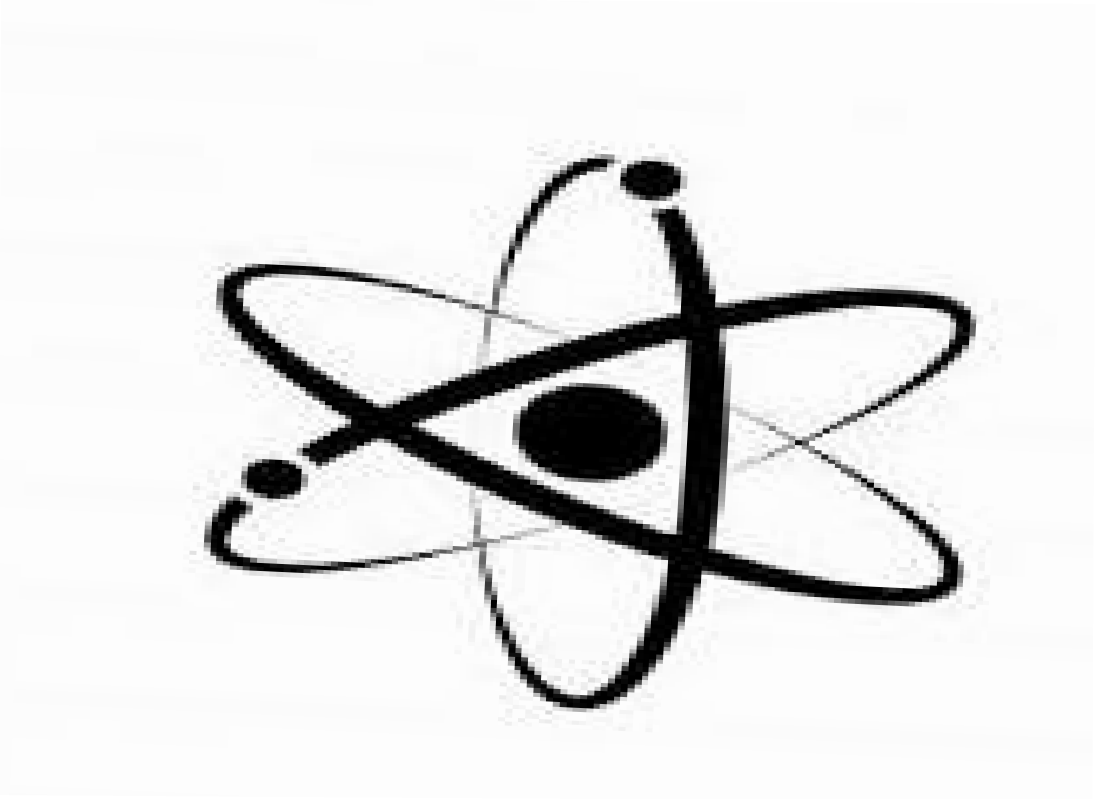
Surgical Sciences

Thirty-Second Annual Residents' and Fellows' RESEARCH DAY

WAKE FOREST UNIVERSITY SCHOOL OF MEDICINE



NOVEMBER 14, 2024

Research Day Chairperson
John Jackson, 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 32nd 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 Accordingly, you acknowledge and agree that by participating in the event, you will receive and maintain any unpublished information or materials in confidence until such time as the information or materials are published or otherwise made publicly available by the originating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 Box Lunch *Biotech Place Atrium*
1:00 pm – 2:00 pm…….	Research Lecture Bruce J. Tromberg, MD “Accelerating Innovation and Technology Development through Engineering-Medicine Partnerships” *Biotech Place Auditorium*
2:00 pm – 4:00 pm…….	Presentation and Judging of Posters *Biotech Place Atrium*
6:00 pm – 7:00 pm…….	Cocktail Hour *The Graylyn Estate*
7:00 pm…….....	Reception Dinner Awards Presentation *The Graylyn Estate*

KEYNOTE SPEAKER

Bruce J. Tromberg, MD

Director of the National Institute of Biomedical Imaging and Bioengineering at the National Institutes of Health

Dr. Tromberg is the Director of the National Institute of Biomedical Imaging and Bioengineering (NIBIB) at the NIH where he oversees research programs focused on developing, translating, and commercializing engineering, physical science, and computational technologies in biology and medicine. He leads NIBIB's Rapid Acceleration of Diagnostics technology (RADx Tech) initiative, established in 2020 to increase SARS-COV-2 testing capacity and performance, and broadened in 2023 to include over the counter (OTC) and point of care (POC) devices for additional diseases and conditions. His laboratory, the Section on Biomedical Optics (SBO) in the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), develops portable, bedside, non-contact, and wearable technologies for quantitative sensing and imaging of tissue composition and metabolism.

Prior to joining NIH in January 2019, Dr. Tromberg was a professor of biomedical engineering and surgery at the University of California, Irvine (UCI). During his 30-year academic career Dr. Tromberg served in multiple leadership roles, including, director of UCI's Beckman Laser Institute and Medical Clinic (BLIMC), PI of the Laser Microbeam and Medical Program (LAMMP), an NIH National Biomedical Technology Center, and co-founder of UCI's Department of Biomedical Engineering. Dr. Tromberg specializes in the development of optics and photonics technologies for biomedical imaging and therapy. He has co-authored more than 450 publications and holds 25 patents in new technology development as well as bench-to-bedside clinical translation, validation, and commercialization of devices. Honors and awards include the Michael S. Feld Biophotonics Award from Optica, the Britton Chance Biomedical Optics Award from the International Society of Optical Engineering (SPIE), and membership in the National Academies of Medicine and Engineering.

