function to threatened limb loss. The long-term goal of this study is to investigate an effective therapeutic to minimize muscle damage and accelerate recovery from tourniquet I/R injury. REFERENCES: 1. Fitzgibbons, P. G., Di-giovanni, C., Hares, S., & Akelman, E. (2012). Safe tourniquet use: a review of the evidence. The Journal of the American Academy of Orthopaedic Surgeons, 20(5), 310-319. <https://doi.org/10.5435/JAAOS-20-05-310> 2. Lejay, A., Meyer, A., Schlagowski, A. I., Charles, A. L., Singh, F., Bouitbir, J., Pottecher, J., Chakfé, N., Zoll, J., & Geny, B. (2014). Mitochondria: mitochondrial participation in ischemia-reperfusion injury in skeletal muscle. The international journal of biochemistry & cell biology, 50, 101-105. <https://doi.org/10.1016/j.biocel.2014.02.013> 3. Kong, L., Andrassy, M., Chang, J. S., Huang, C., Asai, T., Szabolcs, M. J., Homma, S., Liu, R., Zou, Y. S., Leitges, M., Yan, S. D., Ramasamy, R., Schmidt, A. M., & Yan, S. F. (2008). PKC β modulates ischemia-reperfusion injury in the heart. American journal of physiology. Heart and circulatory physiology, 294(4), H1862-H1870. <https://doi.org/10.1152/ajpheart.01346.2007> 4. Steinberg, S.F. (2008). Structural basis of protein kinase C isoform function. Physiological reviews, 88(4), 1341-1378. <https://doi.org/10.1152/physrev.00034.2007>

28. A Systematic Review of Cutibacterium Acnes in Breast Surgery & Related Adverse Outcomes

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Introduction: Cutibacterium acnes (C. acnes; formerly Propionibacterium acnes) is a bacterial species that resides in a range of human organs, including the skin, and was thus previously considered a contaminant in intraoperative cultures. With recent advancements in diagnostic technology, C. acnes is cited as a leading source of infection in orthopedic literature for shoulder surgery and within plastic surgery it is ubiquitously present in breast capsules. However, the role of C. acnes has yet to be fully appreciated or understood in breast surgery. Methods: A systematic review was completed identifying all original research papers or case reports discussing breast surgery and C. acnes. PubMed, Embase, and Web of Science were searched with the terms shown in Table 1. Articles were then reviewed for duplicates and excluded based on title, abstract, and full paper revision Figure 1. Results: Final papers are represented in Table 2. 14 of the 16 papers examine the role or prevalence of C. acnes in capsular contracture. Staphylococcus Aureus is frequently cited as the most commonly isolated organism, with C. acnes also isolated from implants/capsules in 14 of 15 papers. This literature search highlights the potential implications of C. acnes as a contributory organism to biofilms and capsular contracture. Conclusion: For nearly three decades C. acnes has been a prevalent organism in breast surgery literature, although little remains known about its clinical implications. A need exists for novel research surrounding the impact C. acnes has on patient outcomes and the requisite to evolve clinical practice.

29. Acetylsalicylic Acid Dosage and Duration Effects on Deep Inferior Epigastric Perforator (DIEP) Flap Breast Reconstruction

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Background: The deep inferior epigastric perforator (DIEP) flap has emerged as the gold standard for breast reconstruction following mastectomy.¹ The employment of microvascular techniques causes endothelial trauma activating coagulation paths increasing microthrombosis risk.^{2,3} Multiple pharmacological agents have been investigated for thrombosis prevention in the setting of DIEP flaps with one of these agents being acetylsalicylic acid, or aspirin. Current literature evaluating postoperative aspirin in DIEP flaps varies on the dosage, duration, timing, and respective patient outcomes.²⁻⁵ Methods: With IRB approval, a retrospective chart review of 508 patients (843 flaps) who underwent DIEP flap breast reconstruction from January 2019-March 2022 at Atrium Health was completed. Patient demographics, medical history, operative course, and postoperative complications were collected. Results: Patients were grouped by no aspirin, 81mg, or 325mg postoperative aspirin. The no aspirin group experienced no flap failures. There was no significant difference in flap failure

incidence between the 81mg and 325mg groups ($p=0.11$). There was no significant difference in incidence of hematoma requiring return to OR when comparing the no aspirin group to patients taking 81mg or 325mg ($p=0.09$). Additionally, no difference was found in hematoma incidence for the 81mg versus 325mg group ($p=0.97$). Conclusion: No difference in hematomas requiring operative intervention or flap failures was found in regards to postoperative aspirin use. There was also no difference in hematoma incidence with 81mg compared to 325mg of aspirin.

30. Regional Morphologic Outcomes in Spring-mediated Cranioplasty and Cranial Vault Remodeling

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Background: Spring-mediated cranioplasty (SMC) and cranial vault remodeling (CVR) are widely used surgeries for repair of sagittal craniosynostosis (SC). This study evaluates the pre-and post-operative three-dimensional regional morphology of SC patients who have undergone either SMC or CVR using the frontal bossing index (FBI), occipital bulging index (OBI), vertex narrowing index (VNI), and scaphocephalic severity index (SCI) to capture differences in anterior protrusion, posterior protrusion, width restriction, and global dysmorphology, respectively. **Methods:** CT and 3D photographs ($n=788$) of 222 SC patients from 2001 to 2022 who underwent SMC (489) and CVR (299) were analyzed longitudinally to quantify anterior, posterior, biparietal, and global change. Short-term post operative trends were evaluated based on post-operative time in 6-month intervals from 0-12, followed by a yearly 12-24 interval through two years postoperatively, and long-term trends were evaluated based on age in 2-year intervals up to 10+ years of age. A combination of analysis of variance, Tukey-Kramer post-hoc analysis, and independent t-tests were used with $p < 0.05$ significance level. **Results:** The mean age (months) at time of surgery was older in the CVR cohort (mean 22.35 ± 15.83) than in the SMC cohort (mean 4.43 ± 2.25 ; $p<0.05$) with SMC comprising 152 cases and CVR 70 cases. Pre-operatively, the SMC cohort had more severe regional dysmorphology in FBI, VNI, and SCI ($p<0.05$) relative to the CVR group. The FBI, VNI, and SCI improved in short-term (12-24 months post-operative) and long-term (10+ yrs. of age) analysis of both cohorts ($p<0.05$). In the initial post-operative period (0-2 yrs.), the difference in FBI between the two cohorts was maintained ($p<0.05$). However, SMC had a larger percent improvement in FBI for the first 12 months postoperatively ($p<0.05$). The VNI improved rapidly in the first 6 months after surgery in both cohorts and was statistically equivalent between the cohorts in the two-year postoperative period. However, percent change was significantly better in the SMC cohort at all time points ($p<0.05$). On long-term age-based analysis, the difference in FBI between surgical approach disappeared in the 6-8-year-old group ($p=0.57$) at which point the two cohorts improved at statistically equivalent rates. Despite a narrower head preoperatively, the SMC cohort achieved a statistically equivalent VNI at all age groupings. The global SCI trended towards superiority in SMC by 10 years of age ($p=0.087$) despite more severe preoperative morphology. **Conclusions:** SMC and CVR achieve similar long-term regional morphologic outcomes with SMC achieving better percent improvement in FBI, VNI, and SCI. SMC trended towards significance in achieving better maintenance of morphologic improvements while CVR trended to have early improvement that is less durable over time. Surgical repair with SMC and CVR impacted cranial width more than anterior protrusion and posterior protrusion in the short and long-term.

31. Patient-derived Organoids as a Model to Assess Tumor Specific ECM Architecture

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Introduction: Tumor growth and malignancy are heavily influenced by the tumor microenvironment (TME), a tightly integrated structure composed primarily of tumor cells, cancer associated fibroblasts (CAFs), immune cells, endothelial cells, signaling molecules, and extracellular matrix (ECM) proteins. In many cancers, crosstalk between tumor cells and nearby stromal cells results in a “stromagenic switch” in which the stroma flips from a suppressive to a supportive role in tumorigenesis through the induction of the CAF phenotype. These reprogrammed fibroblasts are particularly active and are the primary remodelers of the ECM through the formation, degradation, and realignment of structural ECM components, especially collagen. The resulting architectural changes in the TME mediated by CAFs influence tumorigenesis and cancer progression and leads to a tumor-promoting desmoplastic stroma implicated in 20% of cancers. The complexity of these

interactions has made it challenging to map the contribution and interplay of factors including tumor origin, location, and progression in the development of tumorigenic stroma, and calls for the development of novel approaches to model this behavior. In this study, we aim to characterize the remodeling response induced by the crosstalk between cancer and stromal cells using an organoid model. Methods: Stromal cells were isolated from tumor (colorectal or appendiceal) or normal liver sites and cultured in pro-fibroblastic conditions. In parallel, spheroids were formed from patient-derived appendiceal cancer cells as well as two colorectal cancer cell lines (HCT-116 and Caco-2). Each stromal cell type was embedded in a collagen type I solution which was then used to suspend the spheroids and allowed to crosslink to form organoids. A portion of these organoids were treated with TGF- β , a potent fibroblast activator, which served as a positive control. After one week in culture, organoids were collected and measurements were taken to assess overall stiffness as well as collagen fiber density, length, width, straightness, and angle. Results: Picrosirius red staining followed by polarized light imaging and hue analysis indicated that cancer cells alone were insufficient to remodel collagen, and significant remodeling only occurred in the presence of stromal cells. This effect was pronounced in regions of the organoids bordering the cancer cell spheroids. Treatment of organoids by TGF- β tended to produce stiffer collagen fibers as assessed by rheological measurements, and this effect was somewhat strengthened by the presence of spheroids. Differences in remodeling between primary stromal cells were not pronounced, though increased bundling of collagen fibers was observed compared to a hepatic stellate cell line (LX-2). Conclusion: This project demonstrates a working system for the study of architectural changes in patient-derived tumors and provides evidence for interactions which are most pronounced at the tumor-stroma interface. Future work will expand on the number of tumor samples, with special interest in exploring the differences between high and low grade appendiceal tumors and further characterization of the molecular factors implicated in these tumor-stromal interactions.

32. Fasciocutaneous Parascapular Free Flap: A Reliable Reconstructive Option for Complex Head and Neck Surgical Defects

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Objective: This study aimed to define perioperative factors and surgical outcomes for patients that underwent fasciocutaneous parascapular free flap reconstruction of complex head and neck defects after tumor extirpation. Study Design: Retrospective cohort study Setting: Tertiary academic hospital Methods: This study included patients who underwent reconstruction of complex head and neck surgical defects using fasciocutaneous parascapular free flap at a single tertiary care center between October 2005 and December 2018; with a focus on patient demographic characteristics, post-operative flap and donor site complications, frequency of need for flap revision, and 30-day all-cause mortality. Results: One hundred twenty-nine patients were included in the study. A total of sixty-seven patients had received radiation, chemotherapy, or a combination prior to surgery (51.9%). Primary defect locations included cutaneous (28.7%), oral cavity (29.5%), oropharynx (3.9%), nasopharynx (3.1%), sinus/orbit (19.4%), infratemporal fossa (3.1%), hypopharynx (3.1%), and larynx (9.3%). Flap complications occurred in forty-three patients (33.3%), including venous congestion (6), hematoma (7), dehiscence (18), anastomotic leak (5), fistula (7), infection/abscess (1), partial necrosis (8), and complete necrosis (7). Donor site complications included wound dehiscence (6), hematoma (5), and a combination of the two (1). Operative flap revision was required in 28 patients. The overall success of the reconstruction was 94.6%. Conclusion: Fasciocutaneous parascapular free flaps are an attractive choice for reconstruction of head and neck surgical defects due to the availability of a large skin paddle, consistency of the vascular supply, ease of flap harvest, versatility and resiliency of the donor tissue.

33. Utilizing Organoids to Study Perfusate Selection in Appendiceal Cancer Patients Undergoing Repeat HIPEC

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Introduction Repeat cytoreductive surgery (CRS) with HIPEC offers survival advantage in select patients with peritoneal surface disease. Patient-derived tumor organoids (PTOs) established after the 1st CRS/HIPEC may generate additional selection parameters for patients who are candidates for repeat cytoreduction. Herein, we explore PTO drug efficacy in

patients who have undergone repeat CRS/HIPEC. Methods After IRB approval, tumor samples were obtained from patients with appendiceal cancer undergoing CRS/HIPEC at our institution. PTOs were biofabricated utilizing unsorted tumor cells resuspended in a collagen-based hydrogel and underwent HIPEC treatment with mitomycin C (MMC) and oxaliplatin and endpoint analysis with ATP viability. Significant PTO responses demonstrated <50% post-treatment viability and were significantly different than untreated controls ($p < 0.05$). Results From June 2019 through June 2022, 74 specimens were collected from 51 patients who underwent CRS/HIPEC for low grade appendiceal (35/68, 51.5%) and high grade appendiceal (16/68, 23.5%) cancer. 7 patients (13.7%) underwent repeat CRS/HIPEC. Successful PTO studies were conducted in 67/74 specimens (90.5%). MMC demonstrated improved cytotoxicity in repeat HIPEC PTOs compared to oxaliplatin (32.5% vs. 46.2%). When oxaliplatin was utilized as the perfusate during the first CRS/HIPEC, only 2/8 (25%) PTOs fabricated from repeat CRS/HIPECs of the same patient displayed significant treatment efficacy to MMC ($n=1$, 17% viability) and oxaliplatin ($n=1$, 25.6%) with an average viability of 45.9%. When MMC was utilized as the first HIPEC, 9/10 (90%) PTOs fabricated from repeat CRS/HIPEC demonstrated significant treatment responses to both MMC ($n=5$, avg viability 26.8%) and oxaliplatin ($n=4$, avg viability 41.4%), with an average viability of 34.1%. Further, repeat PTOs fabricated from patients who received MMC during their first HIPEC demonstrated improved cytotoxicity to both oxaliplatin (38.8% vs. 61.0%) and MMC (25.2% vs. 47.2%) compared to those receiving oxaliplatin. Conclusions Tumor organoids represent a unique platform to study drug sensitivity in CRS/HIPEC patients. PTO studies performed from specimens HIPEC patients may help improve selection of perfusates utilized in subsequent cytoreduction surgeries.

34. Assessing the Mucolytic and Cytotoxic Activity of Bromelain in Appendiceal Cancer Organoids

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Introduction Mucin production in appendiceal cancer (AC) has been hypothesized to serve as a barrier to HIPEC drug delivery and treatment resistance. There is no currently approved mucolytic agent for AC. Bromelain is a pineapple extract with mucolytic properties that has generated research interest. We explored the cytotoxic and mucolytic effects of bromelain against mucinous AC in a patient-derived tumor organoid (PTO) model. Methods After IRB approval, tumor specimens were obtained from patients with AC undergoing cytoreductive surgery with HIPEC. PTOs were biofabricated using an unsorted tumor cell suspension in a collagen-based hydrogel. PTOs underwent HIPEC mimicry treatment with bromelain, cisplatin, and mitomycin C (MMC) under 37C and 42C conditions. Bromelain was also assessed as a pre-treatment agent to MMC and cisplatin HIPEC treatments. Results From October 2020 - March 2022, 11 specimens were collected from 10 patients with low grade appendiceal (7/11, 63.6%) and high grade appendiceal cancer (4/11, 36.4%). Testing was successful in all 11 specimens. Mucin depleting effects of bromelain (600 ug/ml) were greatest in the presence of N-acetylcysteine (NAC, 3% w/v) compared to bromelain alone (50% residual mucin vs 85%, $p=0.002$) and NAC alone (85% residual mucin, $p=0.003$). The cytotoxicity of bromelain increased with time and reached statistical significance only 60 minutes after treatment exposure (>50% post-treatment viability reduction, $p < 0.01$). The cytotoxicity of cisplatin and MMC increased with the addition of bromelain under 42C HIPEC conditions compared to cisplatin (70% greater reduction in post-treatment cell viability, $p=0.03$) and MMC (60% greater reduction in viability, $p=0.002$) alone. IHC studies demonstrated reduced Ki67, CK20, and MUC2 expression after treatment with bromelain. We also found increased expression of annexin V and caspase 3/7 in bromelain treated PTOs compared to untreated controls, suggesting bromelain's anti-tumor activity induces apoptosis pathways. Antiapoptotic-prosurvival proteins Bcl-2 and Bcl-xL were significantly reduced after treatment with bromelain compared to untreated controls ($p=0.009$ and $p=0.01$, respectively). Conclusions Bromelain demonstrates mucolytic and cytotoxic activity against appendiceal cancer PTOs both as a single agent and in combination with traditional perfusates. Bromelain may induce its cytotoxic effects through activation of apoptosis.

35. Chronic Cough: Evaluation of Patients' Success in Completing Cough Suppression Therapy

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Background: Chronic cough is highly prevalent amongst many patients in the US. Behavioral interventions with speech-

language pathologists (SLP) can improve quality of life but require patient-centered motivation, therapy attendance, and compliance with therapy techniques. Previous studies have shown the internal factors of self-efficacy and goal commitment are integral to patient motivation to pursue cough suppression therapy (CST). In this study, the authors aim to identify the motivational factors that prompt patients' progression from the contemplation to action stage of change and attend cough suppression therapy. Methods: A retrospective chart review was performed on patients > 18 years presenting to a tertiary care laryngology clinic with chronic cough. The patients were previously surveyed between February 2021-July 2021 to determine motivational factors for attending CST. Patient compliance with CST was identified (yes/no) as well as the number of visits and cough severity index (CSI) at therapy, if available. Results: Thirty-five patients were identified with ages ranging from 33-76 (mean 57.6 years, SD: 12.3). The majority were female (n=25) with a mean presenting CSI of 19.9 (10.3). After expressing intent, 71% of patients entered the action phase of change and attended CST with an average improvement in CSI of 4.4. Conclusion: The most common motivational factors overall were cough bothersome to self and desire for cough to improve, however, the extrinsic motivation of cough bothersome to others was more often reported by those attending therapy. Understanding patients' motivations to participate in CST may be useful when assessing candidacy and helping patients remain in the action stage required for success in behavioral therapy.

36. Impact of Lingual Adiposity on Obstructive Sleep Apnea

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Title: Impact of Lingual Adiposity on Obstructive Sleep Apnea Purpose: There is growing evidence that excess adipose tissue within the head and neck contributes to obstructive sleep apnea (OSA), particularly in obese patients. This subset of the population is often difficult to treat with surgical therapies. We theorized that tongue fat is a key factor in the development of OSA in obese patients; however, it is not clear if tongue fat also plays a role in the normal and overweight patient population. Our study was designed to determine if tongue fat plays an important role in this population. Methods: This is a prospective case-control study. Patients were prospectively recruited immediately after undergoing an overnight polysomnogram at the WRNMMC sleep clinic. The results from the sleep study were not known at the time of consent. A total of 86 patients were recruited. Subjects underwent magnetic resonance imaging (MRI) utilizing a three-point Dixon sequence. Volumetric reconstruction algorithms were used to evaluate the size and distribution of tongue fat deposits within subjects with sleep apnea and their matched controls without. Results: 86 patients were identified; mean age of 42.2 (SD, 11.2) years, 16% female. Patients on average had BMI 27.5 (SD, 2.89), with 18.6% (n=16) normal BMI, 61.6% (n=53) overweight, 19.8% (n=17) obese. Logistic regression lines were plotted for significant predictors of AHI score, and a positive correlation was found for AHI vs BMI and AHI vs age. No significant correlation was found for AHI vs tongue fat volume, or BMI vs tongue fat volume. No correlation was found for AHI vs tongue fat fraction or BMI vs tongue fat fraction. Logistic regression of predictors for apnea presence AHI ≥ 5 (n=48) vs < 5 (n=36) demonstrated higher average age (45.4 years) and BMI (28.3) in those with AHI ≥ 5 vs average age (38.2 years) and BMI (26.5) in those with AHI < 5 . While tongue volume and fat fraction were found to be higher in the patients with AHI ≥ 5 , the difference between this population and patients with AHI < 5 was not found to be statistically significant. Conclusion: Our study demonstrates that tongue fat does not play a significant role in the pathophysiology of OSA in the non-obese (BMI < 30) patient population. When analyzed with prior literature in the obese population, this suggests that tongue fat likely plays a significant role in the development and severity of OSA in the obese population and may explain, in part, why obese and morbidly obese patients are difficult to treat. Based on this study, we believe selective treatments targeting tongue fat should be designed and limited to the obese and morbidly obese population. Clinical Implication: These results may help determine criteria to consider whether individual patients would benefit from a novel, minimally invasive OSA treatment via cryoablative tongue fat reduction.

37. Blocking Inositol-requiring enzyme-1 (IRE1) affects triple-negative breast cancer chemotherapy sensitivity and prevents chemotherapy-related cardiotoxicity

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Triple-negative breast cancer (TNBC) is one of the most highly aggressive breast cancer types that predominately affect young and minority women. TNBC patients are more likely to receive cytotoxic chemotherapy regimens since they have limited targeted options. This results in severe side effects resulting in chronic cardiac dysfunction. Another issue compounded in the risk of developing cancer and chemotherapy-related toxicities is obesity. Obesity is associated with worse overall survival in women with TNBC. Inositol-requiring enzyme-1 (IRE1) is an arm of the unfolded protein response (UPR) pathway that plays a crucial role in tumor development. It has been shown that IRE1/XBP1 protein levels are upregulated in TNBC. Preliminary data suggested that targeting IRE1 in combination with Doxorubicin (DOX) enhances chemotherapy responsiveness in the 4T1 breast cancer model and reduces metastasis. Moreover, inhibiting IRE1 prevents long-term DOX-mediated cardiac damage by reducing fibrosis. Therefore, to determine the role of obesity and IRE1 targeting on chemotherapy response and the development of therapy-related cardiac toxicity, female BALB/c mice were placed on control (low fat) and Western (high fat) diets and injected mammary gland tissue with 4T1-luciferase murine TNBC cells. Mice were treated with doxorubicin (DOX) with or without IRE1 blockade. Cardiac function was measured by ultrasound at baseline and at the end of the study. Our data demonstrate that a high-fat diet promotes primary tumor growth and potentiates cardiac dysfunction. Furthermore, we found that the combination of targeting IRE1 with DOX enhanced chemotherapy responsiveness in TNBC preclinical models. Moreover, DOX treatment alone reduces cardiac function, but this effect was prevented by targeting IRE1 in the high-fat diet model. Also, targeting IRE1 increases mitochondrial respiration suggesting that IRE1 blockade may enhance mitochondrial function during stress as a potential cardio-protective mechanism. Overall results suggested that systemic suppression of IRE1 protected cardiac tissue in mice treated with doxorubicin while enhancing anthracycline-mediated tumor killing.

38. Routine Fungal & Acid-Fast Cultures in Diabetic Foot Infections: Are They Worth the Cost

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Background: Diabetic foot infections (DFIs) are a complication of diabetes mellitus (DM) that can add to the already costly care for patients with DM. One incurred cost relates to intraoperative cultures. It is well documented that DFIs are commonly polymicrobial; therefore, it is common practice to send an intraoperative specimen for gram stain, aerobic/anaerobic, acid fast and fungal cultures. Each added microbiology evaluation increases overall treatment cost, but do they add to a higher rate of successful treatment? Previous literature suggests that osteomyelitis due to fungal and mycobacterial organisms are rare. The purpose of this study was to examine the prevalence of positive acid-fast and fungal cultures. In addition, we aimed to determine if certain clinical characteristics yielded an increased number of positive acid-fast and fungal cultures and lastly to calculate the cost and potential cost savings related to the routine ordering of these two cultures. **Hypothesis:** Our study hypothesized that (1) few surgical cases of diabetic foot infections will result in positive acid-fast or fungal cultures, (2) certain patient characteristics and comorbidities will predict increased rates of positive acid-fast and fungal cultures, and (3) there can safely be cost savings for patients by abstaining from routinely ordering these tests. **Methods:** We examined the medical records of surgical patients between 09/2018 to 04/2022 from two foot and ankle surgeons that included a diagnosis of DM as well as fungal, acid-fast, gram stain, and anaerobic/aerobic cultures taken at the time of surgery. 445 patients met the inclusion criteria and demographics, comorbidities, and culture results were recorded. Three logistic regressions were run to look at the odds of positive fungal cultures based on sex, immune state, and IDDM. The cost at AHWFB of each culture was determined by the associated laboratory codes for each respective test. **Results:** Of the 445 cases analyzed, only 1 case had a positive acid-fast culture, and 21 had positive fungal cultures. None of the three predictor variables were significantly associated with the odds of having a fungal infection. The following odds included: immunocompromised patients 2.054 (CI 0.724-5.826), female 0.783 (CI 0.280-2.183), and IDDM 6.921 (CI 0.918-52.177). Although none of the variables reached statistical significance, additional exploration of the data indicated that 20 of the 21 cases of positive fungal cultures were IDDM. The cost of the microbiologic cultures to patients at AHWFB was aerobic/anaerobic: \$155, fungal: \$143, gram stain: \$77, acid-fast: \$51. By not routinely ordering rarely positive acid-fast and fungal cultures, the savings per patient would be \$194 and for total patients in our study would be \$86, 330. **Conclusions:** In conclusion, this study supported our hypothesis that relatively few patients with DFIs have positive acid-fast and fungal cultures. We were unable to find statistically significant characteristics leading to positive fungal cultures. It should also be noted that of those who went on to heal after a positive fungal culture without subsequent surgery, more than half healed without treatment with anti-fungal medication. From this analysis, we can suggest that by routinely adding fungal and acid-fast cultures to microbiology assessments, the cost incurred by the patients will increase; but these cultures may not lead to increased rates of successful treatment.