SURGICAL SCIENCES

DEPARTMENT CHAIRMEN:

Edward H. (Ted) Kincaid, M.D. .....Department of Cardiothoracic Surgery

Fabian Johnston, M.D. .....Department of General Surgery

John Wilson, M.D. .....Department of Neurosurgery

Craig M. Greven, M.D. .....Department of Ophthalmology

Cynthia Emory, 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 2024
PLANNING COMMITTEE

HOST DEPARTMENT:
INSTITUTE FOR REGENERATIVE MEDICINE

John D. Jackson, PhD.....Chair, Wake Forest Institute for Regenerative Medicine
Garrett S. Bullock, PhD, DPT.....Co-Chairperson, Department of Orthopedic Surgery

Committee Members

Lydia Durr.....Hypertension & Vascular Research

Shanna J. Ellison.....Hypertension & Vascular Research

Shea Gilliam-Davis, PhD.....Hypertension & Vascular Research

Angela Hockley.....Hypertension & Vascular Research

Jasmine L. Malachi, MA.....Hypertension & Vascular Research

KEYNOTE SPEAKERS (PAST 6 YEARS)

2018	Todd E. Rasmussen, MD, FACS Uniformed Services University School of Medicine
2019	Andreas K. Lauer, MD Oregon Health & Science Universtiy
2020	Ana H. Kim, MD Columbia University Medical Center
2021	Rebecca Sippel MD, FACS University of Wisconsin-Madison
2022	Prasad S.Adusumilli, MD, FACS Memorial Sloan Kettering Cancer Center
2023	Gary H. Gibbons, MD National Heart, Lung and Blood Institute

AWARD RECIPIENTS (PAST 6 YEARS)

CLINICAL RESEARCH

	Gold Medal	Silver Medal
2018	Robert C. Siska, MD Plastic and Reconstructive Surgery Resident	Konstantinos Chouliaras, MD General Surgery-Oncology Resident
	David Harriman, MD General Surgery-Transplant Fellow	Ioannis Kontopidis, MD Cardiothoracic Surgery Fellow
	Mike C. Lin, BS Cardiothoracic Surgery Student	Tracey Pu, BS Cardiothoracic Surgery Student
2019	Christine Velazquez, MD Plastic and Reconstructive Surgery Resident	Suman Medda, MD Orthopaedic Surgery Resident
	Adam Campman Nelson, MD General Surgery Fellow	David Hobson, MD Cardiothoracic Surgery Fellow
	R. Andrew Hesse, BS Surgery-Ophthalmology Student	Harper Wilson, BS/BA Otolaryngology Student
2020	Mija Khan, MD Plastic and Reconstructive Surgery Resident	Jungwon Park, MD, PhD Plastic and Reconstructive Surgery Resident
	Christine Velazquez, MD General Surgery Fellow	Shiny Rajan, PhD Institute for Regenerative Medicine Fellow
	Vanessa Lukas, BA General Surgery-Urology Student	Ishetta Madeka, BA General Surgery-Oncology Student
2021	Jacob Maus, MD Plastic and Reconstructive Surgery Resident	Sydney Thomas, MD Surgery-Otolaryngology (Dentistry) Resident
	Griffin Bins, MD Plastic and Reconstructive Surgery Fellow	Berjesh Sharda, MD General Surgery – Transplantation Fellow
	Rohin Gawdi, BS General Surgery- Oncology Student	Symonne Martin General Surgery- Trauma Student

2022

Gold Medal

Maria Masciello, MD, MS
Surgery-Otolaryngology (Dentistry)
Resident

Griffin Bins, MD
Plastic and Reconstructive Surgery
Fellow

Ahmad Shamulzai, BS
Neurosurgery
Student

Silver Medal

Donald Browne, MD
Plastic and Reconstructive Surgery
Resident

Mary Duet, BS
Plastic and Reconstructive Surgery
Fellow

Greg Aiello, BS
Ophthalmology
Student

2023

Gold

Jessica Rauh, MD
Surgery-Pediatrics
Resident

Cecilia Schaaf, DVM
Surgery - Oncology
Fellow

Lauren Hostettler, MS
Surgery- General
Student

Silver

Kunhan Patel
Surgery - Otolaryngology (Dentistry)
Resident

Naresh Mahajan, PhD
Regenerative Medicine
Fellow

Amelia Davidson, BS
Surgery- Plastic & Reconstructive
Student

Bronze

Elizabeth Laikhter, MD
Surgery - Plastic & Reconstructive
Resident

Darnell Campbell
Surgery- Plastic & Reconstructive
Student

BASIC RESEARCH

	Gold Medal	Silver Medal
2018	Lily Velet, MD Urology Resident	Edward J. Doyle, III, MD Otolaryngology Resident
	Nima Pourhabibi Zarandi, MD Institute for Regenerative Medicine Fellow	Manuel U. Ramirez, PhD Hypertension and Vascular Research Fellow
	Omeed Rahimi, MS Hypertension and Vascular Research Student	Elizabeth R. Stirling, MS Hypertension and Vascular Research Student
2019	Amy P. Trammell, MD Orthopaedic Surgery Resident	Robert Siska, MD Plastic and Reconstructive Surgery Resident
	Tomohisa Yamashita, MD, PhD General Surgery Fellow	Omar A. Abdelaal, MD Institute for Regenerative Medicine Fellow
	Jordan Forte, BS Plastic and Reconstructive Surgery Student	Adam Jorgensen Institute for Regenerative Medicine Student
2020	Aaron Bradshaw, MD General Surgery-Urology Resident	Tyler Overholt, MD General Surgery-Urology Resident
	Brittany Liebenow, BA Neurosurgery Student	Ishetta Madeka, BA General Surgery-Oncology Student
2021	Robert Siska, MD Plastic and Reconstructive Surgery Resident	Richard A. Erali, MD General Surgery-Oncology Resident
	Nadeem Wajih, PhD General Surgery-Oncology Fellow	Anastasiya Gorkun, PhD Institute for Regenerative Medicine Fellow
	Ethan Shelkey, BS Institute for Regenerative Medicine Student	Yismeilin Feliz-Mosquea, BS General Surgery- Hypertension Student