39. Distraction osteogenesis and endoscopic suturectomy in the treatment of rachitic craniosynostosis: a case series and literature review

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Background: Patients with genetic or nutritional rickets frequently suffer from craniosynostosis. Surgical options described in the literature include various forms of craniectomy, but descriptions and outcomes following distraction osteogenesis and endoscopic approaches are scarce. Here, we first perform a comprehensive review of published surgical outcomes in patients with rachitic craniosynostosis. We then describe two patients with rachitic craniosynostosis who successfully underwent distraction osteogenesis at our institution. **Case description:** Two two-year old boys with rachitic craniosynostosis, one genetic and one nutritional, presented with pan-craniosynostosis. The patient with nutritional rickets had received an endoscopic suturectomy at another hospital 19 months prior. Both patients underwent PVDO with distractor devices activated daily for 30 days to achieve a target distraction of 30 mm. Blood loss was 5mL (genetic) and 40mL (nutritional). Complete distraction was confirmed by x-ray and both patients recovered without complication. There was no evidence of resynostosis at 18 month follow-up, although the patient with genetic rickets did undergo cranial vault remodeling to correct persistent turricephaly. **Conclusion:** PVDO successfully treated rachitic pan-craniosynostosis associated with both genetic and nutritional etiologies, although longer follow-up is needed to fully appraise outcomes. Endoscopic craniosynostosis surgery also temporarily relieved elevated intracranial pressure in the patient with genetic rickets, who was just 6 months of age at the time of surgery, but reoperation was ultimately necessary to relieve pan-resynostosis.

40. Comparing Anesthetic Techniques and the incidence of Perioperative Hypotension After Surgical Hip Fracture Repair

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Background: Two commonly employed methods of providing anesthesia for hip fracture repair are general or spinal anesthesia. General anesthesia employs a combination of medications to render the patient unconscious. Spinal anesthesia is performed via the injection of a local anesthetic into the subarachnoid space. With sensory anesthesia at or above the surgical site, the patient may not need significant sedation to tolerate the surgical stimulus. The most common anesthetic complication encountered in surgical hip repair is postoperative hypotension. In this investigation, hypotension was defined as systolic blood pressure (SBP) < 90 mmHg or mean arterial pressure (MAP) < 65 mmHg, and it was sought to compare two groups of patients who had surgical repair of hip fractures receiving spinal or general anesthesia. **Hypothesis:** Because spinal anesthesia induces sympathetic blockade leading to decreased venous return and reduced peripheral vascular resistance, we hypothesize that patients who received spinal anesthesia for hip fracture repair would be more likely to experience perioperative hypotension compared to those receiving general anesthesia. **Methods:** Using electronic medical records queried from WFBH Atrium Health, we identified 663 patients underwent surgical hip fracture repair. In descriptive analyses, we computed the mean number of minutes per hour in a hypotensive state. Our primary outcome was a hypotensive episode lasting 15 minutes or longer. We applied logistic regression to test for an association between anesthesia type and each outcome, separately, with multi-variable adjustment for ASA grade, age at surgery, sex, race, and ethnicity. In a sensitivity analysis, propensity score matching was performed using logistic regression with nearest neighbor 1:1 matching to create two balanced groups of patients who received either regional or general anesthesia. **Results:** 253 patients receiving regional anesthesia were matched with 253 patients receiving general anesthesia. The odds ratio (95% CI) for a hypotensive event at SBP less than 90 mmHg was 1.1 (0.72, 1.6), while the odds ratio for a MAP less than 65 mmHg was 1.0 (0.62, 1.7). The confidence interval for both ratios did not imply significance. Hypotensive events among the two groups were low as no patient recorded an episode of MAP of less than 65 mmHg lasting 15 minutes or more. **Conclusions:** Choice of anesthetic did not impact the incidence of hypotension, even when the two populations were matched. We suspect this is due to improved medical technology and monitoring, as the patients in this study were being monitored as frequently as every 15 seconds. An incidental finding is the extremely low rate of hypotension, even among the older cohort. This implies that the elderly may be more resilient to anesthetic procedures than the literature suggests.

41. Postoperative Opioid Use in Patients Undergoing Functional Endoscopic Sinus Surgery

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Background: Endoscopic sinus surgery is a commonly performed outpatient procedure where opioids are frequently used. Few prospective studies have been conducted to address opioid prescription after sinus surgery. Our goal was to further examine our practice habits in opioid prescription and its relation to patient experience. **Methods:** Prospective, observational study. Patients were consented prior to surgery between September 2018 and March 2020. All patients were given equal postoperative pain control recommendations and initial prescription for 20 tablets of hydrocodone-acetaminophen. One to two weeks postoperatively, the patients were called and asked to respond to five questions regarding the amount of opioid taken, the stop date following surgery, non-opioid pain regimen, how opioids were discarded, and if the patient felt opiate helped. The data was analyzed using binomial regression. **Results:** Twenty patients were included in the study with an average age of 52 years and an equal distribution of men and women. The median number of pills taken postoperatively was 3. Eighty percent of patients reported taking less than 5 pills, 10% used from 5-10 pills, and 10% used greater than 10 pills. Seventy percent of patients kept the remaining prescription after initial use. Thirty five percent of patients used no over the counter medications in addition to Norco. Seventy percent of patients felt the narcotic helped their pain following sinus surgery. A higher average narcotic was used in patients with a history of pain related diagnoses, multiple medical diagnoses, lung disease, diabetes, and any narcotic use. This was only found to be significant with history of any reported narcotic use (Mean 7.1 vs 2.4 pills taken, $p=0.0161$). **Conclusion:** The addition of a narcotic to postoperative pain regimen positively impacted patients' perception of pain control. Despite this, 90% of patients consumed less than half of what was prescribed. This information coupled with a detailed preoperative assessment will lead to judicious use of narcotics in the postoperative analgesic armamentarium.

42. Analyzing the Impact of a Chief Resident Service on Practicing Surgeons

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Introduction: Graduates of surgical residencies often feel unprepared for independent practice. A chief resident service designed to provide graduated entrustment through a faculty-supervised elective general surgery rotation might increase their self-perceived preparedness for practice. Therefore, we aimed to evaluate the perceived effect of a chief resident service experience on our graduates' transition to independent practice. **Methods:** We distributed an anonymous electronic questionnaire to all graduates from 2006 through 2021 who participated in the Chief Resident Service and for whom we could obtain a functioning email address. Scaled responses were measured on a scale of 0 to 100, with 0 indicating the respondents' experience on the Chief Resident Service greatly decreased the ease of their transition in a particular domain and 100 indicating the service greatly increased their ease of transition. **Results:** Out of 76 graduates between 2006 and 2021, we obtained working email addresses for 62 (81.6%) and obtained 48 responses (77.4% response rate). Participants completed residency training 6 years prior to survey completion on average, and currently describe their practice as academic (55.3%), community-based (23.4%) and community-based with an academic affiliation (21.3%). Overall, 93.8% of graduates indicated that they felt comfortable enough to enter practice immediately after graduation, and all respondents indicated that their experience on the service increased their sense of responsibility for patient outcomes. In fact, most reported their experience on the chief service increased their confidence in the operating room (97.9%), increased their ability to run an efficient clinic (100%), and eased their transition to practice (97.9%). For all self-reported competencies regarding the impact of the Chief Resident Service, median scores ranged from 77 to 100. Most respondents (89.5%) also provided open-ended responses describing their experience on the service with the majority (95.3%) reflecting positively on the service. Predominant themes identified by open-ended responses included increased confidence ("the Chief Service significantly increased my operative confidence and decision-making"), autonomy ("there is nothing like the Chief Service as a gauge of your technical autonomy"), and ownership ("I grew as a surgeon as I took true ownership"). **Conclusions:** Most graduates reported that their experience on the chief resident service eased their transition to clinical practice, specifically noting that the chief service increased their operative confidence, provided them with an unmatched opportunity for graduated entrustment, and increased their perception of ownership regarding patient outcomes.

43. Combined Hyperthermic And Antibiotic Therapy In The Treatment Of Surgical Implant Related Biofilm Infections

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Background: The purpose of the current study was to demonstrate the effectiveness of localized hyperthermia in augmenting the effectiveness of antibiotics against *Staphylococcus aureus* (*S. aureus*) and *Pseudomonas aeruginosa* (*P. aeruginosa*) biofilm. *S. aureus* and *P. aeruginosa* are two common bacteria associated with surgically implantable devices, and their development into biofilms impedes antibiotic effectiveness. Current research shows hyperthermic therapies may be useful in altering the composition of the extracellular polymeric matrix of biofilms which decreases the protective ability of the biofilm, increasing the effectiveness of antibiotics. The current study used Photothermal Therapy (PTT) as a method to induce hyperthermia. PTT uses near-infrared (NIR) light to stimulate photothermal nanoparticles (NPs) for the generation of heat. By embedding NPs in medical-grade silicone-based implants, localized hyperthermia at the interface of the implant and biofilm leads to rapid bacterial cell death, and precision treatment. **Methods:** PTT nanoparticles were developed using the polymer poly[4,4-bis(2-ethylhexyl)-cylopenta[2,1-b;3,4-b'] dithiophene- 2,6-diyl-alt22, 1,3-benzoselenadiazole-4,7-diyl] (PCPDTBSe), and dispersed at a ratio of 10mg of nanoparticles into 1g of silicone to form disks 5 mm in diameter and 1mm thick. Stimulation with 800 nm rapidly increases nanocomposite (BSe) temperature. *S. aureus* (XEN29) and *P. aeruginosa* (PA01) were cultured on BSe disks for 24hr. Planktonic bacteria was removed, and biofilms were treated with 200ug/mL Ciprofloxacin (CPFX) and simultaneously exposed to 800 nm light at 5W for 25 seconds (PTT). Bacteria were quantified by counting colony-forming units (CFU) immediately following PTT. CFU data was compared to control biofilms grown on silicone disks with no NPs (Si disks). **Results:** XEN29 biofilms grown on BSe disks showed a 0.6 log reduction when treated with CPFX. When treated with CPFX and PTT, XEN29 biofilms grown on BSe had a 0.7 log reduction compared to biofilms grown on Si disks exposed to CPFX and PTT. After treatment with CPFX, PA01 biofilms grown on BSe had a 1.5 log reduction in CFU. CPFX and PTT led to 100% ablation of PA01 biofilms grown on BSe, a 2.7×10^7 CFU difference from treatment with CPFX alone, and a 1.2×10^7 difference from biofilms grown on Si exposed to the same treatment. XEN29/PA01 cocultured biofilms grown on BSe disks showed a 1 log reduction when treated with CPFX. When treated with CPFX and PTT, XEN29/PA01 biofilms grown on BSe had a 1.3 log reduction compared to CPFX alone and a 1.6 log reduction compared to biofilms grown on Si disks exposed to CPFX and PTT. **Conclusions:** We have shown that the potential new treatment of using PTT for biofilm growth on surgical implants using medical-grade silicone embedded with PCPDTBSe nanoparticles does increase the effectiveness of relevant antibiotics in inhibiting *S. aureus* and *P. aeruginosa* biofilm. Further research using animal models is needed to demonstrate continued efficacy of PTT when used through tissue barriers.

44. One-step 3D bioprinted liver-on-a-chip (LOC) for drug cytotoxicity screening

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Liver-on-a-chip (LOC) is a 3D in vitro hepatic micro-physiological system aiming to recreate the conditions of hepatocytes and the dynamic physicochemical hepatic environment on a microscopic scale. Conventional LOC fabrication uses an assembly of chip parts such as polydimethylsiloxane (PDMS), glass slide, and polymethyl methacrylate (PMMA). However, it requires a lot of steps with manual labor and has limitations in reproducibility from sample to sample. The study aimed to automate the fabrication process of LOC for high throughput drug cytotoxicity screening. We utilized a 3D integrated tissue and organ printing (ITOP) system to allow one-step bioprinting of LOC that can automatically fabricate a whole chip within 25 min. The bioprinted LOC consists of an outer layer of polycaprolactone (PCL) and inner fluidic channels with liver organoids and hydrogel. After LOC is moved to the chip platform inside the incubator, it is dynamically cultured using a peristaltic pump, and its cell viability and metabolic activities after drug administration are further assessed. The human liver carcinoma cell (HepG2) organoids showed high cell viability (>70%), an increase in organoid size, consistent ATP production, and an increase in albumin production up to day 14. The effect of acetaminophen (APAP), which is a nonsteroidal anti-inflammatory drug and the primary cause of induced acute liver failure in the United States, was observed in LOC.

Compared to the non-treated group, APAP treated LOC group showed a significant loss in cell viability (< 40%), lower ATP production, and smaller spheroid size at day 7. The LOC fabricated using the one-step bioprinting process showed high cell viability and metabolic activities for 14 days of culture and could be used to detect the liver cytotoxicity of drugs. Thus, we believe it has the potential to serve as a high throughput Liver in vitro model for the accurate study of in vivo biological processes such as monitoring the tissue response to administered drugs.

45. Heparin-functionalized bioink for digital-light-processing (DLP) 3D bioprinting

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Like a native extracellular matrix (ECM), the bioink hydrogel system should not only provide structural support for the cells to reside within but also provide various biochemical (e.g., cell adhesion sites and growth factor reservoir) and biophysical (e.g. structural features and mechanical stiffness) cues for guiding cell behaviors. However, there are limited biomaterials for DLP bioink that has been utilized to serve these roles. The aim of this study was to utilize heparin, which is one of the glycosaminoglycan (GAG) known for its growth factor immobilization, in DLP bioink. We developed a heparin-based bioink by modifying heparin to have thiol (-SH) groups to form a covalently crosslinked hydrogel network of methacrylated gelatin (GelMA) and poly(ethylene) glycol diacrylate (PEGDA) during the UV-crosslinking process. DLP printability of heparin-based bioink was assessed using an artifact with six design metrics. The growth factor-binding effect in the heparin-based bioink was characterized by premixing the FGF2 in bioink and assessing the viability and proliferation of 3D bioprinted immortalized mouse myoblasts (C2C12). The thiol modification of thiolated heparin (HepSH) was roughly 50%, which allowed a proper heparin conjugation to GelMA and PEGDA hydrogel with an increase in mechanical/rheological properties compared to non-thiolated heparin. The bioink with 1 w/v% HepSH (PGHS1) showed higher print accuracy in square and circle designs and similar results in other designs compared to the bioink without HepSH (PG). Additionally, PGHS1 with pre-mixed FGF2 (PGHS1-FGF2) showed the highest cell viability and ATP activity on day 1 compared to PG, PG-FGF1, and PGHS1. PGHS1 showed high printability and its growth factor immobilization allowed a faster proliferation of encapsulated C2C12 cells in the early culture. The heparin-based DLP bioink has the potential to mimic the native ECM and be further used in Tissue Engineering and DLP bioprinting applications.

46. Neuropathy is associated with increased risk of amputation, revascularization, and death in patients with peripheral vascular disease

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Objectives: Peripheral neuropathy is associated with amputation risk among patients with diabetes mellitus and critical limb threatening ischemia (CLTI). The association of neuropathy and adverse limb events has not been clearly defined in patients with peripheral arterial disease (PAD) without diabetes mellitus or in those patients with intermittent claudication. **Methods:** Patients referred to vascular surgery clinic for PAD were recruited from a single center. Exclusion criteria were a documented history of neuropathy or prior lower limb amputation. Screening utilized the Michigan Neuropathy Screening Instrument (MNSI). Scores >2 were considered abnormal and scores >4 were considered positive for peripheral neuropathy. Limb-specific outcomes of amputation and revascularization as well as a composite outcome including death were modeled using time to event analysis. **Results:** 86 patients were recruited. Mean age was 67±10.2 years, 30% were women, 24% were black. Mean ankle brachial index (ABI) was 0.74±0.3. PAD symptoms at initial evaluation were claudication in 52% of patients and CLTI in 38% of patients. Neuropathy was present in 20% of the cohort with a significantly higher proportion in diabetics (34% vs. 3%; p=0.0009). Neuropathy was more common in patients with CLTI compared to claudicants (36% vs. 9%; p=0.011). Forty patients (47%) reached the composite outcome of amputation, revascularization, or death with a median time to event of 16 months. Abnormal MNSI examination was significantly associated with the increased risk of the composite outcome (HR=3.19; p 0.0005)(Figure 1). **Conclusions:** A significant proportion of patients presenting to vascular specialists for PAD have undiagnosed neuropathy. Patients with PAD and neuropathy have an increased risk of amputation, revascularization, and death. Expanding neuropathy screening in vascular surgery clinic visits may help to identify patients at higher risk.

47. Microfluidic Incubation of Patient Derived Tumor and Immune Cells Boosts Lymphocyte Cytotoxic Phenotype

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The human immune system possesses a remarkable capacity to recognize and eliminate a cell based upon specific antigens. In cancer therapy, a patient's own immune cells can be used to eradicate their tumor. Past research improved anti-tumor immune cell response by administering immune checkpoint blockade therapeutics (ICB). Other treatments seek to isolate, expand, and infuse tumor-derived immune cells (tumor infiltrating lymphocytes, TILs) or genetically modified T cells (chimeric antigen receptor (CAR) T cells) to target and eradicate cancer cells. Unlike CAR T cells which recognize only 1 antigen on a tumor, TILs recognize multiple tumor antigens. Being in 79 clinical trials, TILs have a promising record of treating melanoma, cervical, ovarian, lung, and colorectal cancer. Given their autologous nature, TILs have less associated side effects than engineered CAR T cells. However, TILs have poor proliferative capacity and viability which limits treatment availability and efficacy. Recent advances in ex vivo 3D cell culture biofabrication might enable improved TIL production. Specifically, the formation of tumor organoids (i.e. tumor microenvironment cells [cancer, stromal and immune cells] which are isolated from a tumor biopsy of an individual patient and encapsulated in extracellular matrix (ECM)-like hydrogel) closely mimics the in vivo environment and allows for high throughput analysis. We recently coupled patient-derived tumor organoids (PTOs) with patient-specific immune cells from peripheral blood mononuclear cells (PBMCs) and showed good response to ICB in these immune-reactive tumor organoids (iPTOs). To further mimic in vivo physiology, and potentially improve TIL production for clinical treatment efficacy, we seek to utilize microfluidics due to their close approximation of a circulatory system. We propose to emulate the in vivo activation of PBMC-derived T cells by exposing them to PTOs in a microfluidic chip. We hypothesize this method will generate large amounts of viable tumor-specific T cells, similar to TILs, but with increased viability, cell expansion propensity, and cytotoxic responsiveness. We hypothesized that the close contact of antigen presenting cells (APCs), tumor cells, and peripheral blood mononuclear cells through a microfluidic device would emulate lymph node activation of an immune cell to its target, characterized by an increase in markers of activation, cytotoxicity, proliferation, homing markers, and production of inflammatory cytokines. These factors were measured via flow cytometry, immunohistochemistry, and cell culture medium proteomic analysis. Experimental groups to be analyzed consisted of negative (untampered PBMCs) and positive (patient TILs) controls compared to a co-culture of PBMC, APC, and PTO (OILs) in a microfluidic device. The microfluidic chip design as well as its success to boost T cell cytotoxic phenotype will be presented.

48. Examining the incidence of Intraventricular Hemorrhage and Hydrocephalus in Patients with Non-Traumatic Intracerebral Hemorrhage: A Gender-Based Inquiry

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Introduction: Non-traumatic Intracerebral Hemorrhage (ICH) accounts for 2 million strokes annually worldwide. This stroke burden disproportionately impacts minorities, and results in severe neurological deficits. Sex differences in brain structure and function, such as a larger mean length of frontal horn in males and increased global cerebral blood flow in women, can contribute to hematoma volume and expansion of ICH into nearby structures. No studies have yet to investigate sex differences in the incidence of Intraventricular Hemorrhage (IVH) and hydrocephalus as sequelae of ICH, both of which correlate with poor long-term outcomes. **Objective:** To investigate sex differences in the incidence of Intraventricular Hemorrhage and hydrocephalus in patients with non-traumatic Intracerebral hemorrhage. **Methods:** A retrospective review of a comprehensive stroke center spontaneous ICH database from 2019-2022 was performed, including patient characteristics such as history of diabetes mellitus, hypertension, coronary artery disease, tobacco use, and anticoagulant use in addition to ICH characteristics such as hematoma location volume, expansion, incidence of IVH and hydrocephalus. A logistic regression model controlling for these covariates was built to investigate sex differences in incidence of IVH and hydrocephalus. **Results:** This cohort had 100 patients with spontaneous, non-traumatic ICH, of which 39% were female.

Overall, 52/100 (52%) patients had IVH and 21/100 (21%) patients developed hydrocephalus. Among males, 29/61(48%) had IVH as opposed to 23/39 (59%) in females, $p = 0.264$. There was similar development of hydrocephalus in both males 13/61(21%) and females 8/39 (21%). Logistic regression showed females had higher odds of IVH. Higher diastolic blood pressure and anticoagulant use on admission also had higher odds of IVH. Conclusion: This pilot study demonstrates a trend towards higher incidence of IVH among females when controlling for history of diabetes mellitus, hypertension, coronary artery disease, tobacco use, and anticoagulant use. Higher odds of IVH in patients with higher diastolic blood pressure on admission adds to the previously investigated association between systolic blood pressure and ICH hematoma volume. Our sample validated the higher odds of IVH in patients with anticoagulant use on admission.

49. Optimization of Functionalized Electrospun Vascular Scaffolds for Coronary Artery Bypass Grafting

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Cardiovascular disease is the leading cause of mortality in the US and worldwide. In particular, coronary artery bypass grafting is a procedure used to treat coronary artery disease (i.e., narrowing issues). The allografts and xenografts have immunogenic responses, and autografts are limited in supply and dimensions. In this study, we aimed to develop and optimize a biofunctional electrospun vascular scaffold for anti-thrombogenic effects and in situ endothelialization by controlling functional parameters. PCL/Collagen scaffolds were fabricated with different ratios using electrospinning system. Then, we conducted collagen crosslinking and heparin conjugation with various EDC/NHS ratio and reaction steps to immobilize endothelial cell (EC)-specific antibodies. We observed the crosslinking degree of collagen, heparin conjugation, and antibody conjugation onto the PCL/collagen scaffolds. Especially, we confirmed amount of heparin conjugation according to reaction steps that one-step showed more conjugation than two-step. In addition, the tensile strength of two-step was increased due to the collagen crosslinking degree increased, but the one-step showed low tensile strength. The antibody-conjugated scaffolds showed good anti-thrombogenic effects by the platelet adhesion test and in situ endothelialization by EC capturing test. We successfully prepared functionalized electrospun vascular scaffolds by heparin conjugation and EC-antibody immobilization.

50. The effect of basement membrane matrix co-localized with 3D bioprinted breast cancer spheroids on cancer aggressiveness

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Breast cancer is the most common cancer in pregnant and postpartum women. Triple-negative breast cancer (TNBC) is a type of breast cancer (10-15%) that is usually more aggressive and more likely to recur than other breast cancer subtypes. Since the treatment option of TNBC is limited to receptor-targeted therapy, only chemotherapy which is the systemic treatment has been applied. However, the responses to chemotherapeutic agents are varied according to the patients and the cancer characteristics. In addition, chemotherapeutic agents have undesirable adverse reactions. Thus, there is a need for developing an in vitro breast cancer model for personalized drug response examinations. In this study, we developed a breast cancer model using TNBC spheroids combined with the basement membrane (BM) matrix that could reproduce different levels of cancer aggressiveness. The cancer spheroids co-localized with the BM matrix were deposited into alginate-based constructs using the 3D bioprinting process. As a result, the 3D-printed breast cancer spheroids demonstrated higher viability and proliferation, and drug resistance. And the outcomes strongly suggested that the BM matrix could enhance nuclear polymorphism, proliferation (Ki-67+), and extracellular matrix (ECM) accumulation. Herein, our 3D bioprinting platform to fabricate the in vitro cancer model can be utilized as a high-throughput screening system for various tissue-derived cancers for personalized and precision medicine.