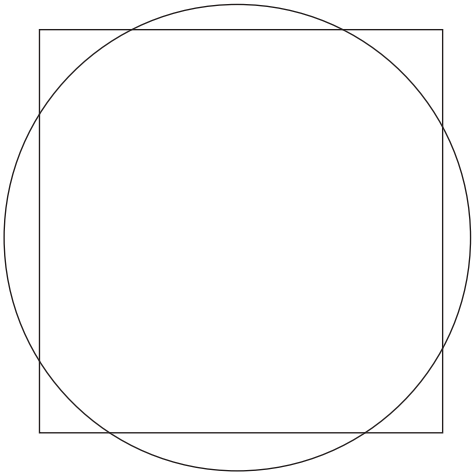
	Gold Medal	Silver Medal
2022	Gloria Sanin, MD Vascular and Endovascular Surgery Resident	Tameka Dean, DO Orthopedics Resident
	Li Tan, PhD Plastic and Reconstructive Surgery Fellow	Cecilia Schaaf, DVM, PhD Institute for Regenerative Medicine Fellow
	Yu-Ting Tsai, MS Cancer Biology Student	Nicholas Edenhoffer, BS Physiology and Pharmacology Student

	Gold	Silver	Bronze
2023	Rebecca Calafiore, MD Regenerative Medicine Resident		
	Jonathan Ray, MS Surgery - Hypertension Fellow	Gauri Kulkarni, PhD Regenerative Medicine Fellow	Wonwoo Jeong, PhD Regenerative Medicine Fellow
	Mohamed Gaber Surgery - Hypertension Student	Kelsey Willson Regenerative Medicine Student	Gemma Nomdedeu-Sancho, MS Regenerative Medicine Student

EDUCATIONAL RESEARCH

	Gold Medal	Silver 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	Thomas N. Steele, MD Plastic and Reconstructive Surgery Resident
2022	Michael Boyajian, MD Plastic and Reconstructive Surgery Resident	Gabriel Cambronero, MD General Surgery Resident
2023	Michael Boyajian, MD Surgery- Plastic & Reconstructive Resident Sasha Kondrasov Surgery- Plastic & Reconstructive Student	

Abstracts



1. The upper time limit of normothermic machine preservation of liver grafts from donation after circulatory death is yet to be defined

William Archie, MD Dionisios Vrochides, MD PhD

Clinical Science
Surgery-Transplant- Resident

Background: The normothermic machine perfusion pump (NMPP) could reshape the future of transplantation. Providing ex-vivo optimization, NMPP attenuates ischemic insult while replenishing energy. An understanding of machine perfusion time (MPT) impact and potential clinical benefits is paramount and necessitates exploration. This study aims to investigate the relationship between MPT and post-transplant graft function Methods: Retrospective review of the first 50 donation after circulatory death (DCD) grafts preserved using NMPP in a tertiary institution was performed. Essential preservation time points, graft parameters, recipient information, and postoperative outcomes were prospectively recorded. Post-transplant graft function was measured using L-GrAFT7. The first 20 recipients were allocated into the early group, considered the learning curve population for the center. The subsequent 30 were allocated into the late group. Recipients were also stratified into cohorts depending on MPT, i.e., short (< 8 hr.), medium (8 - 16 hr.) and long (> 16 hr.). Results: NMPP operational parameters were not predictive of L-GrAFT7. The early group had significantly less MPT and CIT than the late group, (553 minutes vs. 850 minutes, p<.001) and (127.5 minutes vs. 154 minutes, p=.025), respectively. MPT had no impact in either group. Conclusion: Increased MPT of DCD liver grafts had no adverse recipient results for the durations utilized in this population, indicating the upper limits, likely beyond 24 hr., have not been reached within this cohort. Future studies are necessary to determine whether longer MPT is beneficial or detrimental to graft function and, if the latter, what is the maximum safe duration. The effect of MPT on long-term outcomes must also be elucidated.

2. Patients who received DCD grafts preserved with normothermic machine perfusion had better 90-day outcomes than those who received DBD grafts preserved with ischemic cold storage

William Archie, MD Dionisios Vrochides, MD PhD

William Archie, Rohit Mantha, Carly Janusek, Katheryn Peterson, Damien Huckleberry, Vincent Casingal, Roger Denny, Lon Eskind, David Levi, Jose Soto, Allyson Cochran, Dionisios Vrochides
Surgery-Transplant
Clinical Science- Resident

Background: Liver transplant is the only definitive treatment for end stage liver disease. Demand continues to far outpace supply. To expand the donor pool, alternatives to ischemic cold storage (ICS) have been explored, including the normothermic machine perfusion (NMP) pump. Previous studies have demonstrated the ability of NMP to rescue donation after circulatory death (DCD) grafts allowing increased liver transplants. In this study, we aim to investigate the impact of DCD NMP utilization on early post-operative outcomes compared to ICS.