51. Accuracy of Blood Loss Estimation in the Operating Room

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Background: Hemostasis during surgery is a primary contributor to the patient's blood management. Accurate blood loss estimation from surgery can help teams with postoperative management. Our goal of the study is to analyze the accuracy of medical workers' estimations of blood loss on different operating room items. **Methods:** A survey was sent out to medical students, residents, and attendings in a single situation. The survey asked participants to estimate the amount of simulated blood from pictures of a lap, raytech, towel, and drape. **Results:** All average estimations were greater than the actual amount of simulated blood on the operating room item. The average estimation for laps was over twice the actual amount of simulated blood, 38.2 cc estimated and 16 cc actually. On a soaked raytec, the estimated fluid was 60.8 cc when in reality it had 18 cc of fluid. On the non-soaked raytec the estimated fluid was 14.9 cc but in reality, was 3 cc. The towel had 14 cc of fluid on it with the average guess being 39.7 cc. Lastly, the participants guessed the drape had 40.1 cc of fluid when in reality it had 12 cc. **Conclusion:** All in all, our study found a substantial overestimation of blood on operating room items by residents, students, and attending physicians. Our study suggests estimation of surgical blood loss by analysis of soaked raytecs, laps, and towels may be inaccurate.

52. Retrospective Review of Reoperation and Reamputation Rates of Two Techniques for Proximal Margins Analysis on Toe Amputations

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Background: Toe amputations are a common podiatric procedure for osteomyelitis. Whether or not the surgeon obtains a surgical cure for osteomyelitis can be difficult to assess. Using a proximal margin of the bone can assist the treatment team in deciding the duration of postoperative antibiotics. In our study, our two senior authors use separate ways to analyze the proximal margin. The first surgeon has the pathologist analyze the proximal aspect of the toe amputated for osteomyelitis. The second surgeon takes a sample from the metatarsal head following the removal of the toe to be reviewed for osteomyelitis. Our goal is to analyze the re-operation rate and re-amputation rate between these two techniques. **Methods:** A retrospective chart review was performed on all isolated toe amputations from our two senior authors from March 2017- September 2022. Patients were excluded that did not have cultures performed. Re-operation and re-amputation rates were analyzed for positive and negative margins. **Results:** Our study found an overall 29.7% reoperation rate after negative margins and 25.5% reamputation rate after negative margins. For the proximal margin group, there was an overall 50% reoperation rate and 43.8% reamputation rate. There were no significant differences in reamputation or reoperation rates between the two proximal margin techniques. **Conclusion:** All in all, both techniques demonstrated similar results drawing us to conclude both are adequate techniques for proximal margin selection. Our study did find that a proximal margin had almost double the rate for reoperation and reamputation compared to patients with a negative margin.

53. The Need for Additional Surgery Following Passive versus Active Approaches to Syndromic Craniosynostosis - a Meta-Analysis and Review

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Background: Endoscopically assisted craniofacial surgery (EACS), including endoscopic strip craniectomy (ESC), has numerous advantages over traditional, open approaches such as fronto-orbital advancement (FOA) in treating nonsyn-

dromic craniosynostosis. However, several papers report high reoperation rates in syndromic patients treated with EACS. This meta-analysis and review examines undesirable outcome rates (UORs), defined as reoperation or Whitaker category III/IV, in syndromic patients undergoing primary EACS compared to procedures which actively expand the cranial vault. Methods: PubMed and EMBASE were searched in June, 2022 to identify all papers reporting primary reoperation or Whitaker outcomes for syndromic patients undergoing cranial vault expanding surgery or suturectomy. A meta-analysis of proportions was performed comparing UORs in passive (EACS) and active procedures. A trim-and-fill adjustment method was used to validate sensitivity and assess publication bias. Results: A total of 721 articles were screened. Five EACS papers (83 patients) and 22 active approach papers (478 patients) met inclusion criteria. Average UORs for EACS and active approaches were 26% (14-38%) and 20% (13-28%), respectively ($p=0.18$). Meta-regression showed no effect of operative age or follow-up length (after two-years) on UOR. Reoperation occurred earlier in EACS patients (13.7 months post-primary surgery versus 37.1 months for active approaches, $p=0.003$). Relapse presentations and reason for reoperation were also reviewed. Subjectively, EACS UORs were higher in all syndromes except Apert, and Saethre-Chotzen patients had the highest UOR for both approaches. Conclusion: There was no statistically significant increase in UORs among syndromic patients treated with EACS compared to traditional approaches, although EACS patients required revision significantly sooner. Limited EACS data is a limitation of this analysis, and overlapping patient populations in EACS studies is a shortcoming in the literature. Uncertainties regarding the long-term efficacy of EACS in children with syndromic craniosynostosis should be revisited as more data becomes available.

54. Inflammation-mediating Piezo1 receptor expression in settings of altered hemodynamics

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Background: Brain intracranial aneurysms affect six million people in the United States. About 500,000 people worldwide die annually due to ruptured intracranial aneurysms. The exact pathophysiology of aneurysm formation is still largely unknown. Piezo1 is a mechanoreceptor expressed in endothelial cells of developing blood vessels and are implicated in diseases such as hypertension and arteriosclerosis. In addition to hemodynamic forces, Piezo1 has been shown to play an inflammatory role, as mechanically activated Piezo1 modulates macrophage polarization and stiffness-sensing macrophages lacking Piezo1 exhibit reduced inflammation and enhanced wound healing responses. Malfunction of Piezo1 mechanoreceptors has recently been demonstrated as a novel mechanism of abdominal aortic aneurysm (AAA) development. With the increasing evidence of relationship between AAA and intracranial aneurysms, it is important to study Piezo1 dysregulation as a potential cause of intracranial aneurysm development and/or rupture. Hypothesis: We hypothesize that vascular shear stress leads to Piezo1 overexpression and disorganization in arterial smooth muscle cells, resulting in altered calcium influx, increased cytoskeletal cross-linking and stiffening, and aneurysmal formation. We further hypothesize that the Piezo1 mechanoreceptor upregulation may influence activation of pro-inflammatory macrophages. Methods: Following craniotomy and verified aneurysm clipping for ruptured and unruptured intracranial aneurysms, we excised and collected the domes of the aneurysms in patients consented for the Wake Forest Cerebrovascular Tissue Bank. We also collected vascular malformation specimens-AVMs and dural arteriovenous fistulas. These specimens were stained with CD31 to co-localize Piezo1 in the endothelial cells, α -SMA to co-localize in smooth muscle cells, and CD68 to co-localize pro-inflammatory macrophages. Results: Piezo1 mechanoreceptor overexpression was found in the smooth muscle layer of intracerebral aneurysms, but not in other vascular lesions such as the AVMs or dural arteriovenous fistulas, or extracranial vessels such as the superficial temporal artery (STA). Elevated Piezo1 mechanoreceptor expression was found in human cerebral aneurysms along with pro-inflammatory macrophages. Additionally, there was significant dysregulation of Piezo1 mechanoreceptors in the intracerebral aneurysms compared with the regular appearance seen in the control human STA. Conclusions: Our preliminary data is the first demonstration of overexpression of Piezo1 mechanoreceptors in a disorganized manner in the walls of human intracerebral aneurysms. The findings further suggest that upregulation of Piezo1 mechanoreceptors may influence activation of pro-inflammatory macrophages. Our results are a critical step in knowledge of intracranial aneurysm development and may represent a therapeutic target. Future steps will be to explore the inflammatory role of Piezo1, studying the positive feedback loop between Piezo1 mechanoreceptor function on macrophages and modulation of polarization responses. Source of funding: The Aneurysm and AVM Foundation, The Bee Foundation, Brain Aneurysm Foundation

55. Otolaryngology-Head & Neck Surgery Mentorship Program for Pre-Clinical Wake Forest Medical Students: A New Program to Encourage Diversity

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Otolaryngology-Head & Neck Surgery Mentorship Program for Pre-Clinical Wake Forest Medical Students: A New Program to Encourage Diversity Introduction: Without prior knowledge or interest, many medical students may not have the opportunity for formal exposure to the competitive field of Otolaryngology-Head & Neck Surgery (Oto-HNS). Traditionally, Oto-HNS has not been a diverse specialty. Only 30% of Otolaryngologists are women. Men comprise 92% of professors. African Americans comprise only 2.3% of all trainees.¹ Given such statistics and increasing competitiveness, students from underrepresented backgrounds may overlook Oto-HNS as a potential career. In response, we have initiated a pre-clinical mentorship program for students from diverse backgrounds in order to provide an early introduction to the field and to provide a faculty mentor. Methods: In 2022, two female Wake Forest medical students from diverse backgrounds who completed their M1 year were selected via a written application process. They participated in a six-week program rotating weekly with a different Oto-HNS subspecialty at Atrium Health Wake Forest Baptist. They rounded with residents, observed faculty and residents in clinics and ORs, attended resident lectures, and were introduced to audiometric testing. They were exposed to patient care, operations, networking, research opportunities, and more. Students were evaluated on attendance, clinical performance, professionalism, teamwork, and a formal case presentation. Future participants may expect similar experiences. Results/Conclusion: Students will complete an exit questionnaire and will be followed through their Match Day and beyond, to determine the impact of the program on their education and ultimate career pathway. We anticipate benefits of: increased medical knowledge, exposure to patients and the surgical environment, developing networking opportunities, and having a faculty mentor. Longitudinal study concerning their ultimate career choices will serve as one way to measure our goal of increasing diversity in Oto-HNS. We hope the program will become a model to motivate other medical educators and institutions to initiate similar programs in Oto-HNS and other surgical specialties in order to inspire a new generation of surgeons to become passionate about education, surgery, diversity, and mentorship.

56. An Optically Active Compression Orthosis Improves Hand and Finger Tissue Oxygenation in Induced Ischemia

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Introduction: Increasing tissue perfusion to the hand and fingers is desirable in patients with vascular insufficiency due to injury, vasospasm, or occlusive disease and in patients with peripheral neuropathy after peripheral nerve injury. A novel optically-active compression (OAC) orthosis was created with a far-infrared (FIR) emitting fabric for the purpose of increasing local tissue perfusion to the hand and fingers. We hypothesize that in an induced, in-vivo ischemic condition, the OAC orthosis can restore tissue perfusion to the native, non-ischemic state as measured by tissue oxygen saturation using near-infrared spectroscopy. Materials & Methods: A prospective, split-body cohort study was designed to enroll consecutive patients undergoing Wide Awake Local Anesthesia No Tourniquet (WALANT) hand surgery to test the efficacy of the OAC orthosis on restoring tissue perfusion. WALANT patients were selected because injection of lidocaine with epinephrine into the surgical site generates a relatively ischemic region of tissue. Both an experimental and a sham orthosis was applied to each patient, so that the non-operative hand served as each patient's own control. Tissue oxygenation was measured on bilateral hands using a handheld near-infrared spectrometer (ViOptix® Intra.Ox®) at four time points in triplicate. Results: 25 patients undergoing WALANT hand surgery were enrolled. Localized ischemia and decrease in tissue oxygen saturation was detectable by the handheld spectrometer in the experimental ($p < 0.001$) but not the control arm indicating the administered epinephrine had no systemic effects. In the setting of epinephrine-induced ischemia via local injection, the OAC orthosis, but not the sham orthosis, reversed the ischemic state ($p < 0.001$) based on tissue oxygen saturation levels. Conclusions: Our results demonstrate that an adequately ischemic state was created by the injection of lidocaine with epinephrine and that this effect was successfully reversed by use of the OAC orthosis. Tissue oxygen saturation levels in the induced ischemic state significantly differed from the baseline pre-ischemic state in the experimental group. After ap-

plication of the OAC orthosis, tissue oxygen saturation significantly increased and was restored to control and pre-surgical levels. This demonstrates that the OAC orthosis has a profound effect on tissue perfusion. This introduces many exciting future applications in replantation, revascularization, steal syndrome after vascular access, connective tissue disorder digital ischemia, vasopressor-induced digit ischemia, decreasing mastectomy flap necrosis, etc.

57. Google Search Analysis in Laryngology: What do people want to know and where do they find the answer?

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Background: Patients recently diagnosed with a new medical condition frequently turn to the internet to learn more about their diagnosis. We aimed to identify specific questions people are asking regarding common laryngological diagnoses by evaluating “People Also Ask” (PAA) questions generated by Google and to determine if the sources accessed were of high quality. **Methods:** The terms “subglottic stenosis,” (SS) “Zenker’s diverticulum,” (ZD) and “vocal fold paralysis,” (VFP) and related terms, were entered into Google, and PAA questions and associated websites were extracted using. Questions were categorized into specific topics and websites were categorized by type then assessed using Journal of the American Medical Association (JAMA) benchmark criteria. A search engine optimization tool (SEO) was used to determine search volume for individual topics. **Results:** 144 PAA questions (SS n=52, ZD n=49, and VFP n=43) and their associated websites were extracted and most commonly related to disease etiology (34%), management (27.1%), and signs/symptoms (16.7%). Sources linked to PAA questions were academic (37.6%), government (25.6%), and commercial (16.2%) websites, while medical practice (7.69%), single surgeon (3.42%), and social media (9.40%) websites were less frequently referenced. JAMA scores were highest for government websites (mean 3.35, SD = 0.54) and lowest for academic websites (mean 0.77, SD = 0.14). **Conclusion:** The most commonly asked questions related to SS, ZD, and VFP are related to etiology and management. Academic medical institution websites are most frequently viewed to answer these questions. It is important for academic laryngological professionals to ensure that information on their academic website is accurate and up-to-date.

58. Suture fusion and midface hypoplasia in Crouzon syndrome

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Background: Early onset of minor suture fusion in syndromic craniosynostosis is associated with midface dysplasia and is a common indication for craniofacial surgery. This study seeks to describe the impact minor suture fusion severity has on midface morphology in Crouzon syndrome. **Hypothesis:** We hypothesize that a direct relationship exists between minor suture fusion and midface growth restriction. A primary purpose of this study is to identify which suture(s) or synchondrose(s) are implicated. Using statistical modeling we examine the effects of degree of skull base suture fusion on various cephalometric measures of midface growth, while controlling for diagnosis, age and gender. **Methods:** Pre-operative computed tomography images (CT) of 63 patients with Crouzon syndrome and 63 normocephalic controls were included. Degree of skull base suture fusion for 7 sutures was scored on a 5-point scale introduced by Madeline and Elster. The sella (S), nasion (N), A point (A), basion (BA), and anterior nasal spine (ANS) landmarks were used to calculate the SNA angle, BA - ANS length of the lower midface, and N - S length of the upper midface. All analyses were performed using multiple linear regressions. **Results:** The mean age was 42.9 ± 75.5 months (43.9% female) and the control group was significantly older ($p < 0.01$). Advanced spheno-occipital synchondrosis fusion in Crouzon syndrome correlates with regression of the BA - ANS length by 0.563 mm per incremental increase in suture fusion ($p < 0.01$). The lower midface (BA - ANS) growth was restricted to a greater degree than the upper midface (N - S) with ratios of the two ranging between 0.559 and 0.93. Fusion severity did not impact SNA angle. **Conclusions:** These results suggest sheno-occipital synchondrosis fusion severity in Crouzon syndrome is correlated with lower midface regression. Similarly, all anterior skull base sutures limited lower midface growth to a greater degree than the upper midface.

59. Representation of Women in Medical Leadership Positions at an Academic Medical Center

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Women are generally underrepresented in medical leadership positions, making gender equity an area of focus. Despite women making up nearly half of medical school graduates, women in academic medicine are less commonly full-time faculty members and advanced to higher positions less frequently. For example, a 2018-2019 AAMC report noted only 18% of medical department chairs were held by women. Absence of women in medical leadership has the potential to diminish research, medical training, and policy decisions benefitting women's health. We surveyed 22 clinical departments, 14 clinical department sections, and 9 science departments at an academic medical center, questioning which funded leadership roles, if any, were held by women. Leadership positions included department chair, vice chair, residency director, fellowship director, clerkship director, or section head. 22.7% (5/22) of clinical department chairs and 55.5% (5/9) of science department chairs are currently held by women. Vice chair position is held by women in 31.8% (7/22) of clinical department positions and 11.1% (1/9) in the science departments. Twenty-nine medical departments and sections reported having a residency program, of which 55% report having a woman residency director. 66% of the medical and science departments that offer a fellowship program (20/30) report having at least one woman fellowship director. Additionally, 25% of departments with fellowships (5/20) have two or more women holding fellowship director positions. Although the total number of section chairs could not be calculated per department, 50% of clinical departments surveyed (11/22) reported having at least one woman section head. Our survey was limited in that we could not determine the percentage of inter-departmental gender representation for most groups and assume there is variability depending on the medical specialty. For example, one department reported having 5 section head positions, each held by women faculty, whereas another department with 8 section head positions reported only one position held by a woman. Three clinical departments (3/22, 13.6%) and two medical sections (2/14, 14.3%) reported having no women in the listed leadership positions at this time. Overall, we are encouraged by the distribution of women in leadership in the clinical and science departments, especially regarding residency and fellowship director positions, although more work should be done to encourage women's representation to some degree in every medical department. Diversity in medical leadership is critically important when training the next generation of physicians and researchers to understand and advocate for women's health.

60. Total Ankle Arthroplasty Medial Malleolus Fractures and Use of Prophylactic Screw: A Retrospective Review

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Ankle arthritis is a debilitating condition that negatively impacts a patient's quality of life. A total ankle arthroplasty procedure continues to gain traction as a viable treatment option for end-stage ankle arthritis that has failed conservative treatment. While newer total ankle models have shown improvement in complications and survivorship, intraoperative and postoperative medial malleolus fractures continue to be a concern. We created two novel radiographic measurements of the bone bridge between the total ankle prosthesis and the tibial cortex. Using 72 patients, we analyzed the correlation between the bone bridge and intraoperative and postoperative fractures. We found patients with no fractures had a larger transverse and short bone bridge, 12.67 +/- 2.93 mm and 11.24 +/- 2.7 mm respectively, than patients who experienced an intraoperative or postoperative medial malleolus fracture. While patients who received a prophylactic screw had over 4mm smaller of a bone bridge than the group with no fractures, it was successful in preventing further fractures. We recommend in patients with a transverse bone bridge of 12 mm or short bone bridge of 10mm that the surgeon considers placement of a prophylactic screw.

61. Intracranial sub-second dopamine measurements during a risky decision-making task in patients with Alcohol Use Disorder suggest diminished dopaminergic signals about ‘relief’

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Objective: To our knowledge, no data have been reported on dopamine fluctuations, on subsecond timescales, in humans with Alcohol Use Disorder (AUD). Here, we monitored dopamine release in two patients with and two patients without a history of AUD during a risky decision-making task to begin to characterize how sub-second dopamine responses to counterfactual information (related to psychological notions of regret and relief) in AUD may be altered. Methods: We made measurements of extracellular dopamine levels once every 100-milliseconds, using human voltammetric methods. Measurements were made in the caudate during deep brain stimulation (DBS) electrode implantation surgeries (for treatment of movement disorders) in patients who did (“AUD”, n=2) or did not (“non-AUD”, n=2) have a history of AUD. Participants performed a risky decision-making task in which they made choices between “Sure bets” or 50/50, monetary, “Gamble” outcomes. Results: We report fast changes in dopamine levels that appear to be modulated by what “could--have-been” and by patients’ AUD-status. Positive counter-factual-prediction-errors (related to relief) differentiate patients with versus without a history of AUD. Conclusions: Dopaminergic encoding of counterfactual information appears to differ between patients with AUD and patients without AUD. The current study has a major limitation of a limited sample size, but these data provide a rare insight into dopaminergic physiology during real-time decision-making in humans with an addiction disorder. We hope future work will expand the sample size and determine the generalizability of the current results.

62. Thirty- and ninety-day survival is better in patients who have pre-planned transaortic Impella placement

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Thirty- and ninety-day survival is better in patients who have pre-planned transaortic Impella placement Kimberly M Linden MD; Elizabeth Wood MD; Gabriel Cambronero MD; Adrian Lata MD Background: Mechanical circulatory support (MCS) has been shown to have improved survival when used in patients in cardiogenic shock or with high-risk percutaneous coronary intervention (PCI). Transaortic Impella is a retrograde placed MCS device placed into the left ventricle (LV) through the aortic valve. With increased use and familiarity, there have been case reports using early placed Impellas for postoperative support after cardiac surgery in high-risk patients. We hypothesize that early and planned use of transaortic Impella will lead to improved outcomes in patients with low ejection fraction (EF) post-cardiac surgery compared to those who undergo cardiac surgery and require salvage Impella placement. Methods: This is a retrospective review of patients who underwent coronary, valvular, or aortic surgery and had a transaortic Impella placement between from January 1, 2017- September 25, 2022. Primarily 30-day and 90-day survival was evaluated with secondary outcomes being intraoperative EF, postoperative EF, pre-Impella removal EF, discharge EF, post operative stroke, major bleeding, immediate graft infection, delayed graft infection, and finally acute renal failure. Results: Of 62 patients, 43 patients had planned placement compared to 19 unplanned. Planned Impella had a 88% 30-day survival and 83% 90-day survival compared with 84% 30-day survival and 79% 90-day survival in salvage patients. Major bleeding events were higher in salvage patients. Conclusions: Planned Impella patients had higher rate of 30-day and 90-day survival and lower rates of major bleeding.

63. Response of Infected/Non-infected Breast Cancer Cells to Silver Nanoparticle-induced Photothermal Therapy

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ABSTRACT Background: According to the American Cancer Society, breast cancer is the most common cancer diagnosed among women in the United States, except for skin cancers. Breast cancer is the second leading cause of cancer death in women, and it has recently been discovered that intracellular bacteria reside in breast cancer cells, having an impact on therapeutic responses. Photothermal therapy is an alternative approach for treating breast cancer, using materials that absorb light to generate heat. Silver is widely used as an antibacterial agent, and silver nanoparticles (AgNPs) have been shown to be advantageous for wound healing, yet they can also be designed to have photothermal properties. Previously, our lab developed AgNPs stabilized with biocompatible polymer chitosan. The resulting AgNPs had a triangle shape, with optical absorption in the infrared, which could generate heat upon exposure to infrared light. **Hypothesis:** We hypothesized that AgNPs stimulated with infrared light can induce heat to kill both infected and non-infected breast cancer cells. **Methods:** Triangular AgNPs containing strong absorption at 800 nm was synthesized by reducing silver ions in the presence of silver seeds. Breast cancer cell lines MDA-MB-231 and MCF7, and epithelial breast cell line MCF 10A were infected with *Pseudomonas aeruginosa* 27853. All infected and non-infected cell lines were incubated with different concentrations (0, 0.01 or 0.025 mg/mL) of AgNPs respectively. Cell lines in experimental groups were exposed to 5 W of 800 nm light for 36 seconds. Cellular response to photothermal ablation was measured using proliferation and clonogenics assays. **Results:** Infected/Non-infected breast cells incubated with AgNPs alone in the absence of infrared light exhibited no change in the number of cells or surviving colonies. Upon exposure to 800 nm light, cell and colony numbers decreased with increasing AgNPs concentration (and hence increased temperature). The temperature increases for 0, 0.01 or 0.025 mg/mL of AgNPs were 6 °C, 27 °C and 50 °C respectively. Infected breast cells formed more colonies than their non-infected cells with the treatment of 0.01 mg/mL of AgNPs and laser exposure for all three cell lines. For infected/non-infected MDA-MB-231, infected/non-infected MCF 10A and non-infected MCF7, 0.025 mg/mL AgNPs concentration with laser (5W, 800 nm, 36s) induced sufficient heat to cause nearly all cell death and no colony formation. A significant reduction in colony number was also observed for infected MCF7 under this condition. **Conclusions:** Triangular AgNPs have been demonstrated as an effective photothermal therapy against breast cancer cells upon exposure to infrared light. In this work, 0.025 mg/mL AgNPs concentration with laser (5W, 800 nm, 36s) generated sufficient heat, leading to the death of both infected and non-infected breast cells, though infected breast cells appeared to be more resistant to AgNPs-induced hyperthermia. No colony formation indicated that AgNPs-induced cellular damage is irreversible, indicating less potential for regrowth. These results highlight a new utility of AgNPs, while also corroborating that breast cancer cells with intracellular infection may be more resistant to anti-tumor therapies. Source of mentor's funding or other support that funded this research: The project described was supported by the Department of Plastic and Reconstructive Surgery.