Methods: 55 LT recipients who received a DCD graft preserved with NMP pump over a two-year period were matched against recipients of all organs preserved with ICS in the five years prior to adoption of NMP. Propensity match (2:1) was utilized for Native MELD, indication for transplant, BMI, major comorbidities, age, and gender. Retrospective review of length of stay (LOS), ICU LOS, operative time, intraoperative blood products received, unplanned reoperation (UPRO), 90-day readmissions, 90-day endoscopic retrograde cholangiopancreatography (ERCP), and discharge disposition were also analyzed. To mitigate the impact of inflation, we compared all 174 liver transplants (n=55 with NMP, n=119 without NMP) performed at our institution over the last two-year period since the introduction of the NMP pump in our practice for cost analysis.

Results: The NMPP cohort had a lower 90-day readmission rate (40% vs 51.4%; p = 0.028). 90-day ERCP rate was not statistically significant between the two cohorts (27.3% vs 26.5%; p = 0.11), but those who required ERCP in the ICS cohort were more likely to require additional ERCP's within the same 90-day period (72.2% vs 20%; p = 0.004). Operative time was higher in the NMP cohort but not statistically significant (436.2 minutes vs 418.04 minutes; p = 0.15). LOS (p = 0.44), ICU LOS (p=0.09), UPRO (p=0.06), intraoperative total blood products (p = 0.37), and PRBC (p = 0.04) all failed to reach statistical significance. The ICS cohort had 2 patient mortalities and 1 liver graft with primary non-function requiring

emergent retransplant. The NMP cohort had neither. While not statistically significant, compared to the ICS cohort, the DCD NMP cohort total cost was 4.5% lower (p = 0.11). Fixed cost was not significantly different between the two cohorts (p = 0.67). However, DCD NMP cohort variable cost was 6.2% lower than ICS cohort (p = 0.05).

Discussion: The NMP cohort had significantly fewer 90-day readmissions and, despite similar 90-day ERCP rates, was less likely to require multiple ERCP's. This indicates that NMP may improve complication rates among liver transplant patients despite utilization of extended criteria grafts. This improvement in outcomes is reflected in the significant reduction of index admission variable cost. Applying the percent cost reduction to the previously described average transplant cost in the United States of $215,000, utilization of NMP could save $9,600, helping offset the price of the pump itself. Long-term outcomes including cost with a larger NMP cohort with more long-term follow up is needed.

3. Endocrine-targeting Therapies Interact with Short-Chain Fatty Acids to Reduce ER+ Breast Cancer

Alana Arnone, PhD Dr. Katherine L. Cook, PhD

Adam S. Wilson Valerie S. Payne Katherine L. Cook
Cancer Biology/Surgery-Hypertension
Basic Science-Fellow

Background: Emerging evidence suggests that dysregulated gut microbiota may contribute to the development and recurrence of estrogen receptor-positive (ER+) breast cancer (BC), as BC patients often exhibit altered gut microbial populations. Although oral endocrine therapies effectively treat and prevent ER+ BC, recurrence remains possible up to 10 years post-diagnosis. The potential for manipulating the gut microbiome and its metabolites to enhance the efficacy of oral endocrine therapies and improve BC outcomes is underexplored. Preliminary data indicate that supplementation with bacterial-derived metabolites, such as short-chain fatty acids (SCFAs), can influence the initiation, progression, and treatment of ER+ BC. Therefore, this study aims to determine whether SCFAs can enhance the efficacy of oral endocrine therapies against ER+ BC by modulating the gut microbiome.

Methods: Female C57BL/6 mice on a Western diet received medroxyprogesterone acetate and were induced with 7,12-dimethylbenz[a]anthracene (DMBA) to develop breast tumors. Once tumors appeared, mice were randomized to continue on the diet or receive SCFAs in their drinking water. Similarly, MMTV-PyMT mice were placed on a Western diet and randomized to continue or receive SCFAs. Tumor-free survival was assessed in both models. To explore SCFAs' effects with tamoxifen (TAM), BALB/c mice were injected with 4T1.2ER+ cells and treated with TAM, SCFAs, or a combination. Tumor tissues were analyzed for G-protein-coupled receptors and the proliferation marker Ki67. Additionally, metagenomic analysis was performed on fecal samples from postmenopausal ER+ BC patients before and after aromatase inhibitor (AI) treatment.

Results: SCFAs in drinking water significantly extended tumor-free survival in the DMBA and MMTV-PyMT models. Further, SCFAs increased TAM efficacy, significantly reducing ER+ tumor growth compared to TAM or SCFAs alone. Metagenomic analysis showed that AI treatment increased several SCFA-producing gut microbes, including Parabacteroides merdae and Dysosmobacter welbionis.

Conclusions: SCFAs alone reduce breast carcinogenesis and enhance TAM efficacy against ER+ tumor growth. AI treatment also appears to increase levels of SCFA-producing gut microbes, potentially influencing its efficacy. These findings suggest SCFAs could be a promising adjunct to oral endocrine therapies for ER+ breast cancer.

4. Association of frailty index with follow up in patients with diabetic retinopathy

Logan Bearfield, MS3 Sally Ong, MD

Manuela Gutierrez Velez, Margaret Havunjian; Sally S. Ong
Surgery-Ophthalmology
Educational Science- Student

Purpose: Frailty describes the loss of biological reserves across multiple organ systems. An electronic frailty index (eFI) quantifying 54 total deficits and integrated within the Electronic Health Record was previously developed by Callahan et al. at Wake Forest University and has been associated with adverse postsurgical outcomes, Emergency Department visits

and hospitalizations. We hypothesize that the eFI is associated with decreased rates of follow up in patients with diabetic retinopathy.
Methods: A retrospective chart review was conducted on patients with diabetic retinopathy who underwent an initial eye examination by a retina specialist at Wake Forest Baptist Health from January 1, 2017, to December 31, 2019. Data was collected for up to 2 years from the initial retina visit, comparing outcomes such as loss to follow-up (LTFU) status against eFI scores.
Results: Of the total 249 patients included, 203 (81.5%) were lost to follow up at some point during the study period. There is a statistically significant relationship between LTFU and patients considered to be Pre-fail (eFI 0.1-0.21) or Frail (eFI >0.21) when compared to Fit patients (eFI <0.1) (p=0.0035). Visual acuity outcomes and duration of follow-up were not significantly affected by eFI levels. Pre-frail (OR 0.39 (0.18, 0.82); p= 0.0137) and frail (OR 0.23 (0.10, 0.53); 0.0006) individuals had significantly lower odds of receiving anti-VEGF injections compared to fit individuals, even after adjusting for covariates.
Conclusions: Patients with higher eFI scores have higher rates of LTFU in the retina clinic. The Frailty Index can be a powerful tool in predicting loss to follow up in patients with diabetic retinopathy. To our knowledge, no prior studies have researched the association of eFI and loss of follow up in patients with diabetic retinopathy.

5. Innervation of the Bioengineered Muscle Construct in a Muscle-Nerve Injury Model

Erika Billman Ji Hyun Kim, PhD

Vladimir Mashanov, Aurelia Poerio, Young Min Ju, Ickhee Kim, Sang Jin Lee, Bill Vaughan, John Jackson, Anthony Atala, James J. Yoo, Ji Hyun Kim
Wake Forest Institute Regenerative Medicine (WFIRM)
Basic Science- Fellow

Introduction: Volumetric muscle loss is among the most debilitating conditions in regenerative medicine. Existing standards of care rarely lead to full recovery. New tissue engineering-based treatments are currently under development. One of the remaining issues is the timely and proper innervation of implanted muscle cells. To address this issue, this study develops an implantable skeletal muscle construct that can enhance intrinsic peripheral nerve regeneration and innervated muscle fiber formation.
Methods: We developed a microsphere-loaded neurotrophic factor (NF) delivery system involving PLGA microspheres loaded with ciliary neurotrophic factor (CNTF) and glial cell line-derived neurotrophic factor (GDNF). The three-dimensional skeletal muscle construct was bioprinted using primary human muscle progenitor cells and the NF delivery system. The construct was implanted into a rat ectopic transposed nerve model to investigate the capability of promoting host nerve migration and neuromuscular junction (NMJ) formation. The ability to regenerate skeletal muscle and peripheral nerve was evaluated in the rat traumatic muscle-nerve injury model. The nerve-muscle injury model was created by removing approximately 30% of the tibialis anterior muscle and resecting the distal end of the common peroneal nerve in rats. Two bioprinted skeletal muscle constructs were implanted into the muscle defect. The severed host nerve was directed to the construct via a silicone conduit. The levels of implant innervation and functional maturation were assessed.
Results: In the transposed nerve implantation study, the CNTF/GDNF-loaded MSs significantly increased the sprouting from the host nerve. The growing neurites formed NMJs with the muscle cells in the construct. Electromyography confirmed the improved functional integration of the host nerve with the constructs containing the NF-loaded MSs. In the study using the muscle-nerve injury model, the nerve successfully regenerated through the conduit, and the neurite sprouting in the construct with NF-loaded MSs was 67% higher with improved NMJ formation than the construct without NF. Approximately 60% of the implanted hMPCs maintained their muscle phenotype with adequate vascularization.
Conclusions: This study validates a clinically relevant strategy that facilitates the innervation of bioengineered skeletal muscle implants, improving functional maturation and physiological control of the grafted muscle cells in vivo.

6. Innovating Microsurgery Training: A Simulation and Video-Based Curriculum

Michael Boyajian, MD Christopher Runyan, MD, PhD

Davidson A, Molair W, James A, Runyan CM, Llull R
Surgery-Plastic & Reconstructive
Educational Science- Resident

Purpose: Microsurgical technique is essential to the armamentarium of the plastic surgeon. Herein, the purpose of this project was to develop a simulation and video-based curriculum to accelerate the microsurgical learning curve of junior

trainees. Methods: A 3D printed microsurgical simulator was developed, with silicone mock vessels of various sizes. To guide learners, we produced a video-based curriculum with stepwise "Needle Control", "Knot Tying", and "Vessel Work" drills. Learners are meant to navigate through this portable training regimen at their own convenience. In this pilot study, we gave 10 medical students curriculum access for 2 weeks. Before and after this intervention, the participants filled out surveys and performed live rat femoral artery anastomoses under a recording microscope. Videos from 3 senior plastic surgery residents served as our control group. Two attendings graded all anonymous videos using the Stanford Microsurgery and Resident Training (SMaRT) Scale. Results: Following the 2-week training program, student participants improved their live rat anastomosis times from 71.2 to 32.1 minutes (compared to the control group's 26.6 minutes). Additionally, the students demonstrated statistically significant improvements ($p<0.01$) across all SMaRT Scale metrics and approached the scores of the senior plastic surgery residents. Conclusions: An accessible simulation and video-based microsurgical curriculum was developed. A pilot group of medical students improved in terms of subjective confidence, speed, and objective microsurgical skill. Based on this pilot project success, the curriculum has since been approved to be incorporated into the formal Plastic Surgery training at our institution.