64. The Impact of Postoperative Antibiotic Type & Duration After Implant Based Breast Reconstruction on Resistance Among Cultured Species

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ABSTRACT Background: There is a growing presence of literature within plastic surgery that establishes best practice for postoperative antibiotics after implant based breast reconstruction (IBBR), though it has not been widely adopted or translated into clinical practice. This study aims to determine how antibiotic type and duration affects patient outcomes. We hypothesize that IBBR patients who receive a longer duration of postoperative antibiotics will demonstrate higher rates of antibiotic resistance as compared to the institutional antibiogram. **Methods:** A retrospective chart review included patients that underwent IBBR between 2015 and 2020 at a single institution. Variables of interest included patient demographics, comorbidities, surgical techniques, infectious complications, and antibiograms. Groups were classified by antibiotic duration (≤ 7 days, 8-14 days, and >14 days) and by antibiotic type (Cephalexin, Clindamycin, or Trimethoprim/Sulfamethoxa-

zole (tmp/smx)). Results: There were a total of 70 patients who experienced infections included in this study. Onset of infection did not differ based on antibiotic type during either device implantation (post-expander $p=0.391$; post-implant $p=0.234$). Antibiotic duration and type did not have an established relationship with explantation rate, either ($p=0.154$). In patients that had Staph aureus isolated, there was significantly increased resistance to Clindamycin when compared to the institutional antibiogram, sensitivities of 43% and 68% respectively. Conclusions: Antibiotic duration nor type displayed a difference in overall patient outcomes, including explantation rates. In this cohort, S. Aureus strains isolated in association with IBBR infections demonstrated a higher level of resistance to Clindamycin compared to strains isolated and tested within the broader institution.

65. Perioperative Outcomes in Head & Neck Surgery Following ERAS Protocol Implementation

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Introduction: Enhanced recovery after surgery (ERAS) protocols are multimodal care pathways designed to improve recovery rates after surgery. The current study compares outcomes in patients undergoing head and neck free flap reconstruction prior to and after implementation of a free flap-specific ERAS protocol. Methods Chart review of head and neck cancer patients who underwent free flap reconstruction at a tertiary referral academic institution (2013-2021). Outcomes include complication rates, ED visits/hospital readmissions, all-cause mortality and length of stay. Fisher's Exact Test was used for all tests other than the ED visits/readmits (Wilcoxon Two-sample Test) and length of stay (two sample t-test). Results Thirty patient charts were reviewed (15 pre-protocol, 15 post-protocol). Sixty-seven percent of pre-protocol patients incurred non-wound related complications compared to 33% post-protocol ($p=0.14$). Sixty percent of pre-protocol patients experienced wound complications compared to 20% of post-protocol ($p=0.06$). Total complications were less for the post-protocol compared to the pre-protocol group (40% and 80% respectively, $p=0.06$). All-cause mortality within 6 months was 17% for pre-protocol group and 0% for post-protocol ($p>0.99$). There were 14 ED visits/readmissions in the pre-protocol group compared to 2 in the post-protocol group ($p=0.16$). Average length of stay was unchanged ($p=0.45$). Discussion Preliminary results show that ERAS protocol implementation does not significantly alter perioperative outcomes, however there is a trend toward less total complications ($p=0.06$) and wound related complications ($p=0.06$) post-protocol. Study power is currently limited by sample size however additional data collection is planned and should improve power to detect any such trends. Conclusion ERAS protocol implementation showed trends toward improved perioperative outcomes, although not statistically significant in this small cohort. These trends warrant further investigation

66. Assessing Flexion Gap Changes and Component Rotation Before and After PCL Resection with a Robotic-Assisted System for Total Knee Arthroplasty

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ABSTRACT Background: During a Total Knee Arthroplasty (TKA), the extension and flexion gap between the femur and the tibia are matched before the implant is placed to allow for proper leg kinematics and to prevent excessive device wear or instability. The extension gap is the distance from the distal femoral condyle to the proximal tibia and is measured when the knee is in full extension; this can be altered by removing bone from the distal femur and the tibia as well as soft tissue releases. The flexion gap is the distance between the posterior femoral condyle and the tibia when the knee is in 90 degrees of flexion; this distance can be altered by removing bone from the posterior femoral condyle and tibia, soft tissue releases, changing the posterior tibial slope, or resecting the PCL. During a TKA, the PCL can be retained or removed if a viable one remains pre-operatively. Previous literature demonstrated that removal of the PCL affected the flexion gap, but does not quantify the extent of this change, particularly with a robotic system and tensioner that allows for precise gap measurement. The purpose of this study is to determine the extent to which the PCL affects the flexion gap and component rotation. Hypothesis: Resection of the PCL will create a statistically significant change in the medial and lateral flexion gap during total knee arthroplasty measured by the MAKRO robotic system. Methods: Patients who underwent TKA with Dr. Langfitt were retrospectively analyzed for six different measurements: medial and lateral initial flexion gap, medial and lateral flexion gap before PCL resection, and medial and lateral flexion gap after PCL resection. The knee capsule was opened using the standard medial parapatellar approach. The ACL was resected. Pins were inserted into the femur

and tibia, and the MAKO system arrays were placed. Checkpoint and bone registration points were collected to match the points on the MAKO robot to the CT previously collected. The knee was placed in 90 degrees of flexion and predicted femoral and tibial cuts were input into the MAKO system. Using these inputs, the MAKO system measured medial and lateral flexion gap distances when varus and valgus strain was placed on the knee. Distal femur and tibial cuts were made, with care taken to avoid PCL fibers. The distal femoral and proximal tibial cuts were removed. The knee was then placed in 90 degrees of flexion, and a tensioner was placed between the femur and tibia. The medial and lateral flexion gaps were measured and collected. The PCL was resected with electrocautery, and the medial and lateral flexion gap measurements were again collected. The TKA was completed. Normally distributed variables were analyzed using paired T-tests. A Bonferroni correction was utilized, and a significance was set at .0083. Results: PCL resection produced significant medial flexion gap changes (.875 mm $p < .001$) and lateral flexion gap changes (.750 mm $p < .001$). Distal femur and tibial cuts also produced significant medial flexion gap changes (1.21mm $p < .001$) and lateral flexion gap changes (1.81mm $p < .001$). Conclusions: Resection of the PCL results in a significant change in the medial and lateral flexion gap. Secondly, tibial cuts result in an increase in the medial and lateral flexion gap.

67. Caging the Dogma: Surgical treatment of Pyoderma Gangrenosum is Effective with Careful, Multidisciplinary Medical Optimization

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Background: Pyoderma gangrenosum (PG) is an autoimmune neutrophilic dermatosis with debilitating sequela including wounds, incapacitating pain, and disability.¹ Until recently, PG wounds have been treated conservatively or with medical therapy only.² Many surgeons have heard the adage, “never operate on pyoderma gangrenosum,” due to the potential for pathergy, in which minor trauma or surgical insult leads to an inflammatory “snowball effect. This has been known to result in paradoxical and often rapid wound progression that is disproportional to the inciting event.¹⁻⁴ In this case series, we report our success in carefully timed surgical debridement and reconstruction of PG wounds, which has seldom been reported in the literature. Methods: We performed a retrospective review of consecutive patients presenting with PG wounds who were treated with medical therapy followed by surgical debridement and reconstruction over a 10-year period at Wake Forest Atrium Health. All patients who received surgical treatment were included. Patient and surgical characteristics as well as wound healing outcomes and complications were analyzed. Results: 3 patients underwent surgery during the review period for treatment of PG. 100% of patients were female with a mean age of 64. Mean duration of PG wounds were 1.6 years and all received high dose corticosteroid treatment. 1 of 3 was treated additionally with weekly methotrexate. All followed closely with dermatology and only proceeded to surgery after careful inter-team discussion regarding surgical candidacy and perceived clinical risk. Average wound size was 250 cm². Average skin graft take and total time to healing was 97% and 3.3 weeks, respectively. Average time to healing after skin graft placement was 1.3 weeks. One of three patients suffered a complication, requiring 3 total operations due to failed first stage of reconstruction with a dermal regeneration template. Two of three patients developed eventual venous stasis dermatitis resulting in separate wounds, but there were no cases of pathergy, donor site complication, or clinical worsening of pyoderma gangrenosum in our study. Follow up was on average 10.2 months. Conclusion: In this series of three consecutive patients with PG wounds treated with pharmacotherapy and surgery, we suggest that surgical reconstruction may be both safe and effective in treatment the treatment of PG. All subjects healed in two weeks or less after placement of a split-thickness skin graft. This challenges the widely-accepted dogma of non-surgical PG treatment. Keys to success in surgical reconstruction are medical treatment by a dermatologist, careful clinical response monitoring, objective data measurement including frequent wound examinations, and eventual medical clearance for surgery based on the individual patient response and inter-disciplinary discussion. High-powered studies are needed to develop this overlooked treatment modality, which may significantly lessen patient suffering and health care expenditures. References: 1. Hickman JG, Lazarus GS. Pyoderma gangrenosum: a reappraisal of associated systemic diseases. *Br J Dermatol.* 1980 Feb;102(2):235-7. 2. Moon JH, Huynh J. Pathergy in Neutrophilic Dermatoses. *N Engl J Med.* 2021 Jan 21;384(3):271. 3. Pompeo MQ. Pyoderma Gangrenosum: Recognition and Management. *Wounds.* 2016 Jan;28(1):7-13 4. Acharya N, Chattopadhyay A, Jain S. Rhupus With Pyoderma Gangrenosum Treated With Immunosuppression and Skin Grafting. *J Clin Rheumatol.* 2021 Aug 1;27

68. Methodologies of Reconstruction of the Anterior Skull Base

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Introduction: Anterior skull base defects range in size and complexity. Regardless of extent, skull base defects are recommended to undergo reconstruction to establish a barrier between the intracranial contents and the sinonasal cavity to prevent cerebrospinal fluid leak. The aim of this review is to describe the range of reconstruction techniques available for skull base reconstruction. **Methods:** A literature review of published data on reconstruction methods for anterior skull base defects was conducted. The reconstruction materials and surgical techniques used for skull base reconstruction are reviewed. **Results:** A range reconstructive methods exist for anterior skull base defects, including synthetic grafts that are amenable to small defects of the sella often associated with endoscopic endonasal surgery. Moderate size defects are commonly reconstructed with the nasoseptal flap, however a broad range of novel local flaps using nasal tissues exist to reconstruct defects in areas with poor nasal septal tissue, including the inferior turbinate flap, middle turbinate flap, turbinal flap, and septal flip flap. Large defects associated with large anterior skull base defects following craniofacial resection for malignant pathologies are best reconstructed with autologous free tissue flaps that provide vascularized muscle capable of sealing the intracranial vault, while preventing meningitis. **Conclusion:** Defects of the anterior cranial vault can be reconstructed with a broad range of reconstructive methods depending on the defect size and pathology associated with the defect.

70. Locoregional Behavior of Head and Neck Cutaneous Squamous Cell Carcinoma with Perineural Invasion of a Named Nerve

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Background: Aggressive cutaneous squamous cell carcinoma presents a challenging clinical scenario, particularly when it involves the head and neck (HNSCC). Anecdotally, there has been an observed tendency for HNSCC lesions to present with either named nerve perineural invasion (PNI) or lymphatic metastasis but not both. We aim to further review this pattern of locoregional involvement. Confirmation of such a finding has the potential to contribute to future research initiatives in refining subtypes of these malignancies. In doing so, additional workup and adjuvant therapy options for this patient population may be realized. **Method:** A retrospective chart review of all HNSCC patients treated with wide local excision within the Department of Otolaryngology-Head and Neck Surgery from 2012-2016 was performed with IRB approval. Inclusion required at least PNI or lymphatic invasion. **Results:** A total of 32 lesions met the inclusion criteria. A noteworthy difference in the behavior between subsites was realized. PNI was present in 14 facial lesions; seven of these had named nerve involvement. Of those with named nerve PNI, none had lymphovascular invasion or nodal metastasis on imaging or prophylactic neck dissection when performed. **Conclusions:** HNSCC that presents with named nerve involvement may have less likelihood towards nodal metastasis. Further longitudinal study in a larger population is needed to confirm this pattern of locoregional involvement.

71. Optimization and Validation of Utilizing Alginate-Based Casts to Model and Characterize the Physical Properties associated with Bioprinted Tissue Constructs

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Optimization and Validation of Utilizing Alginate-Based Casts to Model and Characterize the Physical Properties associated with Bioprinted Tissue Constructs Jake B. Miller^{1,2}, Mara Suleiman^{1,2}, Lori Byers^{1,2}, Joshua Bowlby^{1,2}, Alice Marchetti^{1,2}, Amish Asthana^{1,2}, Giuseppe Orlando^{1,2} 1. Wake Forest School of Medicine, Wake Forest Institute of Regen-

erative Medicine (WFIRM), 2. Department of Surgery, Wake Forest University, Winston-Salem, North Carolina The field of bioprinting has recently gained heightened attention as providing a promising technology that gives rise to achieving successful therapeutic outcomes where other methods have been met with limitations. However, bioprinting 3-Dimensional (3D), layered tissue constructs requires optimization of the appropriate size/shape of the desired construct, pressures to avoid shear stress, and the amount of bioink needed to sustain the printing process. To measure the behavior of the bioprinted products in response to terminal mechanical assays independent of the aforementioned factors, other models may be suitable. Therefore, I propose that an alginate cast, with the same compositions and crosslinkers of traditional bioink, may be used as a suitable alternative to bioprinting to extrapolate the results of assays aimed at modeling the physical properties of 3D bioprinted tissue constructs in vitro. The alginate casts have demonstrated their capacity to withstand the effects of both physiological and mechanical pressures, suspend 3D cell cultures, and respond to assays designed to measure physical characterization and cytocompatibility. The casts are cylindrical and composed of primarily 1.5% UltraPure Low Viscosity Monolaurate (UP LVM) and crosslinked with 100 mM calcium or 25 mM strontium. The cylinders occupy a volume of ~40 μ L with a diameter of 5 mm and height of 2 mm. Previous studies have validated the durability and strength of these biomaterials and highlighted the ability to encapsulate free HepG2 (a liver cancer cell line) cells, HepG2 spheroids, and human islets in the hydrogel. There are several aims and assays designed to assess the rheology of the alginate and evaluate the potentiality of modifying assays designed to measure the viability of 2-Dimensional, monolayer cell cultures to be utilized on 3D cell cultures cast in a 3D structure. The mechanical tests conducted determine the degree of permeability, effect of swelling, compressive strength, and implication of using different alginates/crosslinkers on the casts. To characterize the permeability of the constructs, the LVM alginate casts were crosslinked in either 100 mM calcium or 25 mM strontium and were either subjected to pre-incubation overnight at 37°C or not. The casts were then incubated with FITC-coupled lectins of differing molecular weights: 75 kDa, (Maackia Amurensis, MAL-1), 120 kDa, (Ricinus Communis Agglutinin I, RCA I), and 150 kDa, (Sambuca Nigra, SNA). All solutions contained two dilutions which reflected the lowest and highest values of the lectins' fluorescent range in μ g/mL. After a 48-h incubation on a mechanical rocker at 4°C in 2 mL of 0.9% saline and lectins, images were taken on a Leica Confocal microscope with and without washing in 0.9% saline. To test compression, an instron 5544 at a force of 0.01 N/s was also used to generate a Young's Modulus curve to calculate the elastic modulus of the casts in comparison to the compressive strength of the native pancreas (the site of human islets), which is 1500-2000 pascals. The elastic modulus of the casts provides insight to the potential tolerance of the bioprinted construct to physiological conditions such as vascularization. Swelling ratios will be calculated by comparing LVM casts with different bioink compositions: the 0.3% HA will be buffered in either 0.9% saline or in Hank's Balanced Salt Solution without calcium/magnesium (HBSS-/-). The percent change in the swelling ratio will be a ratiometric expression of swollen weight to dry weight (lyophilized form). The two different bioink compositions and two different crosslinkers be used and casts will be subjected to 1-day and 5-day incubations at 37°C in islet media to discern

swelling. To test cytocompatibility of spheroids encapsulated in a cast, the MultiTox-Fluor Multiplex cytotoxicity assay was used. Cell viability was assessed ratiometrically as Live: Dead HepG2 spheroids. The Multitox assay exploits the biological difference between live/dead cells in the capacity of live cells to integrate the dye GF-AFC and cleave AFC, whereas the dye bis-AAF-R110 can only be cleaved by the dead-cells to release R110. After optimizing the assay, the viability ratio of free HepG2 spheroids was comparable with HepG2 spheroids encapsulated in alginate. The results of the permeability test revealed that the highest degree of permeation was achieved by MAL-1, followed by RCA I. However, SNA was nearly entirely excluded from the cast due to the pore size exclusion of the cast. A pre-incubation overnight at 37°C increased the vulnerability of the alginate to permeation. The compression tests yielded Young's Modulus' that revealed each cast was only displaced marginally by a degree of a few millimeters at the average compressive strength of a human pancreas, indicating the mechanical stress of vascularization the constructs may withstand in vivo. Lastly, there was no statistically significant difference ($p < 0.001$) between the resulting viabilities of free HepG2 spheroids compared to HepG2 spheroids in cast obtained from the MultiTox. Thus, the advantages and the applications of using alginate-derived structures to model the characteristics of bioprinted scaffolds are elucidated. Future directions may involve the incorporation of biological compounds such as Extracellular Matrix (ECM). Other cell cultures such as Min6 will also be attempted to be encapsulated in LVM alginate. Further, efforts to model coaxial bioprinting using a tiered cast composed of Gelatin-Methacryloyl and alginate have been undertaken. Ultimately, this provides insight into the opportunities of using alginate casts to model therapeutic approaches. Giuseppe Orlando, M.D., Ph.D, MCF

72. Raman Spectroscopy analysis of DCD renal allograft urine for the identification of biomarkers of function

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Background: Due to the pathophysiology of donation after cardiac death (DCD) organ donation, 50% of DCD renal allografts will experience delayed graft function (DGF), defined as the need for dialysis within the first week post-transplant. The majority of DGF grafts will eventually resume 'normal' physiological activities, although some will fail. Hypothesis: It is hypothesized that Raman spectroscopy conducted on urine samples will identify molecular fingerprints specific to DGF versus non-DGF allografts. Methods: Twenty patients undergoing a DCD renal transplant were enrolled and stratified into DGF and non-DGF groups. Urine samples were collected before surgery (baseline) and on Days 1, 2, and 3, as well as monthly through the first year. The patients were followed for up to 12 months. Samples were analyzed with Raman spectroscopy. The primary endpoint was the identification of molecular signatures specific to DGF and non-DGF status. A secondary endpoint was the comparison of the above-mentioned signatures with Raman spectra of urine obtained from healthy individuals, stage 4 and 5 chronic kidney disease (CKD) patients, and finally with patients with urinary stones. Results: The urine molecular spectra of DGF and non-DGF patients differed immediately following the transplant (Day 1) and one month after the transplant. Moreover, the spectra of DGF and non-DGF patients were different from urine spectra from healthy individuals, as well as from CKD patients and patients with urolithiasis. Conclusions: Our preliminary data show that Raman spectroscopy can identify differences in the molecular composition of urine, depending on the functionality of the renal allograft, as early as day 1 posttransplant. In conjunction with clinical metrics, one-year, longitudinal analysis of the Raman spectra will be used to identify a fingerprint of viability and function that may help recognize grafts with preserved functional capacity at the time of procurement. Additionally, it could lead to the development of automated measurement technology for multiplexed biomarker detection with high throughput, sensitivity, and precision.

73. Development of a 3D Bioprinted Vascularized Thick Liver Construct

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*Purpose/Objectives: Establishing adequate vascularization to engineered tissues and organs is an everlasting challenge that needs to be solved. This study aims to produce technologies capable of creating a viable thick (>1 cm³) metabolic tissue that can be used to advance research on human physiology, fundamental biology, and medicine. *Methodologies: We designed a tissue construct with a gyroid-shaped architecture with interconnected channels, which allow for uniform flow and surface shear stress that adequately covers the entire inner surfaces of cell-laden tissue constructs. The tissue constructs with a surface dimension of 1x1x1 cm³ were produced with a digital light projection (DLP) printer using a cell-laden bioink combined with human hepatocytes, followed by coating the interconnected vascular channel walls with human endothelial cells (ECs). Finally, the tissue constructs were loaded into watertight flow chambers connected to a media reservoir for continuous perfusion until predetermined trial time points (10, 20, 30 days). *Results: The retrieved constructs retained their initial dimension, and the cells maintained a greater than 85% viability at all timepoints. Immunofluorescent staining confirmed Hepatocytes and ECs using their respective cell-specific antibodies (HNF4A/albumin and vWF, respectively). Endothelial cell layers covering the vascular lumen surrounded viable hepatocyte aggregates in the construct's interior, indicating EC function. In addition, hepatocytes within the printed constructs produced albumin and bilirubin levels comparable to that of humans, indicating the functionality of the liver construct. *Conclusion/Significance: We successfully developed thick, human vascularized liver tissue in an in vitro environment while maintaining metabolic functionality similar to the in vivo native cells throughout the 30 day survival period. The unique gyroid design concept applied to generate organ constructs enables the growth of de novo tissues as an in vitro physiologically relevant organ model.

74. Spare the Needle, Discharge the Child - Trending Post-Op Labs After Laparoscopic Common Bile Duct Exploration (LCBDE) in Pediatric Patients is Not Helpful

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Introduction Post-operative liver function tests (POST-LFTs) are often collected to assess the success of laparoscopic common bile duct exploration (LCBDE). Yet, uptrending POST-LFTs often lead to additional testing and longer stays despite clinical improvement. As the influence of ductal manipulation during LCBDE on POST-LFT trends remains unclear, the utility of POST-LFTs is worth investigating because additional lab draws increase length of stay (LOS) and patient

distress. Our aim was to examine POST-LFT trends for patients undergoing successful laparoscopic cholecystectomy with LCBDE (LC+LCBDE) to determine whether a predictable POST-LFTs trend emerged. We hypothesized that POST-LFTs would not consistently downtrend. Methods A retrospective analysis of all patients undergoing LC+LCBDE at a single children's hospital was conducted. Successful LC+LCBDE was defined as common duct clearance on fluoroscopy without the need for subsequent ERCP. POST-LFTs were classified as increased or decreased from PRE values with Wilcoxon signed-rank testing to assess for differences between PRE and POST-LFTs. Post-op LOS between successful LC+LCBDE with and without POST-LFTs was also compared. Results Thirty-nine patients underwent LC+LCBDE over 4 years, with 25 complete records. In patients who underwent successful LCBDE, there was no significant difference between PRE and POST-LFTs for total bilirubin, AST, ALT, or Alk Phos. Among successful LCBDE cases with post-op LFTs, the following lab parameters (T. Bili, AST, ALT, Alk Phos) increased in 32%, 40%, 40%, and 32% of patients respectively. Post-op LOS was shorter in patients with no POST-LFTs (16hrs vs 26 hrs, $p=0.03$). Conclusion POST-LFTs after successful pediatric LC+LCBDE do not consistently downtrend. Intraoperative surgical judgment and the patient's post-op status may be better criteria for discharge. While further research is necessary, it appears safe to discharge pediatric patients without post-op LFTs after a clinically successful LC+LCBDE.

75. Effect of Peri-operative Anticoagulation in Total Knee Arthroplasty- Does it Increase Likelihood of Early Post-operative Arthrofibrosis?

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Introduction: Total knee arthroplasty (TKA) is one of the most common surgical interventions for the arthritic knee. Arthrofibrosis is a well-established post-operative complication following TKA, which due to resultant pain or impaired range of motion may require manipulation under anesthesia (MUA). Few studies have examined the relationship between anticoagulation and the development of postoperative stiffness requiring MUA. We hypothesized that patients who received anticoagulation other than aspirin (warfarin, enoxaparin sodium, apixaban, rivaroxaban) following surgery may have an increased risk for development of arthrofibrosis requiring MUA secondary to increased swelling, hemarthrosis formation, or inability to utilize non-steroidal anti-inflammatory drugs (NSAIDs) in the postoperative period. Materials and Methods: A retrospective chart review of patients who underwent surgical management of early arthrofibrosis following total knee arthroplasty at a tertiary care center from 2013-2020 was performed on patients undergoing MUA after a primary or revision TKA met inclusion criteria. A total of 310 patients were included in this study. Exclusion criteria included manipulations completed greater than 18 weeks after TKA and patients with incomplete clinical or radiologic records. Patient demographics, surgical information, perioperative anticoagulation status, and time to MUA were extracted for analysis. Results: 310 patients in the final sample group who underwent TKA were identified, 165 of which underwent subsequent MUA. This group was matched based on similar age, gender, risk factors, and ASA use to a control group of 145 patients who did not undergo MUA. Using logistic regression modeling, a comparison between control-matched groups for patients who received alternative anticoagulation therapy and those who received ASA only demonstrated the difference in the incidence of MUA was not statistically significant ($p=0.5416$). Conclusion: This study shows no statistical significance in MUA rate between patients receiving ASA alone or alternative anticoagulation in the TKA post-op period. Therefore, perioperative anticoagulation has a limited effect as a causation factor for MUA. Further biologic studies on the complex development of MUA may help to elucidate relevant risk factors.