7. Optimization of Artificial Mitochondrial Transfer into Human Pancreatic Islets

Lori Byers, Research Technician Giuseppe Orlando, MD, PhD

Quentin Perrier, Veronica Lisi, Arunkumar Rengaraj, Wonwoo Jeong, Rita Bottino, Christopher A. Fraker, Alice Tomei, Sandrine Lablanche, Sophie Maiocchi, Giuseppe Orlando, Amish Asthana
Surgery-Transplant
Basic Science- Student

Introduction.
Artificial mitochondrial transfer (AMT), inspired by the natural process of mitochondria transfer between cells to repair damage and treat diseases, can improve native mitochondrial function, reduce oxidative stress, and promote cellular repair. Thus, AMT could be beneficial in regenerative medicine approaches involving cell and organ transplantation. In beta cell replacement therapy for the treatment of type 1 diabetes, AMT could be used to enhance islets and improve their ability to resist the stress inherent to the process of transplantation into humans. However, AMT for islets has not been tested before. The objective of this pilot study was to compare three methods to transfer healthy mitochondria into isolated human islets (spheroids).

Materials & Methods
Healthy mitochondria were isolated from human cardiac fibroblasts (HCFs). Three AMT conditions were tested:
- AMT1: Islets were centrifuged at 1500xG, 15min, 4°C, resuspended in HBSS in a 96-well plate for 4h at 37°C, then centrifuged again.
- AMT2: like in AMT1 but with centrifugation at 300xG.
- AMT3: Islets were resuspended in HBSS with/without mitochondria in a 96-well plate, then placed on an orbital shaker for 4h at 37°C.

Endpoints were: islet viability (Syto13-PI), glucose stimulated insulin secretion (GSIS) index for islet functionality, and mitochondria internalization for the best protocol (confocal microscopy/western blot) compared to untreated islets.

Results
AMT1 and AMT2 significantly reduced cell viability (57.1±4.5% and 63.9±4.1%, $p<0.05$) compared to AMT3 and control (88.1±1.1% and 90.4±1.1%). There was no difference in GSIS index between AMT3 and control (2.27±0.10 vs. 2.34±0.22). Mitochondrial internalization was observed on confocal (exogenous mitochondria were pre-labeled with mitotracker red and membrane of live cells was labelled in green with calcein) and an increase in the COX4/GADPH signal (1-fold for control, vs. 1.6 for ATM3 from 0.9x106 HCFs, vs. 6.3 for ATM3 from 13.6×106 HCFs) was confirmed compared to untreated islets.

Conclusion
We concluded that the ATM3 was the optimal method among these tested.

8. A 20-Year Single-Center Experience with Zero HLA-Mismatched Deceased Donor Kidney Sharing: Time to Revisit the Policy?

Arianna Cabrales, MD Dr. Robert Stratta, MD

Jigish Vyas, Chris Webb, Colleen Jay, Emily McCracken, Alan Farney,
Giuseppe Orlando, Robert J Stratta
Surgery-Transplant
Clinical Science- Fellow

Introduction: National sharing of zero HLA-mismatched kidneys affords the opportunity to improve outcomes and shorten waiting times in selected patients. However, it is uncertain if this system is benefiting the appropriate patient population.

Methods: We performed a retrospective review of all deceased donor kidney transplants (DDKTs) at our center from 1/1/2002 through 12/31/2023 using our institutional database. All patients received depleting antibody induction with FK/MPA/prednisone maintenance therapy.

Results: We identified 230 recipients of zero HLA-mismatched kidneys including 180 (78.3%) primary and 50 (21.7%) retransplants. Mean donor age was 40.1±17.2 years, mean KDPI was 52±28%,186 kidneys (80.9%) were imported, and 117 (50.9%) were pumped. Mean cold ischemia time was 22.6±6.2 hours and delayed graft function occurred in 19.1%. Mean recipient age was 51.0±14.7 years, including 71 patients (30.9%) ≥60 years of age. In 74 cases (32.2%), the recipient was ≥20 years older than the donor. Mean time on the waiting list was 17±20 months. 185 recipients (80.4%) were White and 30 (13.1%) were Black although the latter comprised 40% of our waiting list during the study period. The annual proportion of zero HLA-mismatched DDKTs decreased from 16.7% to 7.2% to 4.3% over time and correlated with changes in national allocation. 52 kidneys (22.6%) were transplanted into patients with a PRA≥80% whereas 121 patients (52.6%) had a PRA<20%. One-year patient and kidney graft survival rates were 98.3% and 95.2%, respectively, whereas 5-year rates were 83.6% and 75.4%, respectively. Mean time to graft loss was 79±56 months and mean time to death was 90±56 months. Death with a functioning graft was the most common cause of graft loss, accounting for 70/126 (55.6%) graft losses.

Conclusions: At our center, zero HLA-mismatched DDKT activity has declined in the past 2 decades and these kidneys are disproportionately transplanted into older White recipients with relatively short waiting times and low PRA levels. Based on these findings, we recommend that policy changes be considered regarding the allocation of zero-HLA mismatched kidneys to preferentially benefit highly sensitized patients.

9. In-House 3D Printed Microstomia Splints: A Cost-Effective and Efficient Solution

Brandon Casas, MD Joseph Molnar, MD, PhD

Eric Zeng
Surgery-Plastic & Reconstructive
Clinical Science- Resident

Introduction: Microstomia, a congenital or acquired condition characterized by an abnormally small mouth opening, can be particularly debilitating for patients recovering from burns, trauma, connective tissue disorders, or head and neck cancer treatments. Oral splints are a cost-effective and efficient solution for maintaining mouth aperture size in patients at risk of developing microstomia and can also serve as a therapeutic modality for patients who have already contracted the condition. Over the years, various intraoral splint designs have been developed -- many of which have been commercialized and can cost up to $580 per unit. Other barriers to effective treatment include compliance due to comfort or efficacy of the device itself. The recent surge in accessibility to 3D printing technology has introduced an innovative solution, enabling physicians to manufacture custom-made splints at a fraction of the cost.

Objective: To assess feasibility, cost-effectiveness, and clinical outcomes of various in-house 3D printed mouth splints compared to industry options. Additionally, we present a case series at our institution utilizing low-cost, in-house 3D printed mouth splints.Methods: Microstomia splints were 3D printed at our institution and adapted from an initial design by Nedelec et al. (2024) to better suit the needs of pediatric patients. Microstomia splint treatment was performed by occupational therapists. Additionally, an analysis was conducted to evaluate the cost-effectiveness, clinical outcomes, and feasibility of

various other in-house 3D printed splint designs.

Results: Five 3D printed splint designs met inclusion criteria. Only one design was deemed suitable for pediatric patients, though its use was discontinued due to patient discomfort and tolerance. The mean weighted cost was $2.05 ± 0.96 per splint. Oral aperture following therapy showed a mean weighted horizontal improvement of 0.79 ± 0.20 cm, and vertical improvement of 1.00 ± 0.23 cm. Average therapy duration was 5.25 ± 2.17 months. At our institution, three patients are undergoing active splint therapy, with one-month post-therapy reports pending, which will evaluate improvements in maximal interincisal opening (MIO) and patient satisfaction scores.

Conclusion: In-house 3D printed mouth splints present a low-cost and promising solution for treating microstomia, with reported improvements in oral aperture. The literature remains very limited regarding long-term effectiveness and broader clinical adaptation in pediatric patients. Given the significant burn case load at our institution, we are eager to scale up in-house oral splint production and extend these low-cost solutions to all patients. Offering customizable splints at a fraction of the cost will help alleviate the financial strain associated with expensive commercial options. Furthermore, the global implications of these affordable devices are significant, especially in third-world countries where access to healthcare is limited and burn rates are higher.

10. Characterization of the Epithelial Glycocalyx in Abdominal Adhesion Formation

Reid Christensen, Medical Student Samuel P. Carmichael II, MD, MS

Samuel P. Carmichael II, Kevin A. Jankowski, David M. Kline, Jessica C. Cardenas,
Frank C. Marini, John B. Holcomb, Anthony Atala
Wake Forest Institute Regenerative Medicine (WFIRM)
Basic Science- Student

Background: Intra-abdominal adhesions (IAA) are scar tissue networks that develop in the abdomen after 90% of abdominal operations, conferring a life-long risk of small bowel obstruction (SBO), which is associated with annual health care costs of $2.3 billion per year in the USA. The FDA-approved resorbable barrier Seprafilm® does not reduce SBO, leaving an unmet need for novel and reliable adhesion prophylactic strategies. Recent evidence has shown that the cells lining the abdomen (i.e. peritoneal mesothelial cells, PMC) undergo a pro-fibrotic transformation (i.e. mesothelial to mesenchymal transformation, MMT) along with changes to their surface biology following tissue injury and hypoxia. The PMC surface glycobiology (i.e. epithelial glycocalyx, EpGL) is vital in protecting abdominal organs from frictional tissue injury under homeostatic conditions, and alterations to this complex structure may facilitate intra-abdominal adhesion formation.

Methods: We have previously developed a clinically relevant IAA model in adult male Sprague-Dawley (SD) rats, combining abdominal wall ischemic buttons with inter-organ abrasion. A cohort of healthy adult male SD rats were humanely euthanized, followed by peritoneal fluid (PF) collection and multi-organ tissue specimen procurement for evaluation of the healthy EpGL and PF environment. Subsequently, additional groups of adult male SD rats were euthanized at time points 24 hours, 72 hours, and 14 days post-operation. Adhesion index scores (AIS) were calculated, PF collected, and tissue samples were procured for animals at each time point. Electron microscopy was conducted using 2.5% Glutaraldehyde as a fixative, followed by staining with 0.05% Alcian Blue 8GX and post-fixed with 2% Lanthanum nitrate mixed with 1% Osmium tetroxide. EpGL height was measured using representative PMCs and averaged for samples at each time point. Statistical analyses were conducted with one-way ANOVA with pairwise comparison using Prism software.

Results: The EpGL in healthy rat abdominal organ specimens was well-visualized with our novel TEM staining approach. No differences were found between the overall mean AIS, abdominal wall only mean AIS and interorgan only mean AIS for adhesions model animals euthanized at all time points. Sham animals did not generate adhesions at any time point. EpGL height was significantly decreased at time points 24hr, 72hr, and 14d compared to baseline.

Conclusions: IAA established within the first 24 hours following surgical tissue injury are not different in severity by day 14 in our clinically relevant rat model, highlighting the importance of immediate insertion of adhesion prophylaxis throughout the abdomen at the conclusion of operation. To our knowledge, this is the first application of a glycoprotein-specific staining protocol using Lanthanum nitrate and Alcian Blue for characterization of the abdominal EpGL. EpGL height was significantly reduced after injury, and we observed incremental regrowth in EpGL height across our time points. Next steps of this work include further characterization of the PMC surface biology using immunofluorescence imaging.