76. Effect of Postoperative Thromboprophylaxis after Total Knee Arthroplasty: Likelihood of Arthrofibrosis in Patients on Aspirin and non-Aspirin Blood Thinners

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Introduction: Total knee arthroplasty (TKA) is one of the most common surgical interventions for the arthritic knee. Arthrofibrosis is a well-established postoperative complication following TKA, resulting in poor patient-reported outcomes and often impaired range of motion requiring manipulation under anesthesia (MUA). Current literature on thromboprophylaxis following anterior cruciate ligament reconstruction reported an association with postoperative arthrofibrosis. Few studies

have examined the relationship between specific anticoagulant agents and the risk of arthrofibrosis after TKA. Choice of thromboprophylaxis after TKA entails a wide arsenal of anticoagulants and antiplatelets consisting of aspirin, warfarin, heparin, fondaparinux, and Direct oral anticoagulants (DOACs). This study hypothesizes that patients on non-aspirin blood thinners such as warfarin, heparin, fondaparinux, and Direct oral anticoagulants (DOACs) following TKA will have an increased risk for the development of arthrofibrosis requiring MUA. Methods: A retrospective chart review of patients who underwent surgical management of arthrofibrosis following TKA at a tertiary care center from 2013-2020 was performed. Inclusion criteria included patients who developed arthrofibrosis after a primary or revision TKA. These patients were then filtered into those who required MUA and those who did not. Exclusion criteria consisted of patients having a MUA greater than 18 weeks after the TKA surgery as well as patients with incomplete clinical or radiologic chart records. Patient demographics, surgical information, postoperative anticoagulation status, and time to MUA were extracted for analysis. Using logistic regression modeling, a comparison was made between control-matched groups for patients who received only aspirin and for patients who received alternative blood thinners. Results: 310 total patients meeting the criteria were identified who developed arthrofibrosis after primary or revision TKA. 165 of these patients underwent subsequent MUA prior to 18 weeks after TKA. This group was matched based on similar age, gender, risk factors, and aspirin use to a control group of 145 patients who did not undergo MUA. The final study groups were: 240 on aspirin alone, 70 in the alternative anticoagulation. Statistical analysis demonstrated that in the group of patients who developed arthrofibrosis and received alternative anticoagulants, 40/70 (57.14%) required a MUA. Of the aspirin-only group that developed arthrofibrosis, 125/240 (52.08%) required a MUA, as seen in Table 1. This difference was not statistically significant ($p=0.5416$). Conclusion: This study shows no difference in developing arthrofibrosis that requires MUA between patients receiving aspirin alone or alternative blood thinners in the TKA postoperative period. Our results demonstrate that the specific agent of choice for thromboprophylaxis has a limited effect as a causation factor for arthrofibrosis requiring MUA after TKA. Further biologic studies on the complex development of MUA may help to elucidate relevant risk factors.

77. Preoperative Activity Status Predicts Postoperative Head and Neck Wound Complications

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Introduction: Preoperative functional activity status (PFAS) is a key component of frailty, a known risk factor for postoperative complications. The association between PFAS and incidence of postoperative wound complications, however, has not been well described in head and neck (H&N) literature. The current study investigates if PFAS as measured by metabolic equivalents (METs) impacts wound complication incidence after H&N cancer surgery. **Methods:** IRB-approved, retrospective review of patients from 2014-20 who underwent resection of non-esophageal, aerodigestive tract Squamous Cell Carcinoma at a single tertiary care center. A standardized MET calculation questionnaire was utilized. METs measure energy cost of activities compared to basal metabolic rate. One (1) MET equates to energy used when sitting. Ten (10) METs correspond to energy used with vigorous activity. Patients were divided into 3 MET groups: 7-10 (Group 1), 5-6 (Group 2), or 1-4 (Group 3). Chart-documented wound complications included flap failure, dehiscence, infection, incisional breakdown, hematoma, and chyle leak. Wound complication incidences were compared to discern if low (<4) MET subgroup patients developed more complications than higher MET subgroup patients. Statistical analysis was done via Welch t-test. A p value <0.05 comprised statistical significance. **Results:** Out of 233 patients, 46 (19.7%) had <4 METs (Group 3), 145 (62.2%) had 5-6 (Group 2), and 42 (18%) had >7 METs (Group 1). Wound complications occurred in 24.4% of patients. Of these, 12.2% were in Group 1, 66.6% in Group 2, and 21.0% in Group 3. Group 1 (METs >7) patients had a significantly lower wound complication incidence compared to Group 2 or 3 ($p=0.02$). The difference remained significant after adjusting for tobacco or alcohol use, preoperative albumin, and prior chemoradiation. **Conclusion:** Patients with high PFAS (METs >7) had significantly lower incidence of postoperative wound complications compared to patients with METs <7 after adjusting for common risk factors. Functional status, defined by METs, may predict wound complications after H&N cancer surgery.

78. Radially Expanding Trocars: A Possible Alternative to Standard Trocars

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Introduction: Access to the abdominal cavity during laparoscopic surgery carries a risk of inadvertent injury to intra-abdominal organs and vascular structures, which can be life-threatening. Postoperatively, port-site complications due to port and fascial defect size may arise such as wound infection, herniation of small bowel, entrapment of the omentum, and bleeding. Conventional trocar systems use sharp pyramidal blades to cut through layers of the abdominal wall. As an alternative to conventional trocars, radially expanding trocar devices, such as The XPAN Universal Trocar System, are emerging. This instrument is designed to decrease the fascial defect incurred from trocar insertion with gradual dilation functioning as a STEP system with 3 millimeter, 5 millimeter, and 12 millimeter sized increments. Our aim is to compare fascial defect size between the XPAN device and conventional cutting trocar in the abdominal walls of porcine cadavers. **Methods:** Three incisions were made on both sides of the abdominal wall. For conventional cutting trocars, a 5mm, 12mm, and 5 to 12mm STEP were inserted into each incision. The XPAN system requires an initial insertion of a 3mm trocar. After insertion of separate 3mm cannulas into each incision, a 5mm, 12mm, and 5 to 12mm STEP system were inserted. The devices remained in place for five minutes. Both abdominal walls were excised and secured to a square frame by springs. The innermost layer of peritoneal fat was dissected to expose the fascial layer. A taper gauge was inserted into the trocar pathway to measure the area of inner and outer fascial defect and a ruler was used to measure visible fascial defect length and width. **Results:** Pilot data collected from our cohort of animals (n=3) demonstrates the following results. The median values (IQR) for the XPAN 5mm, 12mm, and 5 to 12mm STEP system for the outer areas were 7.5 mm² (IQR 7.45-8 mm²), 13.1 mm² (IQR 12.65-13.7 mm²), 14 mm² (IQR 11.6-13.3 mm²), inner area 6.3 mm² (IQR 6.1- 6.25 mm²), 11 mm² (10.55-11.3 mm²), 11.5 mm²(10.55-11.25 mm²), fascial defect length 9 mm (IQR 8-9.5 mm), 12 mm (IQR 11-13.5 mm), 14 mm (IQR 12-14.5 mm), and fascial defect width 6 mm (IQR 5.5-6.5 mm), 12 mm (IQR 8.5-13 mm), 11 mm (IQR 9.5-15.5 mm) respectively. The median values for conventional cutting trocars were measured for outer area 9mm² (IQR 8.8-9.05 mm²), 14.4 mm² (IQR 13.65-14.35 mm²), 15 mm² (IQR 14.85-15.25 mm²), inner area 6.3 mm² (IQR 6.15-6.3 mm²), 12.6 mm² (IQR 12.55-12.65 mm²), 13 mm²(IQR 12.75-14.25 mm²), fascial defect length 9 mm (IQR 7-9 mm), 16 mm (IQR 13.5-18 mm), 21 mm (IQR 17-23 mm) and fascial defect width 6 mm (IQR 4.5-6.5 mm), 12 mm (IQR 9.5-13 mm), 21 mm(IQR 17-23 mm), respectively. Mann-Whitney U test for nonparametric data was conducted demonstrating no statistically significant difference between the radially expanding trocars and the conventional pyramidal trocars for outer and inner area at the 5mm, 12mm, and STEP port sites (p=0.081 and 1.0; p=0.19 and 0.081; and p=0.081 and 0.077 respectively). Likewise, there was no significant statistical significance for fascial defect length and width between the conventional trocars and XPAN trocars at 5mm, 12mm, and STEP port sites (p=0.64 and 0.82; p=0.38 and 0.82; and p=0.66 and 1.0, respectively). **Conclusions:** Our pilot data suggests that when utilizing radially expanding trocars to obtain abdominal access, radially expanding trocars generate a similar traumatic defect to the traditional pyramidal trocars. Given these findings and the small sample size, radially expanding trocars deserve further investigation to determine viability as an alternative for minimizing abdominal wall disruption after laparoscopic surgery and reduce the incidence of port site complications.

79. Probiotics: the future antibiotics

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Background: Staphylococcus aureus biofilm infections are devastating for an innumerable number of patients, especially those with pernicious implantable material infections. For instance, infection remains the most frequently given reason for surgical readmission following breast implant surgery, and S. aureus has been found to be the most common culprit. Current treatment options, such as antibiotics and surgical revision do not prevent biofilm development. Probiotic bacteria, such as lactobacillus species, provide a new option for inhibiting pathogenic biofilms on implant materials. Although probiotics are considered advantageous and non-toxic, as a live organism they may still pose risks, such as inducing a host immune response. However, the biosurfactants produced by probiotic bacteria may be equally advantageous. **Methods:** The ability of probiotics and probiotic biosurfactants to prevent the development of S. aureus was quantified via zone of inhibition assays. Xen40, a methicillin-sensitive S. aureus strain derived from osteomyelitis isolate was used to develop pathogenic biofilms. Probiotic biofilms of L. rhamnosus, L. plantarum, L. paracasei, or L. lactis were developed on 5 mm punch biopsies of Cortiva, an acellular dermal matrix commonly used in breast reconstruction surgeries. Alternatively, the biosurfactants from each strain were evaluated against Xen 40 at concentrations from 0-181 mg/mL. The antibiotic ciprofloxacin was used as a positive control, and the results were further quantified using colony forming units to enumerate Xen 40 following exposure, and crystal violet assays to measure biomass inhibition. **Results:** Probiotic biofilms were easily produced on the Cortiva implant material. The zones of inhibition created by the probiotic biofilms L. rhamnosus and L. paracasei were comparable to that created by 2 µg/mL of ciprofloxacin, and L. plantarum biofilms created a significantly greater zone of inhibition than 2 µg/mL of ciprofloxacin. The biosurfactants derived from L. rhamnosus, L. plantarum, L. paracasei, and L. lactis each demonstrated significant antimicrobial ability, decreasing biofilm biomass by an average of

43% at 22.72 mg/mL and 84% at 181 mg/mL. Conclusions: Probiotic bacteria and probiotic biosurfactants can inhibit the development of *S. aureus* biofilms on the implantable acellular dermal matrix, Cortiva, and should be further explored as a potential suitable alternative to conventional antibiotics.

80. ERCP FINDINGS PROVIDE FURTHER JUSTIFICATION FOR A SURGERY FIRST MINDSET IN PEDIATRIC CHOLEDOCHOLITHIASIS

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Introduction: Endoscopic retrograde cholangiopancreatography (ERCP) first pathway is heavily favored in the management of choledocholithiasis for pediatric patients, despite often requiring two separate general anesthetics. In contrast, a single-stage, “surgery first” approach consisting of LC with cholangiogram and possible laparoscopic common bile duct exploration (LCBDE) has a shorter length of stay with an equivalent safety profile. However, it is unclear what proportion of pediatric patients undergoing initial ERCP have endoscopic evidence of obstructions that would be amenable to clearance with LCBDE. We hypothesized the majority of patients who obtained an ERCP before LC would have been candidates for and benefited from initial LCBDE for choledocholithiasis during LC. **Methods:** A retrospective review of all patients under the age of 18 at a single children’s hospital who underwent ERCP before LC over a 10 year period was conducted. Twenty-six patients underwent ERCP before LC, with 1 patient excluded due to a failed ERCP attempt. Demographic and endoscopic data were analyzed, including ERCP indications, presence of stones or sludge, stone size and number, and stent placement. Based on accepted criteria, stone size was categorized as small (0-4 mm), medium (5-7 mm), or large (≥ 8 mm). Findings considered amenable to LCBDE included the presence of no return, sludge, or stones less than 8 mm on ERCP. **Results:** Of the twenty-five ERCPs analyzed, 10 (40%) had sludge only, 3 (12%) had sludge and stones removed, 9 (36%) had only stones removed, and 3 (12%) had no evidence of stones or sludge. In the 12 patients with stones removed, 3 (25%) had small stones, 4 (33%) had medium stones, and 3 (25%) had large stones; stone size was not specified in 2 patients. Twelve patients had choledocholithiasis with cholelithiasis (48%), making it the most common primary indication for ERCP, followed by primary choledocholithiasis (24%), gallstone pancreatitis (16%), cholecystitis (8%), and concomitant choledocholithiasis with cholecystitis (4%). Of all patients who underwent ERCP, 80% had either findings of sludge, stones amenable to LCBDE maneuvers, or no return of material after balloon sweeps. **Conclusion:** Our findings suggest that a large majority (80%) of pediatric patients who underwent preoperative ERCP had obstructions that are amenable to LCBDE. Implementing surgery first management for suspected choledocholithiasis can offer an efficient pathway to the more established ERCP first strategy. Renewed efforts are needed to promote LCBDE implementation during LC and disseminate practical training to pediatric surgeons.

81. Continuity of Care in Surgical Resident Education: A Model in Otolaryngology-Head and Neck Surgery Residency

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Background: Continuity of care (CoC) is important for both resident education and patient care. A low percentage of residents who assist in a patient’s operation also evaluate the patient either pre- or post-operatively. We present a model in which a primarily resident-run otolaryngology- head and neck surgery (OHNS) clinic addresses the lack of CoC in OHNS residency training. **Methods:** This study analyzed retrospectively collected data of new patients presenting for OHNS care through the resident-run clinic at an academic medical center from 2013-2020. Patient demographic data, visit diagnosis codes, and procedure codes were examined. The resident involved in pre-operative, operative, and post-operative phases of care was recorded, and perioperative CoC was analyzed. **Results:** In this CoC clinic, a resident is responsible for all aspects of a patient’s outpatient, operative, and inpatient care in collaboration with a supervising attending surgeon. Of 1,631 new patients in this clinic, diagnosis codes were representative of outpatient clinical OHNS. Some form of perioperative CoC was found in 98.6% of surgical cases while complete CoC was established in 75.7% of cases. **Conclusion:** The proposed resident CoC clinic is a successful model to address lack of CoC in resident education. Patient diagnoses

encountered in this clinic span the OHNS spectrum of care.

82. Pregnancy Outcomes Comparing First Trimester High-Vaginal Cerclage with Abdominal Cerclage

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Background: Cervical Insufficiency can be diagnosed in patients with a history of painless cervical dilation and recurrent second trimester pregnancy loss (history indicated), following asymptomatic cervical shortening on transvaginal screening ultrasound (ultrasound indicated), or based on physical exam findings of painless dilation (exam indicated).⁷ Cervical cerclage placement is typically indicated in each of these scenarios. Studies have shown cerclage placement is associated with significant decreases in preterm birth outcomes and improvements in neonatal morbidity and mortality. The standard transvaginal cerclage methods currently used include modifications of the McDonald and Shirodkar techniques. Transabdominal approach is generally reserved for women with previous failed vaginal approach, with extremely short cervixes, anatomically deformed cervix, deeply lacerated, or severely scarred from previous failed vaginal cerclage.⁴ The transabdominal cerclage can be placed early in the first trimester or non-pregnant state and the stitch can be left in place between pregnancies with subsequent c section.⁷ The high-vaginal cervical cerclage technique developed at our institution aims to obtain a cervical cerclage placement level like the abdominal cerclage. However, pregnancy outcomes of women undergoing abdominal versus high-vaginal cerclage have not been examined. **Hypothesis:** Women who underwent first-trimester high-vaginal cerclage placement will have similar pregnancy outcomes when compared to women who underwent pre-pregnancy laparoscopic abdominal cerclage placement. **Methods:** A single institution retrospective cohort of women who underwent abdominal cerclage or high-vaginal cerclage between March 1, 2017 to March 30, 2022. The primary outcome was spontaneous preterm delivery (SPTD) < 37 0/7 weeks of gestation. Secondary outcomes were SPTD < 34 0/7 and a composite of adverse perinatal outcomes. Data collected included maternal demographic characteristics, clinical and delivery data, and neonatal outcomes. **Results:** A total of 20 cases were identified, two twin gestations were excluded. A total of 9 underwent pre-pregnancy abdominal cerclage (group 1) and 9 had first trimester cervico-isthmus vaginal cerclage (group 2). SPTB occurred in 2 patients (22.2%) in group 1 and in 3 (33.3%) in group 2 ($p = .27$). One patient in group 1 had SPTB < 32 0/7 weeks compared with no patients in group 2. Maternal demographic characteristics were not significantly different between the 2 groups. Gestational age at delivery was similar between the groups (Table 1). All patients in both groups were delivered by cesarean. **Conclusions:** High-vaginal cervical cerclage had no significant statistical difference in pregnancy outcomes when compared to abdominal cerclage at our institution. High-vaginal cerclage is a comparable alternative to abdominal cerclage for pregnant women who would otherwise undergo abdominal cerclage and this technique avoids complications associated with an abdominal procedure during pregnancy.

83. Sex Differences in Middle Cerebral Artery Hemodynamics but not Systemic Arterial Stiffness in Normotensive Adult Rats

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Background: Cerebrovascular disease (CVD) is a major risk factor for the development of cognitive impairment. Postmenopausal women are more likely to suffer from CVD and have a greater risk of developing Alzheimer disease and dementia. However the mechanisms underlying greater susceptibility of women to cognitive impairment are not well understood. Previous results from our group indicate sex differences in estrogen receptor-dependent vasodilation of the middle cerebral artery (MCA) in adult rats. In this study we determined whether sex differences in MCA reactivity are associated with hemodynamic changes in cerebral arteries or systemic circulation supplying blood to the brain. **Methods:** High frequency ultrasound was used to determine the pulsatility (PI) and resistance indexes (RI) of left MCA (LMCA) and intracranial internal carotid artery (LICA) in 25-week-old male and female Sprague-Dawley (SD) rats. Rats were anesthetized and placed on a heated platform. Images were obtained using a LZ250 transducer and Vevo LAZR device. The LMCA and LICA were visualized by directing the transducer through the rat temporal foramen. Peak systolic flow (Vs), end-diastolic flow (Vd), and mean flow (Vmean) were determined by pulsed wave Doppler mode. PI and RI were calculated as follows: $PI = (Vs - Vd) / V_{mean}$, $RI = (Vs - Vd) / Vs$. In addition, the pulse wave velocity (PWV) of the thoracic aorta (Ao) and left common carotid

artery (LCCA) were determined as a measure of vascular stiffness. The paraffin-embedded sections of LMCA were stained for cyclooxygenase 2 (COX-2), endothelial nitric oxide synthase (eNOS), and collagen deposition (Masson's trichrome). Results: Female rats had lower body weight (BW) compared with males (317.7 ± 8.8 vs. 601.7 ± 29.9 g, $p < 0.05$; $n = 3-7$). Female rats had greater organ weight/BW versus males for brain (0.658 ± 0.012 vs. 0.405 ± 0.014 g/100 g BW), heart (0.658 ± 0.012 vs. 0.301 ± 0.035 g/100 g BW), and kidneys (0.658 ± 0.0079 vs. 0.316 ± 0.0071 g/100 g BW) ($p < 0.05$; $n = 3-7$). There was no difference in systolic - or diastolic blood pressures between sexes, however heart rate was lower in the female rats (340.4 ± 6.8 vs. 422.6 ± 9.8 bpm, $p < 0.05$). LMCA PI and RI were lower in the female compared to male SD rats (PI: 0.745 ± 0.14 vs 1.40 ± 0.27 , $p = 0.057$ and RI: 0.477 ± 0.060 vs. 0.696 ± 0.046 , $p = 0.087$; $n = 3-7$). In contrast, there were no differences in LICA resistance between females and males ($p > 0.05$; $n = 3-7$). COX-2 and eNOS immunoreactivities tended to increase in LMCA of females compared to males (COX-2: 2.06 ± 1.7 vs. 0.333 ± 0.20 , and e-NOS: 7.25 ± 2.2 vs. 1.19 ± 0.56 ; $n = 3-5$). Collagen deposition was similar in LMCA of females compared to males. There were no sex differences in the PWV of LCCA or thoracic aorta. Conclusions: Our results demonstrate sex differences in vascular reactivity and resistance of LMCA with greater expression of COX-2 and eNOS - markers important for vasodilation and maintenance of vascular tone. However, no differences in systemic arterial stiffness were found in the studied rat cohort. Our future studies will focus on older female rats to investigate age and sex effects on cerebrovascular reactivity, cerebral blood flow, and cognitive function.

84. Early Outcomes with Early Weightbearing Utilizing Willits Protocol Following Haglund's Surgery: A Retrospective Review

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Background: Insertional Achilles tendinopathy with Haglund's deformity is a commonly treated condition by foot and ankle surgeons. Literature has been published showing good outcomes following detachment and reattachment of the Achilles with resection of the bone. However, postoperative protocol is variable and has not been well researched. Our purpose is to retrospectively review early mobilization with the Willits protocol following insertional Achilles tendinopathy surgery. Methods: A retrospective chart review was conducted of 24 patients with 28 feet who underwent surgical treatment for insertional Achilles tendinopathy with Haglund's deformity by two foot and ankle surgeons. Following surgery, Willits protocol was initiated for early mobilization. Results: The patients had an average decrease in pain from 6.2 to 1.5 on an 10 point scale postoperatively. There was one postoperative rupture (3.6%) after a trauma. Three patients (10.7%) required reoperation: one debridement for postoperative infection, one achilles rupture after a fall requiring a flexor hallucis longus transfer and v to y lengthening, and one gastrocnemius recession for calf tightness. Conclusion: The Willits protocol, though initially created for Achilles tendon ruptures, provides an early mobilization protocol for patients after insertional Achilles tendinopathy procedures. Our study found low reoperation rate and improved pain level while allowing patients to mobilize earlier than previously reported in literature.

85. Retrospective Comparison of Isolated Haglund's Deformity Surgery versus Combined with Gastrocnemius Recession

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Background: Insertional Achilles tendonitis is a common pathology treated by foot and ankle surgeons that may require surgical intervention. Literature has shown good outcomes following detachment and reattachment of the Achilles for removal of the exostosis. However, there is minimal literature showing the impacts of adding a gastrocnemius recession to the Haglund's surgery. Our goal of the study is to retrospectively review the outcomes of an isolated Haglund's surgery versus a Haglund's surgery combined with a Gastrocnemius recession. Methods: A retrospective chart review of 54 operative extremities were analyzed, 29 with isolated Haglund's surgery and 25 with a Strayer gastrocnemius recession. Results: We found similar decreases in pain between the two groups, 6.1 to 1.5 and 6.8 to 1.8 in the isolated Haglund's and Stray-

ers group respectively. We found decreased postoperative Achilles rupture and reoperation rates in the Strayer group but this did not reach statistical significance. We found a statistically significant decreased rate of wound healing complications in the Strayer group, 4% in the Strayer group and 24.1% in the isolated procedure. Conclusion: All in all, adding a Strayer to a Haglund's surgery decreased wound healing complications, rupture rates, and reoperation rates. We recommend future randomized controlled studies to compare the use of a Strayer procedure on postoperative complications.

86. Oncologic Outcomes: Intravesical Gemcitabine/Docetaxel is a Feasible Alternative for Management of High-Risk Non-Muscle Invasive Bladder Cancer

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Introduction and Background: There continues to be an international shortage of intravesical Bacillus Calmette-Guérin (BCG), the first-line therapy for high-risk non-muscle invasive bladder cancer (HR NMIBC). No alternative treatments have yet been approved. In response to this, our institution employed sequential intravesical (IV) chemotherapy of gemcitabine and docetaxel (Gem-Doce). Here, we aim to define oncologic outcomes in patients receiving IV Gem-Doce to evaluate the efficacy in management of HR NMIBC. **Methods and Materials:** We conducted a retrospective cohort study of patients with HR NMIBC that received IV Gem-Doce as first-line or salvage therapy at our institution. Metrics included prior BCG status, tumor pathology, and recurrence status. BCG-unresponsive was defined as persistent disease after 6 months of BCG or progression at 3 months or relapse within 6 months of treatment. The primary outcome was recurrence-free survival (RFS). **Groups compared:** BCG-naïve versus BCG-unresponsive patients, patients with CIS present versus no CIS, and patients with multifocal versus non-multifocal disease. We performed a Kaplan-Meier survival analysis to determine RFS at 6, 12, and 18-months. **Results:** We identified 45 patients for analysis between 2020 and 2022. Pretreatment pathology was high-grade (HG) Ta (71%), CIS (24%) or HG T1 (20%). The patients were either BCG-naïve (67%) or BCG-unresponsive (33%) and a majority had multifocal disease (58%). Progression occurred in three patients (6.7%) and one patient died. Overall RFS at 6-, 12-, and 18-month was 81%, 61%, and 55% respectively. The BCG-naïve group had a 12-month RFS of 69% (95% CI 0.52-0.90) compared to BCG-unresponsive group at 54% (95% CI 0.29-1.0, $p = 0.97$). Patients with CIS had a higher 12-month RFS of 89% (95% CI 0.70 - 1.0) than those without CIS at 53% (95% CI 0.34 - 0.84, $p = 0.086$). Patients with non-multifocal disease had a 12-month RFS of 74% (95% CI 0.54 - 1.0) and those with multifocal disease were at 37% (95% CI 0.16 - 0.84, $p = 0.082$). **Conclusions:** Our data suggested that IV Gem-Doce is a feasible alternative to BCG for patients with HR NMIBC that are BCG-naïve, have CIS, or have non-multifocal disease. Additional studies are needed to evaluate predictors of response to IV Gem-Doce based on clinical and pathologic characteristics.

87. Opiate use is significantly lower in patients with interstitial cystitis/bladder pain syndrome following cystectomy with urinary diversion

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Introduction and Objective: Opiates are prescribed regularly for pain management in interstitial cystitis/bladder pain syndrome (IC/BPS) patients. The IC/BPS patient subgroup with end-stage disease, often characterized by a contracted and fibrotic bladder and significant discomfort, may elect to undergo cystectomy with urinary diversion (CWUD). Removal of the bladder should, theoretically, eliminate the primary source of pain in at least some patients and thus reduce or eliminate the need for narcotic medications. In an earlier study, we compared pre- and postoperative opioid use in IC/BPS patients who underwent CWUD (N=26) and found that, while not statistically significant, a trend towards decreased post-surgery opiate use was evident. In this study, we revisit this question in an expanded cohort. **Methods:** A retrospective cross-section analysis was completed on an Institutional Review Board (IRB00087367) approved database of IC/BPS patients that underwent CWUD between 2014 to 2022 at our institution. Hunner lesion (HL) status and bladder capacity (BC) were also charted. BC was defined as 'low' if ≤ 500 cc and non-low if > 500 cc. Opiate use in the form of morphine equivalents (ME) was tracked for each patient by cross-referencing them with the North Carolina Controlled Substances Reporting

System. Pre-CWUD was defined as 1 year before cystectomy up until date of surgery and post-CWUD was defined as 1 year after cystectomy. The first 30 postoperative days were excluded from total ME use to account for management of postoperative pain. Paired t-test was used to compare Δ ME for all parameters except age, where a Pearson's correlation analysis was used. Results: A total of 87 patients were included in the study analysis (18 men and 69 female), with a mean age at CWUD of 53.59 ($\pm$ 16.03) years. Mean bladder capacity was 353.3cc ($\pm$ 243.05). In the study, 65 patients had low BC, 12 were non-low BC, 29 patients were HL+, and 49 HL-. Two patients were excluded from analysis based on outlier opiate use. 58 ileal conduit diversions were performed, 11 neobladders, and 18 Indiana Pouches. Mean pre-CWUD ME use was 5774.19/year and post-CWUD 2866.86/year with a Δ ME of -2907. ($p < 0.001$). Change in ME was not significantly different based on gender ($p = 0.513$), BC ($p = 0.698$), age ($p = 0.705$), or HL ($p = 0.468$), nor with presence of HL within the low BC group ($p = 0.447$). Conclusions: Based on the assumption that IC/BPS patients use opiates primarily for pain relief, the significant decrease in opioid use following CWUD likely represents a corresponding significant reduction in pain and implicates the bladder as the primary source of that pain.

88. Chronic Central Serous Chorioretinopathy: Pathophysiology and a New Treatment Paradigm

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INTRODUCTION: Chronic Central Serous Chorioretinopathy (Chronic CSCR) encompasses an ill-defined cohort of patients with exudative maculopathies characterized by choroidal thickening (pachychoroid), choroidal hyperpermeability, and persistent macular exudation. This cohort shares many of the characteristics of Acute Central Serous Chorioretinopathy (Acute CSCR) which is caused by choroidal hyperpermeability. The natural history of Acute CSCR is favorable due to a high likelihood of spontaneous exudative resolution. However, patients with Chronic CSCR have persistent submacular exudation, retinal pigment epithelial (RPE) deterioration, and on occasions, subretinal neovascularization. The chronic exudation leads to progressive and irreversible photoreceptor damage and subsequent poor vision. We have found that the presence of choroidal neovascularization is largely responsible for the persistent exudation and that recognition of this angiogenic process in addition to choroidal hyperpermeability is critical for treatment success. **METHODS:** This study is a single center, retrospective review of 23 patients. Patient records with a referral diagnosis of Chronic CSCR and/or atypical Exudative ARMD during the years 2016 to 2021 were reviewed. Each patient had failed one or multiple monotherapeutic modalities. ICG and OCTA-directed half-fluence PDT Triple Therapy was performed on patients who failed monotherapeutic treatments and had persistent serous detachment of the macula, a thick choroid, ICG hyperfluorescence, IVFA leakage, and an OCTA that showed frank neovascularization or a "double layer" sign. The Triple Therapy consisted of an intravitreal injection of an anti-VEGF drug (ranibizumab, 0.5 mg per 0.05ml, Lucentis, Genentech or bevacizumab (Avastin, Genentech), 0.5 mg per 0.05 ml) on Day 0, followed by half-fluence PDT Visudyne (verteporfin, Bausch and Lomb) and Triescence (triamcinolone acetonide, 2 mg per 0.05 ml, Bausch and Lomb) 3-14 days later. The primary outcomes of this study are the proportion of eyes with complete reabsorption of subretinal fluid, change in central subfield thickness (CST), and visual acuity. Secondary outcomes include change in extrafoveal exudation (nCST), and duration of treatment effect. Patients were assessed at baseline and followed up every 8 weeks after combination therapy. **RESULTS:** 26 eyes from 23 patients with pachychoroid and macular exudation were evaluated. The mean age of this group was 62.3 years $\pm$ 11.8 with 14 (60.9%) males and 9 (39.1%) females. 19 (82.6%) were white and 4 (17.4%) were patients of color. 16 (61.5%) had never smoked, 6 (23.1%) had previously smoked and 4 (15.4%) were current smokers. The mean vision at baseline was 0.45 LogMar best corrected visual acuity (BCVA) $\pm$ 0.41. The central subfield thickness (CST) was 295.2 $\pm$ 133.5 microns. The choroidal thickness as measured by enhanced depth imaging (EDI) was 468.5 $\pm$ 146.2 microns. OCTA and ICG-directed Triple Therapy led to complete subretinal exudation resolution in 23/26 (88.5%) eyes. BVCA improved one line (0.11 LogMar $\pm$ 0.20) after treatment and was maintained at one year (0.11 LogMar $\pm$ 0.22). The CST improved by 107.4 $\pm$ 105.4 microns and paracentral retinal thickness decreased by 123.2 $\pm$ 83.5 microns. The time between treatments was 111.8 weeks $\pm$ 70.6 weeks. **CONCLUSION:** This study confirms the common occurrence of incomplete exudative resolution with monotherapeutic treatments for Chronic CSCR, and validates the efficacy of ICG and OCTA-Directed PDT Therapy. This study also shows the critical need for multimodality imaging and how each modality gives information necessary to correctly diagnose and treat this condition. The results indicate that many Chronic CSCR patients have two pathophysiological processes responsible for the persistent leakage: choroidal hyperpermeability and angiogenesis. The presence of the former necessitates the need for PDT and the latter, anti-VEGF therapy. A randomized study will be necessary to show that patients with simultaneous choroidal hyperpermeability and angiogenesis are treated more efficiently with combination therapy.

89. REFRAMING THE MANAGEMENT OF CHOLEDOCHOLITHIASIS: JUSTIFICATION FOR A SURGERY FIRST MINDSET

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Introduction: The endoscopic retrograde cholangiopancreatography (ERCP) first pathway for choledocholithiasis management is a two-procedure process consisting of ERCP followed by laparoscopic cholecystectomy (LC). In contrast, a single-stage approach consisting of LC with laparoscopic common bile duct exploration (LCBDE) has a shorter length of stay with an equivalent safety profile. Despite this, nationwide referral patterns heavily favor ERCP first. LCBDE as an initial approach in the management of choledocholithiasis may decrease the instances in which patients are unnecessarily exposed to two separate anesthetic events. Therefore, we reviewed the endoscopy reports of preoperative ERCPs in patients with a non-complicated presentation of choledocholithiasis at a large tertiary referral center to determine what proportion of patients may benefit from a surgery first approach. **Methods:** We retrospectively reviewed 71 patients over the age of 18 who underwent ERCP first at a single center over a 6 year study period. Demographic and endoscopic data were analyzed. Thirteen patients were excluded because of missing endoscopy data, a diagnosis of cholangitis, or due to poor surgical candidacy. Endoscopic information collected included ERCP indications, presence of stones and/or sludge, stent placement, stone size and number, and common bile duct diameter. Based on accepted criteria, stone size was categorized as small (0-4 mm), medium (5-7 mm), and large (≥ 8 mm). **Results:** Eleven (19%) patients who underwent ERCP prior to laparoscopic cholecystectomy had sludge only, 15 patients (26%) had sludge and stones, while 32 (55%) had stones only. Of those 47 patients with stones, 17 (36%) were small, 16 (34%) were medium, and 14 (30%) were large. Twenty-six patients (46%) had isolated choledocholithiasis, making it the most common primary indication for ERCP. This was followed by 22 (25%) with concomitant cholelithiasis and/or cholecystitis, gallstone pancreatitis 7 (12%), and isolated cholelithiasis or cholelithiasis 3 (5%). The diagnosis was made with ultrasound in 38 patients (65%), CT scan in 36 patients (63%), and via MRCP in 23 patients (40%). Twenty-one patients (36%) had multiple imaging modalities that included an MRCP. Stent placement was performed in 27 (39%) with the majority of these patients being biliary stents (85%). Of all patients who underwent ERCP, 76% of patients had findings of sludge and/or stones that might have been amenable to basic LCBDE maneuvers and would have benefited from a surgery first approach. **Conclusion:** Our findings suggest that the majority of patients who underwent preoperative ERCP for suspected choledocholithiasis had obstructions that are amenable to LCBDE. Implementing surgery first management for suspected choledocholithiasis can offer an efficient alternative to the more common pathway of ERCP followed by LC. Renewed efforts are needed to promote LCBDE implementation during LC and disseminate effective training to general surgeons.

90. Inpatients with Chronic Lower Extremity Wounds Often Present with Advanced Disease and Carry a High Risk of Lower Extremity Amputation

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Objectives Chronic lower extremity wounds are a significant cause for hospitalization and readmissions. With increasing prevalence of risk factors for peripheral arterial occlusive disease, the burden of lower extremity wounds continues to grow. Patients are often presenting to inpatient settings with advanced disease. In this study we evaluate outcomes of patients admitted to a large tertiary center who are managed by our limb preservation service (FLEX). **Methods** Patients referred to the inpatient FLEX service were included in the study. Admission data including WiFi stage, etiology of disease, ankle brachial index (ABI), and anthropometric data were collected. Limb-Specific outcomes were evaluated using multivariate regression models. **Results** 577 patients were included in FLEX. Mean age was 64 years, 37% were female, and 30% were of black race. 64% of patients were diabetic and 66% were current or former smokers. XX% of patients underwent a major or minor amputation. Mean ankle brachial index (ABI) of the cohort was 0.91 and mean toe pressure was 80.1 mmHg. 63% of patients presented with WiFi clinical stage 3 or 4 disease. 63% of patients presented with WiFi stage 3

disease at the time of evaluation by the FLEX service. 32% of patients underwent minor or major amputation during follow up. Increasing WiFi stage ($p < 0.0001$), hyperlipidemia (OR 3.1; 95% CI 1.55-6.22), Diabetes (OR 1.87; 95% CI 1.27-2.74), end stage renal disease (OR 2.26; 95% CI 1.28-3.99), hypertension (OR 1.69; 95% CI 1.17-2.43) and Hemoglobin A1c (OR 1.23; 95% CI 1.02-1.49) were associated with increased risk of lower extremity amputation. In multivariate models, WiFi stages 3 (infection, ischemia, and wound) were all significant predictors of limb loss. Conclusions Inpatients who are admitted with chronic lower extremity wounds often present with advanced peripheral arterial disease. Our study suggests that early consultation and multimodality therapy is needed to improve limb salvage rates.

91. ADAPTIVE BALLOON WEANING ALGORITHM WITH AUTOMATED REBOA FACILITATES PROXIMAL HOMEOSTASIS DURING REPERFUSION IN A SWINE HEMORRHAGIC SHOCK MODEL

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Introduction and Objectives: Restoration of distal blood flow is critical to successfully salvage patients with resuscitative endovascular balloon occlusion of the aorta (REBOA). Yet, ideal methods for REBOA deflation to restore flow and simultaneously avoid proximal hypotension, remain undefined. Adaptive balloon titration algorithms to guide deflation may prevent large hemodynamic fluctuations during weaning. We hypothesize that automated REBOA weaning can both augment proximal hemodynamics and avoid hypotension during resuscitation in a swine model of hemorrhagic shock. **Methods** Fifteen swine underwent 30% controlled hemorrhage followed by 30 minutes of zone 1 REBOA. Next, the REBOA was deflated with an automated syringe running an adaptive algorithm that prioritized proximal mean arterial blood pressure (pMAP) > 62.5 mmHg during transfusion of shed blood. Upon post-hoc analysis, animal pMAP responses (Hypertensive-HTN vs Normotensive-NORM) and the discovery of low volume distal flow during the intended complete REBOA allowed us to identify two distinct cohorts. The performance of the adaptive weaning algorithm was compared between the groups. **Results** The 2 cohorts (HTN, $n=5$ and NORM, $n=10$) differed in pMAP ($p=0.001$) and distal flow ($p=0.001$) during REBOA. During the wean phase, cohorts were similar in pMAP, time with carotid flow within 90% of baseline, and time above the pMAP threshold of 62.5 mmHg ($p=0.20$, $p=0.59$, $p=0.95$, respectively) despite the weaning algorithm permitting 14.5 mL/kg more distal aortic flow for the HTN cohort ($p=0.001$). **Conclusion** Automated REBOA weaning is feasible and maintains consistent hemodynamics across various physiologic profiles. Automated endovascular devices that can interpret and adapt to a range of hemodynamic physiology will soon facilitate precision resuscitation for patients requiring endovascular aortic occlusion. These findings highlight the need for adaptive control to overcome variability in hemodynamics and differences in resuscitation intensity across clinical contexts.

92. ERCP FINDINGS PROVIDE FURTHER JUSTIFICATION FOR A SURGERY FIRST MINDSET IN PEDIATRIC CHOLEDOCHOLITHIASIS

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Introduction: Endoscopic retrograde cholangiopancreatography (ERCP) first pathway is heavily favored in the management of choledocholithiasis for pediatric patients, despite often requiring two separate general anesthetics. In contrast, a single-stage, "surgery first", approach consisting of LC with cholangiogram and possible laparoscopic common bile duct exploration (LCBDE) has a shorter length of stay with an equivalent safety profile. However, it is unclear what proportion of pediatric patients undergoing initial ERCP have endoscopic evidence of obstructions that would be amenable to clearance with LCBDE. We hypothesized the majority of patients who obtained an ERCP before LC would have been candidates for and benefited from initial LCBDE for choledocholithiasis during LC. **Methods:** A retrospective review of all patients under the age of 18 at a single children's hospital who underwent ERCP before LC over a 10 year period was conducted. Twenty-six patients underwent ERCP before LC, with 1 patient excluded due to a failed ERCP attempt. Demographic and endoscopic data were analyzed, including ERCP indications, presence of stones or sludge, stone size and number, and

stent placement. Based on accepted criteria, stone size was categorized as small (0-4 mm), medium (5-7 mm), or large (≥ 8 mm). Findings considered amenable to LCBDE included the presence of no return, sludge, or stones less than 8 mm on ERCP. Results: Of the twenty-five ERCPs analyzed, 10 (40%) had sludge only, 3 (12%) had sludge and stones removed, 9 (36%) had only stones removed, and 3 (12%) had no evidence of stones or sludge. In the 12 patients with stones removed, 3 (25%) had small stones, 4 (33%) had medium stones, and 3 (25%) had large stones; stone size was not specified in 2 patients. Twelve patients had choledocholithiasis with cholelithiasis (48%), making it the most common primary indication for ERCP, followed by primary choledocholithiasis (24%), gallstone pancreatitis (16%), cholecystitis (8%), and concomitant choledocholithiasis with cholecystitis (4%). Of all patients who underwent ERCP, 80% had either findings of sludge, stones amenable to LCBDE maneuvers, or no return of material after balloon sweeps. Conclusion: Our findings suggest that a large majority (80%) of pediatric patients who underwent preoperative ERCP had obstructions that are amenable to LCBDE. Implementing surgery first management for suspected choledocholithiasis can offer an efficient pathway to the more established ERCP first strategy. Renewed efforts are needed to promote LCBDE implementation during LC and disseminate practical training to pediatric surgeons.

93. Single-cell multiomic analysis in renal transplantation

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Background: The challenge with single cell assays and tissue biopsies is the difficulty of getting a sample large enough to generate the required number of cells. This is because cells are more vulnerable when exposed to the cell lysis buffer due to the small size and will lead to reduced data quality. To solve this issue, we developed a single-nucleus isolation protocol that can work for very small samples such as human kidney biopsies. Hypothesis: It is hypothesized that single-cell transposase accessible chromatin using sequencing (scATAC-seq) assay and scRNA-seq conducted on biopsy samples will identify molecular fingerprints specific to DGF versus non-DGF allografts. Methods: In the context of the Double R Study (IRB00027118) - whereby multiomics data relative to recipients of DCD renal allograft are compared with living donor recipients to address critical pathophysiological, diagnostic and prognostic questions -, renal biopsy samples are collected at the time of admission for the transplant (baseline), one month after transplantation, and 12 months after transplantation. To determine feasibility, single-cell sequencing assay for transposase-accessible chromatin (scATAC-seq) was applied on the renal allograft specimen of a living donor recipient. Results: We were able to obtain a total of 300k-500k high quality nuclei from the tissue sample. After several washes and filtration, the number of nuclei appeared suitable for our scRNA/ATAC-seq co-profiling assay. Pilot results indicated that scRNA-seq library had an average insertion of 400-500 bp and scATAC-seq library exhibited chromatin structure periodicity as expected. Conclusions: Single-cell sequencing assay for transposase-accessible chromatin (scATAC-seq) can be successfully applied to small (<5mm) renal biopsy samples to generate precious data on the regulatory landscapes of single cells. In the future, we will apply it on all biopsy samples of the Double RR study and the generated data will be matched with urine Raman spectroscopy data, peripheral blood bulk RNAseq data, and clinical outcome data.

94. Personalized Immunocompetent Tumor-on-a-Chip Platform Produces Tumor-Reactive Cytotoxic Lymphocytes

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Introduction: Adoptive cellular therapy (ACT) is a promising anti-tumor immunotherapy whereby a patient's T-cells are isolated ex vivo, expanded and modified to improve tumor cytotoxicity, then reinfused into the patient. While the current ACT modalities [chimeric antigen receptor (CAR) T cells, genetically engineered T-cell receptors, and tumor-infiltrating lymphocytes (TILs)] show remarkable success in select tumor clinical trials and patients, major challenges limit ACT application to all tumor types. These limitations include the lack of sufficient cell numbers for therapeutic efficacy and failure of engineered T-cells to effectively target heterogeneous tumors. To overcome these limitations, we developed a biomimetic device where patient-derived tumor organoids (PTOs), also enriched with antigen presenting cells, are co-cultured

with patient-matched peripheral blood mononuclear cells (PBMCs) in a microfluidic tumor-on-a-chip system (TOC). As PBMCs circulate through this on-demand system, they are exposed to the tumor's polyclonal neoantigen composition in a dispersed system. This system both eliminates the infiltration-inhibitory in vivo tumor microenvironment and leads to the formation of patient- and tumor-specific organoid infiltrating lymphocytes (OILs). The goal of this project is to demonstrate anti-tumor reactivity of TOC-generated OILs. Methods: Patient-matched antigen presenting cells (normal lymph node or spleen) were combined with tumor biopsy-derived PTOs (3 metastatic appendiceal and 1 melanoma) in the TOC platform. Patient-matched PBMCs were circulated through the system for 7 days. The resultant OILs were collected and expanded for an additional 7 days. As control, uncirculated PBMCs and TILs were also expanded from the same patient. Following expansion, PBMCs, TILs, and OILs were separately co-cultured with matched PTOs in a plate for 7 days. Thereafter, culture media was collected and assayed for multiplex secreted cytokine analysis, immune cells collected and stimulated for flow cytometric intracellular cytokine analysis, and PTOs collected for immunohistochemistry analysis of immune cell infiltrate and tumor cell apoptosis. Results: Secreted cytokine analysis revealed increased signal intensity of the cytotoxic-associated cytokines perforin, IP-10, and IFN γ in OIL/PTO co-culture media compared to TILs and control uncirculated PBMCs (n=1). Furthermore, TIL/PTO co-culture media had increased IL-10 signal intensity, suggesting TIL immunosuppression. Flow cytometric analysis of PBMCs, OILs, and TILs showed no significant difference between the percent of TNF α , granzyme B, or IFN γ positive T-cells (CD3+CD8+) (n=3, p>0.05). Immunohistochemistry analysis of PTOs after co-culture revealed infiltration of CD3+ and CD3+Granzyme B+ cells into co-cultured PTOs (n=1). Additionally, compared to PBMC control and TILs, the OIL co-cultured PTOs showed increased apoptosis via cleaved caspase 3 expression (n=2). Conclusion: These preliminary results suggest that patient immune cells co-cultured with PTOs (OILs) show higher cytotoxicity associated cytokines as well as induce tumor cell apoptosis, compared to TILs and control PBMCs. With further validation of the OILs' increased tumor-targeting efficacy, we propose a new potential source of therapeutic lymphocytes for ACT in a broad array of tumor types previously untreatable by current ACT modalities.

95. Cerebrospinal Fluid Volume Assessed from Clinical T1w-MRI Predicts Functional Outcomes Post-Thrombectomy

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Introduction: Endovascular treatment (EVT) is recognized as the standard of care for patients with acute ischemic stroke caused by large vessel occlusion (LVO). However, many patients do not achieve functional independence after successful EVT, which may be due to the pre-existing brain atrophy and higher total cerebrospinal fluid volume (CSFV). Prediction of patients who will highly benefit from EVT may be possible using baseline total CSFV as a marker of brain health and reserve. Objective: Quantify total cranial CSFV from clinical T1w-MRI to determine brain health and examine its influence on functional outcomes post successful EVT. Methods: We performed a retrospective analysis of Wake Forest Baptist Health's Stroke Thrombectomy and Aneurysm Registry (n=602), collected between 2015 - 2021. We selected 213 patients (mean age 67.5 ± 14.6 , 49.3% female) who had adequate MRI within 14 days of EVT and a record of the modified Rankin scale (mRS) at 90 days post EVT. Clinical T1w images were transformed into high-resolution images using the convolutional neural network SynthSR. Then, FreeSurfer was used to estimate total cranial CSFV including the ventricles and choroid plexus. To correct for head size, total CSFV was adjusted to the estimated total intracranial volume. Results: Baseline total CSFV significantly predicted 90-day mRS in an ordinal regression model adjusted for baseline mRS (p<0.001). After further adjustment for age, sex, smoking history, prior stroke, hypertension, congestive heart failure, hemoglobin A1c, atrial fibrillation, ASPECT score, and other confounders, total CSFV remained an independent predictor of 90-day mRS (p=0.007). Conclusions: This study elucidates the clinical implications of pre-existing brain health and reserve in the setting of acute ischemic strokes to aid clinicians in treatment decisions impacting prognosis. Increased total CSFV correlates with increased brain frailty and poorer functional outcomes after mechanical thrombectomy, which may ultimately attenuate its benefit.

96. Utility of Deep Inferior Epigastric Perforator Free Flap for Non-Breast Reconstruction: A Single-Center Series and Review of the Literature

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Background: The deep inferior epigastric artery perforator (DIEP) flap has become the gold standard for autologous breast reconstruction; however, it is less commonly used for reconstruction of non-breast defects. In this study we sought to highlight the DIEP flap's versatility in coverage across anatomic locations to better define its role in non-breast reconstruction. **Methods:** We performed a retrospective review of free tissue transfer using DIEP flaps at our institution outside of breast reconstruction from January 2013 to September 2020. Various patient demographics and overall outcomes were collected and analyzed. **Results:** Twenty-six DIEP free flap reconstructions were identified. Recipient sites included seventeen on the head and neck, one on the chest wall, three on the upper extremity, and five on the lower extremity. Twenty-five patients (96%) achieved reconstruction completion. There were no cases of complete flap loss. The one reconstruction failure was secondary to persistent and destructive osteomyelitis of the knee joint, thus requiring lower extremity amputation despite soft tissue coverage with a viable DIEP flap. Furthermore, post-operative complications occurred in nine patients (35.0%) who had successful final reconstructions. Complications included three recipient site infections, two partial flap losses requiring debridement (but not compromising final reconstruction), one donor site wound, and two post-operative hematomas. Ultimately six patients required return to the operating room for an acute or subacute flap-related complication during the same hospital admission. Fourteen patients required operative revisions (54%) for flap thinning or contouring (mean of 1.0 ± 1.1). Four patients (15%) received radiation following DIEP flap reconstruction, one of which resulted in partial flap necrosis requiring minor debridement. **Conclusion:** The DIEP flap is a versatile option for a variety of applications beyond breast reconstruction.

97. Distance Traveled and Disparities in Patients Undergoing Cyto-reductive Surgery and Hyperthermic Intraperitoneal Chemotherapy

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BACKGROUND: The impact of distance traveled on cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (CRS/HIPEC) outcomes needs further investigation. **METHODS:** This is a retrospective review of a prospectively managed single-center CRS/HIPEC database 1992-2022. Zip codes were used to calculate distance traveled to treating facility and to obtain data on median household income and educational attainment from the American Community Survey 2020. Insurance data was collected on a subset of patients (2011-2020) via chart review or patient report. For analysis, patients were separated into 3 groups based on distance traveled in miles (local: ≤ 50 , regional: 51-99, distant: ≥ 100). Descriptive statistics, Kaplan-Meier method, and Cox regression were performed. **RESULTS:** Of 1614 patients, median distance traveled was 109.5 miles (IQR: 53.36-202.29). 23% traveled locally, 23.9% regionally, and 53% distantly. Those traveling distantly or regionally tended to be more white (distant: 87.8%, regional: 87.2%, local: 83.2%), affluent (distant: \$60944, regional: \$65014, local: \$54390), educated (% without high school diploma distant: 10.6%, regional: 11.5%, local: 13.0%), less often uninsured (distant: 2.3%, regional: 4.6%, local: 5.2%) or with Medicaid (distant: 3.3%, regional: 1.3%, local: 9.7%). They more often had higher PCI scores (distant: 15.4, regional 15.8, local: 12.7), and R2 resections (distant: 50.3%, regional: 52.2%, local: 40.5%) (Table 1). Median survival (months) was not different between groups (distant: 34.2, regional: 30.4, local: 30.8; $p=0.34$). Distance traveled was not a predictor of survival on Cox regression. **CONCLUSION:** Over 50% of patients traveled over 100 miles for treatment. While regionalization of CRS/HIPEC may be appropriate given the lack of survival difference based on distance traveled, those who traveled further were more often white, affluent, educated, and insured, which raises concerns about disparities and access to care. The higher percentage of R2 resections and higher PCI scores in the distant group also raises questions about time to treatment, delayed referral and surgical quality.

98. Management of Tibial and Femoral Non-Unions and Stress Fractures with Severe Ipsilateral Knee Arthritis with Long Stemmed Modular Total Knee Arthroplasty

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Management of patients with non-unions or stress fractures of the tibia or distal femur with debilitating ipsilateral knee ar-

thrititis can be difficult to manage. In these examples of care, we present three illustrations of using long-stemmed modular total knee components to successfully manage both tibial and femoral non-unions and stress fractures as well as ipsilateral arthritis with resultant deformity. The average improvement in our knee outcome scores for these three patients via pre-operative Knee Injury and Osteoarthritis Outcome Score for Joint Replacement (KOOS, JR.) and one-year post-operative KOOS, JR. is 44.37. After treatment with a long-stemmed modular total knee prosthesis, all three examples of care went on to union, and the arthritic deformity was corrected.

99. Crowdsourced Comparison of Aesthetic Outcomes of Implant-based Breast Reconstruction with Traditional Transverse versus Skin Reducing Mastectomy Incision Patterns

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PURPOSE: Advancements in reconstructive breast surgery have made postoperative cosmesis and patient satisfaction critical outcome measures. Skin-sparing mastectomy (SSM) incision patterns may be classified into the traditional transverse incision or skin reducing patterns. We aim to identify if there is preference among the public regarding aesthetic outcomes between incision patterns following implant-based breast reconstruction (IBBR). **METHODS:** Twelve patients who underwent IBBR following SSM were included, 6 with a transverse incision pattern and 6 with skin reducing mastectomy (SRM) patterns. Patients were matched regarding age, BMI, ASA, comorbidities, and chemotherapy/radiation status. A survey was created via RedCap to assess outcomes in seven categories: Symmetry, Volume, Projection, Shape, Skin Quality, Scar Pattern, and Overall Aesthetic Rating. The survey was distributed via social media and the Amazon MTurk crowdsourcing platform. **RESULTS:** 1,192 survey responses were recorded and analyzed. Respondents tended to be female, less than 40 years of age, and similarly distributed in terms of healthcare experience. Respondents with or without healthcare experience could accurately identify the difference between scar patterns. In every category, the SRM was rated higher compared to the transverse pattern. **CONCLUSION:** This study represents a crowd-sourced survey of aesthetic results of patients with IBBR following SSM with traditional transverse incision versus SRM patterns. The SRM was found to be more aesthetically pleasing to the general public regardless of age, gender, or healthcare experience.

100. Matthews Cranial Vault Remodeling Procedure

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Non-syndromic sagittal synostosis is the most common of all craniosynostosis cases. Controversy exists regarding the optimal surgical treatment in infancy. Primary treatment with strip craniectomy, spring-assisted cranioplasty, or cranial vault remodeling (CVR) shows improvement in long-term behavioral, social, and executive function also corrects cranial cosmetic deformities. We describe a novel CVR technique, performed with the patient entirely in the prone position. This position offers improved operative access, allowing neurosurgeons to efficiently perform osteotomies and control bleeding. Further, the initial cuts in the skull are positioned adjacent to, but not directly over, the sagittal sinus, reducing the risk of injury/bleeding. This technique involves the creation and elevation of two, single piece bifrontal, biparietal and bioccipital craniotomy bone flaps, allowing a retained medial bone strip to include the fused sagittal suture. These flaps are contoured with Hendel osteotomies on the back table and later fixed on the calvarium with absorbable plates. The central strip is shortened as needed. We present six children who underwent this procedure for the treatment of isolated, non-syndromic, sagittal synostosis with preoperative and long-term postoperative (> 6 months) CT scans. The average cephalic index (CI) improved significantly when preoperative measurements (72.83 +/- 0.033) were compared to long-term postoperative CIs (80.83 +/- 0.039), demonstrating this technique's ability to improve the dolichocephalic deformity associated with sagittal synostosis.

101. Optimization of a live/dead assay for potential application to coaxial bioprinting constructs, using Hep G2 spheroids

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Hep G2 is an immortalized hepatocyte cell line with epithelial morphology, suitable for the generation of three-dimensional (3D) cell aggregates or spheroids that can be used for coaxial bioprinting, an innovative strategy to produce functional cell complexes for tissue engineering applications in regenerative medicine. Many assays and molecule dyes are available to test the viability of the cells in a monolayer; more challenging is to detect live and dead cells in 3D cell culture systems and in 3D bioprinted constructs. In this study we optimized the application of a commercial fluorescent live/dead assay (Multitox), using Hep G2 spheroids (Hep G2s) and Hep G2s casted in a disk of ultra-pure low viscosity sodium alginate (LVM), as a test experiment prior to the coaxial bioprinting trial. Hep G2 cells were cultured in EMEM medium completed with fetal bovine serum and Penicillin-Streptomycin and used at passage not higher than 8. Hep G2s were generated using microwells culture plates, coated with an anti-adherence solution by serial centrifugation steps, to have 1,200 spheroids per well, 500 cells per spheroid. Hep G2s were fully formed after two days of culture, having an average diameter of 150 μm . After, they were transferred to a poly-HEMA coated 6-well plate with a 1:3 distribution ratio and let recover for additional 2 days. Hep G2s were harvest and divided in 2 batches: free Hep G2s and Hep G2s casted in a LVM disk (diameter 60 mm, height 1.5 mm). Multitox assay was performed using 6 replicates of each batch, 50 spheroids equivalent (sEQ) per replicate. Spheroids in lysis solution were also used as control. Incubation settings included multiple time points, 30 min, 1h, 2h and 3h at 37°C; fluorescence at 400EX/505EM for live cells and 485EX/520EM for dead cells was then measured. Live/dead ratio was considered as expression of viability. Live/dead staining, using calcein AM and Ethidium homodimer-1 dyes, was also performed. Hep G2s live/dead ratio was 5.12 ± 0.22 (mean $\pm$ STD) after 30 min and significantly decreased ($p < 0.0001$ by one-way ANOVA) to 2.88 ± 0.29 , 1.51 ± 0.13 and 0.95 ± 0.05 after 1h, 2h and 3h incubation respectively, with a fold change of 5 between 30 min and 3h. The live/dead ratio of free spheroids was significantly higher than the respective control at each time point ($p < 0.0001$ vs control). A similar trend was also observed for spheroids casted in a LVM disk. Live/dead staining after 1h incubation at 37°C confirmed the presence of a larger proportion of viable cells. Multitox proves to be a feasible assay to measure cell viability and cytotoxicity of free or casted 3D cell aggregates. Additional tests need to be performed on different types of 3D cell aggregate either free or used in the preparation of bioinks for coaxial bioprinting. Acknowledgements: This work was supported by JDRF Strategic Research Agreement [grant key 2-SRA-2022-1218-S-B]

102. Repurposing of FDA-Approved Farnesol to Combat Tough Bacterial Biofilms

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Purpose: Biofilm-associated infections caused by drug-resistant and persistent bacteria remain a significant clinical challenge. Farnesol is an FDA-approved agent that is commercially available as a flavor enhancer, while also having versatile antibacterial, antifungal, and antitumor activities. The purpose of this study was to determine whether farnesol is capable of combating biofilms of drug-resistant and persistent bacteria in vitro, and in ex vivo burn wounds. Methods: Bacteria was cultured in media containing farnesol for 24 hours to evaluate its effect on biofilm formation, while 24-hour-old bacterial biofilms were exposed to farnesol overnight to examine its efficacy on disruption of established biofilms, using serial dilution assays to determine surviving colony forming units (CFUs). The effect of farnesol on biofilms was visualized by Live/Dead viability assay, followed by quantitative analyses of images of the three-dimensional biofilm structure. Efficacy of farnesol against biofilm-associated skin infections was assessed using ex vivo healthy, or thermally burned human skin. Results: Farnesol, dissolved in ethanol, is effective at preventing biofilm formation, and also disrupts established biofilms of Gram-positive *Staphylococcus aureus* and/or Gram-negative *Pseudomonas aeruginosa*, with clinically significant reductions, or complete eradication of the bacteria. Moreover, farnesol is capable of killing *S. aureus* persister cells without inducing resistance, even after prolonged culture in the presence of sub-inhibitory farnesol doses. Farnesol is bactericidal by cell

membrane permeabilization and can also detach biofilm from surfaces. Furthermore, farnesol was shown to be safe, and highly effective, for both preventing and treating biofilm-associated infections of *S. aureus* or *P. aeruginosa* in an ex vivo burned human skin model. Conclusions: These results demonstrate that farnesol is an effective broad-spectrum antibiofilm agent with promising clinical potential. Due to its established safety, low-cost, versatility, topical delivery, and excellent efficacy - including the ability to eliminate both persistent and resistant microbial populations - farnesol offers a translational platform for addressing many of today's unsolved clinical challenges due to biofilms.

103. Post-Operative Day #1 (POD1) Discharge in Deep Inferior Epigastric Perforator (DIEP) Flap Breast Reconstruction

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Introduction: Autologous breast reconstruction is the gold standard for reconstruction of the irradiated mastectomy patient. One major drawback is the prolonged hospital stay. Studies have started to question the necessity of longer admissions for these patients, yet only one group has published their experience with post-operative day #1 (POD1) discharge (1-3). Over the last three years, our institution has progressively shortened the length of stay following DIEP flap reconstruction and begun discharging patients on POD1. The purpose of this study is to document our experience with POD1 discharges while also identifying pre-operative and intra-operative factors that may identify patients as candidates for earlier discharge. Methods: An IRB-approved, retrospective review of patients undergoing DIEP flap breast reconstruction from January 2019-March 2022 at Atrium Health was completed consisting of 510 patients and 846 DIEP flaps. Patient demographics, medical history, operative course and postoperative complications were collected. R statistical software was used for statistical analysis, including summary statistics and Welch's two-sample T-tests. Results: 23 Patients totaling 33 DIEP flaps were discharged on POD1 following reconstruction. Standard protocol through all phases of surgery was outlined. Factors associated with POD 1 discharge include BMI less than 30 and shorter operative time. No complications occurred in the POD1 group. Conclusion: POD1 discharge following DIEP flap breast reconstruction is safe for select patients. Lower BMI and shorter operative times may be predictive in identifying patients as candidates for earlier discharge.

104. The Microenvironment Modulates Chondrogenic Differentiation in Progenitor Cells

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Background: Osteoarthritis (OA) is the most prevalent musculoskeletal degenerative disease(1). Treatment currently consists of pain management, lifestyle modification and in some cases arthroplasty. These disease management options address patient pain but do not fundamentally treat or slow OA progression(2). New studies have demonstrated that it may be possible to regenerate isolated tissues when progenitor cells are cultured in the presence of mononuclear cells activated towards specific tissue antigen(3). For the purpose of regenerating articular cartilage, the microenvironment factors that steer progenitor cell differentiation towards chondrogenesis and away from osteogenesis are not fully understood. Aim: The aim of the project was to evaluate the impact of the microenvironment on chondrogenic differentiation of clinically relevant progenitor cell populations for the potential treatment of OA. Methods: The experiment involved coculturing both Adipose Derived Mesenchymal Stromal Cells (aMSCs) and Placenta Derived Progenitor Cells (PLCs) with human derived mononuclear cells activated to promote regeneration of articular cartilage. The cocultures were carried out in 2D and 3D environments and in normoxia and hypoxia. Cells were collected at 24,48,72 and 96 hr time points. Cell lysates were collected in order to perform qPCR for analysis of SRY Transcription Box 9 (SOX9), Indian Hedge Hog (IHH), and RUNX Family Transcription Factor 2 (RUNX2) gene expression. Using two sided T-Tests we compared relative gene expression between time points, progenitor type, plating environment and oxygen environment. Immunohistology of organoids formed in 3D plating conditions was performed to allow for phenotypic characterization. Results: Expression of IHH increased significantly ($p<0.05$) in all but one of the coculture groups. The greatest increase in IHH expression was observed between

72 and 96h time points with peak expression at 96h in all groups. No significant difference in IHH expression was observed between respective normoxic and hypoxic or 2D and 3D coculture environments. Analysis of the chondrogenic transcription factor SOX9 confirmed the onset of the chondrogenic program as seen by temporal increase of gene expression in 2D plated cocultures after 48h and significantly increased expression in the 2D normoxic aMSC coculture at 96h ($p = 0.048$). These findings were further supported by the expression profiles of the osteogenic transcription factor RUNX2, which showed a decreased expression at 96h ($p < 0.05$), confirming that the progenitor cells did not enter the osteogenic lineage. Interestingly normoxic conditions resulted in greater expression of RUNX2 at 96h compared to hypoxic conditions (significant only for 3D plated PLC's, $p < 0.001$). H&E staining of 3D plated organoids demonstrated cellular hypertrophy and production of extracellular matrix in all conditions over time. Alcian Blue staining for identification of glycosaminoglycans (GAG's), a component of articular cartilage, showed robust GAG accumulation over time. Conclusions: IHH, SOX9 and RUNX2 were chosen as genes of interest due to their role in progenitor cell differentiation. Upregulation of IHH and SOX9 steers chondrogenic differentiation while upregulation of RUNX2 induces osteogenic differentiation. Increased upregulation of IHH and corresponding downregulation of RUNX2 confirms that, in the presence of cartilage activated mononuclear cells, progenitor cells undergo chondrogenic differentiation. This is further supported by the temporal increases seen in SOX9 expression. Immunohistology allowed for observation of phenotypic changes that paralleled gene expression. In the future, increased coculture time may provide better understanding of the environment most suitable for chondrogenesis and production of cartilage producing chondrocytes.

105. Is There an Age-Related Difference in Reverse Total Shoulder Arthroplasty Outcomes?

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Background: The number of shoulder arthroplasties, especially reverse total shoulder arthroplasties (RTSA), have increased since the early 2000s. This is due, in part, to expanding indications which have included a broader and younger cohort of patients. The literature remains conflicted regarding the impact of age on subjective and objective outcomes after RTSA. While some existing research suggests that outcomes may be worse for patients under 60 years of age, other studies have found that RTSA is a viable and reproducible option for this cohort. The purpose of this study is to compare RTSA outcomes in patients younger than (or equal to) 65 years of age to those older than 65 years of age. Hypothesis: We hypothesize that there would be no difference between groups with regards to revision rate or patient reported outcomes (PROs) at 1 year after RTSA. Methods: A retrospective case series was performed, analyzing the outcomes and complications of postoperative shoulder arthroplasties for patients, stratified by age; group 1, aged 51-65 and group 2, aged 66-80. Primary outcomes were postoperative instability and/or surgical revision. Secondary endpoints included PROs for pain and function. All data analysis was completed via a non-parametric Mann-Whitney-U test; significance was defined as an alpha level of < 0.05 . Results: A total of 47 patients who were consecutively enrolled in a PROs collection system were included in this study ($n=12$ group 1, $n=35$ group 2). The average age of group 1 was 60 years, and the average age of group 2 was 72 years. No patients in group 1 underwent revisions, while three patients in group 2 required revisions within two years of initial arthroplasty ($p=0.56$). There was no difference in VAS pain score at one-year follow-up between group 1 and group 2 (2.40 ± 2.57 vs 2.01 ± 2.52 , $p=0.77$). There were also no significant differences between group 1 and group 2 for SANE (75 ± 23 vs 73 ± 27 respectively, $p=0.57$) or ASES (67 ± 32 vs 75 ± 22 , $p=0.66$) at 1-year follow-up. However, at one-year post-operation the PROMIS-10 physical score showed significantly reduced function for group 1 when compared to group 2 (38.2 ± 3.76 , 57.77 ± 16.75 respectively, $p=0.009$). Conclusions: In this single-center cohort of patients, there was no significant difference in 1-year VAS, SANE, or ASES score between patients younger than 65 and those older than 65. Younger patients did report significantly lower PROMIS-10 physical scores. Overall, these data challenge previous research reporting that younger patients under 60 have worse outcomes than those older than 65 years of age. Source of mentor's funding or other support that funded this research: none

106. Demographic Analysis of Patients Undergoing Facial Cosmetic Surgery in an Academic Practice

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Background: Facial cosmetic surgery is largely performed in the private practice setting. The demographics of patients undergoing cosmetic surgery in the academic setting has not been well characterized. **Objectives:** Characterize the demographics of patients undergoing cosmetic facial plastic surgery in an academic surgery practice. **Methods:** A retrospective chart review was performed of patients undergoing facial cosmetic surgery in the operating room by fellowship-trained facial plastic surgeons at a single academic institution from 2015 to 2020. Combination cases with functional components covered by insurance were included. **Results:** 186 cosmetic surgical procedures were performed on 137 patients by 3 surgeons over the course of the 6-year period. Cosmetic patients represented 8% of all operative patients for the group. 77% of patients were female. Of the 137 patients, 52% underwent cosmetic procedures in combination with other functional procedures covered by insurance. 90% of patients undergoing cosmetic procedures were white, 5% other, 2% Asian, and 1% Black, and 1% American Indian or Alaska Native. 1% of patients did not have a gender listed. **Conclusion:** Facial cosmetic surgery patients at a single academic institution are composed of disproportionately more white individuals than the surrounding area. Compared to national trends, male and white patients made up a larger portion of patients undergoing surgery. Combination procedures with insurance-based cases constitute approximately half of cosmetic surgeries in this group.

107. CD47 blockade limits immunosuppressive checkpoint molecules in the tumor microenvironment to sensitize triple-negative breast cancer tumors to immune checkpoint blockade therapy.

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Triple-negative breast cancer (TNBC) lacks druggable targets and has high metastatic incidence. Immune checkpoint blockade (ICB) antibodies are FDA approved for TNBC treatment, but therapeutic response and biomarkers are limited. Therefore, additional therapeutic targets and biomarkers are needed to sensitize TNBC tumors to immune checkpoint blockade therapies and improve patient response. CD47 is an integral membrane protein overexpressed on cancer cells that alters anti-tumor immunosurveillance, resulting in tumor progression. CD47 is involved in metabolic reprogramming but whether CD47 is a marker of progression and its role in ICB response for TNBC remains unknown. Human TNBC biopsies were subjected to immunohistochemical analysis to determine CD47 role in TNBC progression. Human matched primary, and metastatic TNBC biopsies increased immunoreactivity to CD47, signifying a potential therapeutic target. To determine CD47 impact on tumor burden, a carcinogen-induced TNBC model was performed in female wild type (WT) and cd47 null(cd47^{-/-}) C57Bl/6 mice. CD47 deficiency in the carcinogen-induced model decreased tumor incidence, multiplicity, weight, and area compared to WT. Since CD47 can regulate metabolism, tumors underwent metabolomic analysis. Principal component analysis displayed differentially regulated metabolites between WT and cd47^{-/-} tumors. Decreased carnitine conjugated fatty acids and ketone bodies were observed in cd47^{-/-} tumors compared to WT, suggesting decreased fatty acid availability and/or metabolism. TNBC cell respiratory measurements validated that targeting CD47 blocked the metabolic dependency of fatty acid oxidation in a fatty acid-enriched environment. Kynurenine/tryptophan pathway metabolites, which catabolize Indoleamine-2,3-dioxygenase (IDO1) and are involved in anti-PD-1/PD-L1 resistance, were decreased in cd47^{-/-} tumors compared to WT. To evaluate immune infiltrate signaling, tumors underwent spatial tissue proteomics by multiplexing photo-cleavable antibodies in Formalin-Fixed Paraffin-Embedded samples. Spatial proteomic analysis determined that cd47^{-/-} tumors had elevated immune cell infiltration (CD45⁺, CD3⁺), suggesting CD47 absence enhances tumor immunogenicity and immune-mediated tumor ablation. Multiplexing of photo-cleavable antibodies increased protein expression of immune checkpoint molecules (PD-L1, VISTA, B7-H3, BatF3) and immunosuppressive cell types (CD11b⁺, Ly6c⁺) in WT tumors compared to cd47^{-/-}, suggesting CD47 absence limits immunosuppressive signaling. Since anti-PD-L1 therapies are approved to treat TNBC and WT tumors from our DMBA model show PD-L1 upregulation, we examined how targeting CD47 would impact tumor burden of mice receiving anti-PD-L1 therapy through an orthotopic EMT-6 murine TNBC model. Targeting CD47 or PD-L1 as monotherapy decreased tumor burden; however, in combination it further reduced tumor burden compared to anti-PD-L1 treatment due to increased intratumoral granzyme B secreting cytotoxic T cells. Our data indicate that CD47 may serve as a marker of anti-PD-L1 response, and targeting CD47 enhances immunogenicity and decreases immunosuppressive molecules, sensitizing TNBC tumors to anti-PD-L1 therapy to reduce tumor burden.

108. Patient Perspective of Podiatrist Attire

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Background: Creating a respectful relationship between health-care providers and patients is important to provide patient care. A provider's attire is the first impression a patient has of their physician. Previous studies have demonstrated different preferences on attire based on the type of physician. However, podiatrists provide a wide variety of services for each patient. Our goal is to analyze the perspective of patients on podiatric physician attire. **Methods:** An anonymous survey was provided to patients at two academic hospital associated clinics. Questions were asked regarding patient preference on podiatric attire based on encounter type: evaluation, office procedure, and surgical consultation. Additional questions were asked regarding tie preference, their preference on primary care provider attire and nursing staff attire. **Results:** Our study included 208 participants with the average age was 56.7 +/- 16.3 years old. The majority of respondents reported no preference on podiatrist attire. Following this response, respondents prefer white coats and scrubs for office procedures and surgical consultations and professional attire with white coats for evaluations. For nursing and medical assistants, the majority (75.3%) prefer scrubs. Almost 75% of participants reported it does not matter if a podiatrist wears a tie and less than 5% prefer a tie. **Conclusions:** We recommend wearing a white coat with scrubs or professional attire. Based on our findings, few participants prefer fleece jackets or ties. We recommend primary care providers wear professional attire with white coats.

109. Handling of Sharps in the Operating Room: A Single Institution Review

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Background: Operating room (OR) personnel are at a high risk for sharp injuries which can cause serious side effects. Previous studies have shown the high rate of under reporting and multiple severe pathogens that can be transmitted by needlestick injuries. Our goals of this study are to analyze OR nurses and surgical technologists' experience with sharps and evaluate their current level of sharps prevention education. **Methods:** An anonymous survey was sent to OR nurses and surgical technologists at a single institution. The survey included questions regarding whether the participants have been stuck by a sharp, when they were stuck, and their perspective on sharp handling safety and education. **Results:** Forty-two participants responded to the survey. We found 69% had sustained a sharp injury with 58.6% being stuck while handling sharps alone. The vast majority (90.5%) believed handing back sharps protected was the safest. Forty-five percent reported never having attended Continuing Medication Education (CME) regarding handling sharps. Only 59.4% of those who had CME found it helpful. **Conclusions:** This is the first study we are aware of that looked at OR personnel's perspectives on sharps handling and current CME. We recommend reevaluation of current CME regarding handling sharps and increased access. Our study found most injuries occurred when handling sharps alone. We recommend using our study to guide future research to improve sharps handling safety in the OR.

110. Change in Height Following Tibiototalcaneal Arthrodesis: Retrospective Radiographic Analysis

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Tibiototalcaneal arthrodesis (TTCA) with an intramedullary rod is a viable treatment option for a myriad of pathologies

involving the foot and ankle. The primary surgical goals are decreased pain, improved hindfoot alignment, and increased function. While the current literature has focused on fixation techniques, deformity correction, and clinical outcomes, we are unaware of any studies specifically examining change in height following a TTCA. In the present study, we retrospectively analyzed radiographs with novel radiographic techniques to determine the change in height from preoperative to postoperative radiographs following TTCA. Patients were divided into three categories: Charcot, arthritis, and pes planus as the indication for surgical intervention. We found that Charcot and arthritis had an average decrease in height on anterior and posterior measurements of the height from the distal tibia to the calcaneus, while pes planus had an increase in height. The average Charcot change in height was $-12.0 \pm 24.4\text{mm}$ anteriorly and $-7.6 \pm 15.5\text{mm}$ posteriorly. The average change in height for the arthritis group was $-6.9 \pm 6.7\text{mm}$ anteriorly and $-3.8 \pm 5.8\text{mm}$ posteriorly. The pes planus group was found to have an average increase in height $0.5 \pm 8.0\text{mm}$ anteriorly and $2.9 \pm 5.8\text{mm}$ posteriorly. Overall, we found a statistically significant difference in height change between the three groups in anterior measurements ($p\text{-value} = 0.012$) and posterior measurement ($p\text{-value} = 0.006$). We recommend surgeons who perform this procedure to be aware of the potential change in height to better tailor surgical and postoperative care.

111. Clinical Outcomes in Shoulder Stabilization via Knotted versus Knotless Fixation

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Introduction: Glenohumeral instability results in disruption or tearing of the glenoid labrum. Surgical treatment using an arthroscopic technique has been successful in restoring stability and athletic function in the absence of glenoid bone loss. Advances in anchor design have allowed for knotless fixation of the labrum. The current literature suggests that there are no significant differences in the clinical outcomes or return to play (RTP) of knotted versus knotless anchoring for any location of labrum repair. The purpose of this study is to further compare rates and timeline for RTP, abduction and external range of motion (ROM), and the surgical failure rates, between knotted and knotless labral repair. **Methods:** After institutional review board approval, a single-centered retrospective chart review analyzing the outcomes and complications of labral repairs for adult and adolescent patients between 2017 and 2022 was performed. Patients were excluded if they did not undergo an isolated knotted or knotless labral repair. Demographic and surgical data were collected including age, sex, race, laterality, characterization of the labral tear, number of anchors and anchor location. Patient participation in sport, if any, level of competition, ability to RTP, and RTP times were also collected. Data analysis was completed using the Prism GraphPad Version 9.3.1 (Dotmatics, Boston, MA) software via a non-parametric Mann-Whitney-U test and a Chi-Squared test with an alpha level of <0.05 set prior to the study. **Results:** Patients were divided into two cohorts of knotted ($n=31$) or knotless ($n=30$) labral repair with the average ages of 26 ± 14 and 22 ± 6 , respectively. There was no significant difference at any time interval for abduction or external rotation ROM. There was no difference in remplissage rate between groups. Also, no significant difference in the presence of perioperative complications or revision was identified. Of those who participated in sports, no significant difference was identified in the ability to return to play between the two groups. However, there was a statistically significant increase in RTP time for patients receiving knotted fixation, when compared to those receiving knotless fixation (194 ± 29 vs 173 ± 49 days, respectively, $p=0.020$). **Conclusion:** Patients who identified as athletes and underwent a knotless labral repair were found to return to their sport at a shorter duration than those who underwent a knotted fixation at all levels of competition. These findings add to the current literature comparing knotted and knotless anchoring during labral repair surgery and help guide patient and physician expectations in the post-operative period.

112. Development of a Living Biobank of Breast Cancer Organoids

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Introduction: Breast cancer is one of the most frequently diagnosed cancers among women, with a high mortality rate. More than 20 different subtypes of breast cancer are identified. Advancement in patient-derived organoid technology makes it possible to preserve cellular, structural, and tissue microenvironment, which mimics the tissue in vivo. The present study

aims to develop a cryopreserved (living) tumor biobank from patient-derived tumor breast tissues. Eventually, biobank organoids will be used to test treatment options outside of patients, in a dish, and provide information on what treatments the patient responds to. Method: Breast biopsies were mechanically and enzymatically digested to yield a single-cell suspension. Patient-derived organoids (PDOs) were bio-fabricated using an unsorted tumor and normal cell suspension in a collagen-based hydrogel. Immune-enhanced tumor organoids (iTOs) were also bio-fabricated using patient-matched PMBCs and tumor cells as described above. Breast cancer living biobanks were developed by freezing organoids in cryopreservation solutions and reestablishing them in growth media compatible with breast organoids. Histological staining for hormone receptors and Her2 receptor markers was performed on organoid sections. Organoids were cultured for seven days, followed by treatment with chemotherapy (Paclitaxel, Doxorubicin, and Sulphonamide) and immunotherapy (Nivolumab, Pembrolizumab, and Atezolizumab), and assessed for cell viability using CellTiter GLO assay. Results: H&E staining showed the characteristics of the breast tissue with well-defined acini. In tumor organoids, acini were somewhat perturbed compared to normal breast organoids. Immunofluorescence staining showed the expression of breast biomarkers, including EGF receptor 2 (HER2), Progesterone receptor (PR), and Estrogen receptor (ER). Zona occludin 2 and keratin 19 expression in luminal cells and expression of Keratin 14 and P63 in basal cells, suggesting correct polarization in the organoids. Immunofluorescence staining of iTOs, with T cell markers including CD3, CD4, and CD8, indicated that immune cells remained viable in the iTOs. Drug responses to Doxorubicin, Paclitaxel, Sulphonamide and a combination of Doxorubicin-Paclitaxel showed significant inhibition of cell growth in normal and tumor organoids ($p < 0.04$). Treatment of breast iTOs showed moderate responses to nivolumab ($n=11$) and pembrolizumab ($n=4$), with a 63%-100% efficacy ($P < 0.05$) respectively. No responses were observed for Atezolizumab ($n=4$). Drug responses of biobank organoids showed comparable drug sensitivities to their fresh, non-frozen counterparts, suggesting that biobank organoids retain physiological relevant information and can be used for testing new drug therapies. Conclusion: Breast cancer organoids recapitulate the histological features of breast tissue in culture and respond to chemotherapy and immunotherapy. In the future, patient-derived breast tumor organoids can be cryopreserved and serve as living biobanks to provide a platform for personalized medicine.

113. Assessing Bromelain Mucolytic and Cytotoxic Activity in Appendiceal Cancer Organoids

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Introduction: Mucin production in appendiceal cancer (AC) has been hypothesized to serve as a barrier to HIPEC drug delivery and treatment resistance. There is no currently approved mucolytic agent for AC. Bromelain is a pineapple extract with mucolytic properties that have generated research interest. We explored bromelain's cytotoxic and mucolytic effects against mucinous AC in a patient-derived tumor organoid (PTO) model. Methods: After IRB approval, tumor specimens were obtained from patients with AC undergoing cytoreductive surgery with HIPEC. PTOs were bio-fabricated using an unsorted tumor cell suspension in a collagen-based hydrogel. PTOs underwent HIPEC mimicry treatment with bromelain, cisplatin, and mitomycin C (MMC) under 37°C and 42°C conditions. Bromelain was also assessed as a pre-treatment agent prior to HIPEC treatment with MMC and cisplatin. Results: From October 2020 - March 2022, 11 specimens were collected from 11 patients with low grade appendiceal (7/11, 63.6%) and high grade appendiceal cancer (4/11, 36.4%). Testing was successful in all 11 specimens. Mucin-depleting effects of Bromelain (600 ug/ml) were most significant in the presence of N-acetylcysteine (NAC, 3% w/v) compared to Bromelain alone (50% residual mucin vs. 85%, $p=0.002$) and NAC alone (85% residual mucin, $p=0.003$). The cytotoxicity of Bromelain increased with time and reached statistical significance at 60 minutes of treatment ($>50\%$ post-treatment viability reduction, $p<0.01$). The cytotoxicity of cisplatin and MMC increased with the addition of Bromelain under 42°C HIPEC conditions compared to cisplatin (70% greater reduction in post-treatment cell viability, $p=0.03$) and MMC (60% greater reduction in viability, $p=0.002$) alone. Immunohistochemistry studies demonstrated reduced Ki67, CK20, and MUC2 expression after treatment with Bromelain. We also found increased expression of annexin V and caspase 3/7 activity in bromelain-treated PTOs compared to untreated controls, suggesting Bromelain's anti-tumor activity induces apoptosis pathways. Antiapoptotic-prosurvival proteins Bcl-2 and Bcl-xL and serine 473 phospho-Akt were significantly reduced after treatment with Bromelain compared to untreated controls ($p=0.009$ and $p=0.01$, respectively). Furthermore, the inhibition of cyclin D1 and the decreased expression of cyclin A, cyclin E, and cyclin H, in bromelain-treated organoids suggest that bromelain-induced cytotoxicity is due to its ability to interfere with cell cycle progression and arrest cell cycle. Moreover, autophagosome initiation protein LC3-A/B I and II expression increases ($p < 0.01$, $p < 0.03$) in bromelain-treated PTOs along with the inhibition of ATG7 $p < 0.01$, ATG 12 $p < 0.04$,

and Becline $p < 0.03$ suggesting that autophagy system is also involved in Bromelain mediated anti-tumor activity. Our data strongly suggest that apoptosis, cell cycle growth arrest, and autophagy are likely mechanisms underlying the anti-tumor activity of Bromelain. Conclusions: Bromelain demonstrates mucolytic and cytotoxic activity against appendiceal cancer PTOs both as a single agent and in combination with traditional perfusates. Our preliminary results support further investigation of Bromelain as a drug for inoperable mucinous cancers.

114. Does Severity of Acute Kidney Injury Influence Outcomes Following Deceased Donor Kidney Transplantation?

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Background: Kidney allografts from deceased donors having suffered extreme injury are often discarded for fear of worse long-term outcomes compared to kidneys with mild acute kidney injury. The use of these organs with extreme kidney injuries has been less well established. Methods: A single center retrospective review was performed of deceased donor kidney transplants (DDKT) from donors with acute kidney injury (AKI). The degree of AKI was categorized based on the terminal serum creatinine (tSCr). AKI kidneys were defined by both doubling of the donor's admission SCr level and tSCr ≥ 2.0 mg/dL. Results: Between January 2007 - August 2021, 236 DDKTs were performed using AKI kidneys. Of these, 136 donors had terminal SCr between 2-3 mg/dL (low group), 51 had SCr of 3-4 mg/dL (moderate), and 49 with SCr ≥ 4 mg/dL (extreme). In the entire cohort, 3 grafts had primary non-function and 3 were lost to thrombosis. In the low tSCr group, the rate of delayed graft function was 45.6% (n = 62) vs. 57.1% (n = 28) in the extreme group (p = 0.222). Excluding patients who died with a functional graft (n = 30) and primary non-function, overall graft loss occurred at rates of 43.4% in the low group, versus 32.6% in grafts with tSCr ≥ 3 mg/dL (p = 0.157). Conclusions: Although very high serum creatinine in the donor has traditionally been viewed as a contraindication for organ use, outcomes appear similar to those in mild AKI cases. Even despite slightly higher rates of delayed graft function, use of these organs may safely increase the donor pool for patients awaiting kidney transplantation.

115. Accidental Thermal Injury From Ignition of Home Oxygen: Is Burn Center Admission a Mandate?

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Introduction: Home oxygen therapy is available for the supportive treatment of patients with chronic lung disease. Nevertheless, complications associated with home oxygen use have been well described. The typical injury pattern associated with the accidental ignition of home oxygen does not mandate emergent intubation. However, due to the thermal component of the injury, patients are initially directed towards admission to burn units. The recent stress applied to the healthcare system by COVID-19 has highlighted the potential benefit of flexibility in the disposition of injured patients. In particular, we wanted to determine if there is a demonstrable benefit from admission to an American Burn Association (ABA) verified burn center for patients presenting with home oxygen ignition injuries. Methods: After obtaining approval from our local Institutional Review Board, we conducted a retrospective review of our institution's ABA-verified burn center database from January 2016 through May 2022. Individual charts were inspected for discrete data points related to the general descriptor of the patient's injuries, comorbidities, and hospital course. Using independent samples t-tests, we compared patients admitted to the burn service with those primarily cared for by non-burn service teams. Results: We identified 49 adult patients admitted with burn injuries associated with home oxygen use during the study period. These patients were divided into those intubated at or near the time of admission and those managed without intubation. Of the 29 patients intubated on admission, the burn service managed 19 of these patients, and non-burn services managed 10. There were no identified differences in the outcomes of ventilator days, days in the ICU, total length of stay, or mortality between the two groups. Similarly, we examined the 20 patients admitted without intubation. The burn service managed 7 of these patients, and non-burn services managed 13. Again, the two groups had no identified differences in the outcomes of days in the ICU, total length of stay, or mortality. Conclusions: This single-center review revealed no difference in outcomes between patients cared for in an ABA-verified burn center versus non-burn services for home oxygen ignition injury. From a care

perspective and resource utilization, the outcomes appear similar. Further, we note that patients required only brief periods of mechanical ventilation - supportive of the opportunity to avoid intubation in these patients. Prevention efforts, like those in the burn center, need to continue, and further studies must be done to confirm these preliminary findings.

116. Single dose antibiotics at the time of transperineal prostate biopsy are equivalent to outpatient antibiotic prophylaxis in preventing infection

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Background: Prostate biopsy is one of the most frequently performed procedures in urology. There are 2 primary ways to biopsy, namely the transrectal (TR) and transperineal (TP) approaches. TR biopsies have been the mainstay method in practice due to their low learning curve, ability to be performed in office, and short procedure time. However, a major critique of the TR approach is the burden of post-procedure infection, which impacts patient health and increases cost to the healthcare system. In response, there has been a nationwide shift to offering TP biopsies due to an allegedly reduced rate of infectious complications. While various studies have attempted to establish the infection rate after TP biopsy, the literature remains inconsistent. Further, there is an ongoing debate regarding the need for antibiotic prophylaxis with TP biopsy. Here, we report the rate of infection following TP biopsy at a single high-volume academic institution and reassess the need for outpatient antibiotics in addition to single-dose antibiotics at the time of biopsy. Methods: This was a retrospective case-control study at a single institution. All biopsies were performed using TP technique under TR ultrasound guidance with general anesthesia in dorsal lithotomy using a grid template. Charts of men undergoing TP biopsy from 2012 to present were reviewed. Infection was defined as at least one of the following: clinically documented prostatitis, fever ($\geq 38.3^{\circ}\text{C}$), and/or presence of urgency, frequency, and dysuria with pyuria, leukocytosis, and positive urine culture (>105 CFU) within 14 days post-biopsy. Patients were divided into 2 groups, those who received antibiotics at the time of biopsy in addition to outpatient antibiotics before/after biopsy and those who only received antibiotics at the time of biopsy. Pearson's Chi Squared was performed to evaluate the difference in infection rate between the 2 groups. Results: A total of 760 biopsies were included in the study. The overall infection rate post-TP biopsy was 1.97% (N=15). The infection rate for patients that received both forms of antibiotics was 1.85% (N=6) and 2.06% (N=9) for patients with only peri-operative antibiotics at time of biopsy. Pearson's Chi Squared test showed no significant difference in infection rates between single dose antibiotics at time of biopsy with/without outpatient antibiotic augmentation ($p=0.835$). Conclusions: There is a growing body of evidence that the rate of infection after TP biopsy is lower than TR, which our data supported. Outpatient antibiotics are not needed as infection prophylaxis to supplement antibiotics at the time of biopsy. Given the low rate of infection in both groups, we question if antibiotic prophylaxis is needed at all. A large-scale randomized control trial is needed to better assess both of these claims. Funding Acknowledgements: None Conflict of Interest Disclosure Statement: The authors do not have any conflicts of interest to disclose as it pertains to this abstract.

117. Atrial Cannulation During Resuscitative Clamshell Thoracotomy

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Abstract Background: Resuscitative thoracotomy and clamshell thoracotomy are performed in the setting of traumatic arrest with the intent of controlling hemorrhage, relieving tamponade, and providing open chest cardiopulmonary resuscitation. Historically, return of spontaneous circulation rates for penetrating traumatic arrest as well as out of hospital survival have been reported as low as 40% and 10%. Vascular access can be challenging in patients who have undergone a traumatic arrest and can be a limiting step to effective resuscitation. Atrial cannulation is a well-established surgical technique in cardiac surgery. Herein, we present a case series detailing our application of this technique in the context of acute trauma resuscitation during clamshell thoracotomy for traumatic arrest in the emergency department. Methods: A

retrospective case series of atrial cannulation during traumatic arrest was conducted in Charlotte, NC at Carolinas Medical Center an urban level 1 trauma center. Results: The mean rate of return of spontaneous circulation in our series, 60%, was greater than previously published upper limit of return of spontaneous circulation for penetrating causes of traumatic arrest. Discussion: Intravenous access can be difficult to establish in the hypovolemic and exsanguinating patient. Traditional methods of vascular access may be insufficient in the setting of central vascular injury. Atrial appendage cannulation during atrial cannulation is a quick and reliable technique to achieve vascular access that employs common methods from cardiac surgery to improve resuscitation of traumatic arrest.

118. 3D Human Renal Tubular Organoids Generated from Urine-Derived Stem Cells for Nephrotoxicity Screening

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Introduction: Acute tubular necrosis (ATN) is one of the most common causes of acute kidney injury. ATN is most frequently the result of the use of pharmaceutical compounds. It is extremely important to screen nephrotoxicity during drug development to accurately predict injury to the kidneys. Current preclinical methods of determining nephrotoxicity include 2D cultures of cell lines and rodent models, both of which are incapable of fully recapitulating the in vivo human response to drugs, contributing to the high failure rate upon clinical trials. The development of 3D human primary cell-based systems to replace the use of animals or the 2D culture for studying nephrotoxicity is urgently needed. Our previous studies demonstrated that human urine-derived stem cells (USC) originate from the renal glomerular parietal stem cell population, which can be obtained via noninvasive approaches[1, 2]. The goal of this study was to determine whether porcine-derived kidney- extracellular matrixes (ECM) could induce USC to differentiate into renal tubule epithelial cells to form 3D organoids as a biological tool to test nephrotoxicity. Methods: The renal cell phenotypic characteristics of 3D USC organoids were identified after induction with kidney ECM. Nephrotoxicity tests were performed in USC organoids three days after acetone (1%) and cisplatin (0.2 mM). Results: Human USC were differentiated into renal tubular epithelial cells in 3D organoids after being induced by kidney ECM. Levels of CYP2E1 and KIM-1 in 3D organoids were significantly increased in response to acetone and cisplatin. Conclusion: This 3-D culture system provides an alternative tool for nephrotoxicity screening and research.

119. 3D Printing of Orbital Floor Stamps: Feasibility and Efficacy in Reconstruction of Orbital Floor Fractures

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Introduction: Three-dimensional (3D) printing is widely used in craniofacial surgery to enhance pre-operative planning, surgical precision, and patient outcomes. However, this technology comes with high costs and lengthy turnaround times that hinder its broad application in acute craniofacial trauma cases. Industry-printed orbital floor implants cost \$8,000 on average and require several days of production time. We previously innovated a novel approach using in-house 3D printers to create contour models to generate patient-specific orbital floor implants. This method enables trauma centers to create patient-specific anatomical implants in a few hours and we hypothesized that this could be done a fraction of the cost of industry-produced implants. Methods: A retrospective cohort study was performed for 14 patients who have undergone orbital floor reconstruction using either in-house or industry-printed 3D models at our institution from 2019 to 2022. Demographic information (age, sex, comorbidities, type of trauma, and BMI), perioperative data (operative length, blood loss, and length of hospital stay), and postoperative results (complications, functional outcomes, and subjective aesthetic outcomes) were collected. In-house orbital floor 3D stamps were designed using mirrored patient CT scans and printing costs were retrieved from our in-house 3D printing lab. Results: In-house 3D-printed stamps were used as contour models to press absorbable plates (Sonicweld®, KLS Martin) into patient-specific implants, and associated costs were compared

to those for industry-created custom implants. Implants created with the help of in-house 3D printing costed 85% less than industry 3D printing (\$998 and \$6,701, respectively). In-house 3D printing averaged a turnaround time of 3.5 hours and was quicker than the industry average of several days. There were no significant differences found in complication rates and no patients in either group required re-operation. Conclusions: This new method of in-house 3D printing to treat orbital floor fractures is rapid, low-cost, and as clinically effective as industry 3D-printed implants. Due to its quick turnaround time, this approach contributes unique value in acute trauma settings where patients may require urgent operation. With greater adoption of this technology, we hope that trauma centers can offer more patients access to custom orbital floor implants, shaped to their own individual anatomy.

120. CT-based 3D-Printed Occlusal Splints for Repair of Acute Occlusal Trauma: A Feasibility Study

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Introduction: Mandible fractures account for a large percentage of craniofacial trauma. In complex orthognathic and mandibular cases, virtual surgical planning (VSP) and patient-specific models are frequently used to reduce operative times and improve accuracy of reconstruction. These models often include occlusal splints, which can stabilize the occlusion and aid with osteotomies. However, occlusal splints often require supplemental intraoral scans and several days of production time. This study explores the feasibility of rapid in-house design of occlusal splints using only CT imaging, without the supplementation of high-resolution intraoral scanners. **Methods:** For two patients with acute occlusal trauma, DICOM files were obtained from CT scans and imported into Materialise Mimics for bone thresholding. The maxilla, mandible, and damaged fragments were individually segmented and subsequently exported to Geomagic for virtual surgical reduction. If occlusal interference was present, fine adjustments were made with the aim of optimizing molar occlusion and incisal relationship. 3D occlusal splints were created and printed in UMA 90 resin using a Carbon M1 printer at our in-house 3D printing lab. Intraoperatively, the 3D printed occlusal splint was soaked in betadine and placed intraorally prior to wiring. **Results:** The average material cost for printing a resin occlusal splint was \$20.43, with a total printing cost of \$329.10 including labor. Turnaround time averaged 6.5 hours (3 hours of design and 3.5 hours of printing). Intraoperatively, the 3D printed occlusal splint set flawlessly in the patient's teeth, aligning the mandibular fragments and allowing for plating of the mandible fractures with ease. **Conclusions:** With the seamless intraoperative application of a 3D printed occlusal splint, this study suggests that designing occlusal splints from solely CT imaging may be viable. This method would contribute unique value in an acute trauma setting where time is limited and only CT imaging is available. Additionally, in traumatic cases with multiple mandible fractures, creating an occlusal splint would aid in stabilizing mandible fragments and allow for accurate plating. Further application of this technique will allow for refinement and outcomes analyses.