11. Hypertension Predicts Elevated Plasma Cytokine Levels in a Rat Model

Reid Christensen, Medical Student Stacey Q. Wolfe, MD

Connor R. Margraf, Kathleen C. Meinhardt, Brock R. Yager, Omar Ashraf, Carol A. Kittle, Debra I. Diz, Zhidan Xiang, Stacey Q. Wolfe
Surgery-Neurosurgery
Basic Science- Student

Introduction: Hypertension is a leading risk factor for cardiovascular disease, stroke, chronic kidney disease, and dementia, affecting approximately 50% of the United States population. Although medical therapy for hypertension allows clinicians to achieve better blood pressure management, only 39.64% of patients on hypertensive medication have a well-controlled blood pressure. Hypertensive patients have been shown to express increased levels of inflammatory cytokines, particularly interleukin 12 (IL-12), suggesting there is a higher level of baseline systemic inflammation in this population. Previous research from our lab has illustrated the direct correlation between plasma IL-12 and blood pressure, in a rat model of cardiometabolic syndrome, which mirrors results from human studies. We therefore sought to better understand the mechanisms by which hypertension leads to increased systemic cytokine expression.

Interferon gamma (IFN-γ) from T lymphocytes is implicated in the pathogenesis of hypertension; like IL-12, is positively correlated with elevated blood pressure in humans. IL-12 signaling from macrophages induces release of IFN-γ, and the complex crosstalk between macrophages and T lymphocytes is of great interest to hypertension researchers. Levels of interferon gamma-induced protein 10 (IP-10) released by macrophages have been shown to be directly correlated with blood pressure as well. Following activation by IFN-γ, IP-10 binds to CXCR3 and mediates chemotaxis, apoptosis, cell growth, and angio-stasis. It is likely that the dysregulation of this IL-12, IFN-γ, IP-10 axis is responsible for the sustained damaging effects of hypertension, and we sought to investigate whether our hypertensive rat model similarly showed up-regulation of these cytokines. Better understanding of the cytokine profile in hypertension will help inform future therapies, which should address the inflammatory milieu that underlies various disease states in hypertensive patients.

Methods: We used a previously developed hypertensive strain of adult male and female (mRen2)27 rats, with adult male and female Sprague-Dawley (SD) rats as our control. Baseline body weights and tail blood pressure measurements were recorded. Tail blood collection for cytokine analysis was collected via simple tail snip technique under vaporized isoflurane. 1-1.5mL of whole blood was collected, centrifuged, and plasma was separated and stored at -80°C until analysis. Serum interleukin-12 (IL-12) and interferon gamma (IFN-γ) levels were measured using ELISA in female (mRen2)27 and Sprague Dawley (SD) rats, and interferon gamma-induced protein 10 (IP-10) levels was measured using ELISA in male (mRen2)27 and Sprague Dawley (SD) rats, based on availability of serum plasma from each cohort.

Results: Mean arterial pressure (MAP) measurements for the mRen2 cohort were significantly higher than our SD cohort (average MAP 164 vs 112, $p<0.001$). Cytokine expression of IL-12 was elevated in our mRen2 hypertensive female cohort (804 ± 280 pg/ml vs 368 ± 208 pg/ml, $p<0.001$). Levels of IFN-γ were elevated in our hypertensive female cohort (112 ± 45 pg/ml vs 56 ± 19 pg/ml, $p<0.05$). Levels of IP-10 were elevated in our hypertensive male cohort (246 ± 61 pg/ml vs 124 ± 36 pg/ml, $p<0.01$). A positive correlation was identified between cytokine expression of all three cytokines and rat mean arterial pressure ($p<0.001$, $p<0.01$, and $p<0.01$ respectively).

Conclusions: Hypertension causes various pathologic changes in the body and predisposes patients to many different disease states. Our findings suggest that upregulation of IL-12, IFN-γ, and IP-10 in human patients can be replicated with a rat model of cardiometabolic syndrome, serving as a pathway for further study into the cell source and molecular mechanisms responsible. Future work will include investigating levels of plasma cytokines in our hypertensive and normotensive animals following induction of intracerebral hemorrhage, as well as the degree of angiogenesis and endogenous hematoma clearance following hemorrhage.

12. Harnessing gut microbiota and microbial-derived short-chain fatty acids to improve combinatorial chemotherapy/immunotherapy efficacy in triple-negative breast cancer

Kenysha Clear Katherine Cook, PhD

Adam S Wilson, Valerie S Payne, David R Soto-Pantoja, and Katherine L Cook
Surgery-Hypertension
Basic Science- Student

Background
Triple-negative breast cancer (TNBC) is one of the most aggressive subtypes of breast cancer (BC), accounting for 15-20% of all invasive diagnoses. While lacking hormone receptor expression for estrogen, progesterone, and HER2, the discovery that this subtype is the most immunogenic, propelled the use of anti-PD-1 (programmed death protein 1) immune checkpoint blockade (ICB) immunotherapy, in combination with chemotherapy, as a standard of care systemic treatment option for TNBC patients. While this advantageously impacted TNBC patient outcomes like survival, only a subset of patients demonstrated treatment response, suggesting a need to better understand patient drivers of response to these therapies. The gut microbiome, in particular, specific bacterial species and their metabolites, have become of interest as potential positive facilitators of therapeutic response in cancer. The increased abundance of gut Akkermansia muciniphila; a mucin-degrading, short-chain fatty acid (SCFA) postbiotic-metabolite producing species, has been positively associated in both preclinical and clinical cancer settings with enhanced single agent therapy response. Currently however, there is no published literature demonstrating direct oral supplementation of this species or its associated-derived metabolites improves combination chemoimmunotherapy response in the TNBC setting.
Methods
To investigate this, our lab used murine EO771 (n=8-12/group) syngeneic models of TNBC where female C57Bl/6 tumor-bearing mice were treated with doxorubicin (DOX) chemotherapy and anti-PD-1 immunotherapy weekly for 3 weeks. At drug treatment initiation, subsets of mice were stratified to also receive either 20x106 CFUs of Akkermansia muciniphila via oral gavage daily or associated-SCFAs (180 mM sodium acetate, 60 mM sodium propionate, and 60 mM sodium butyrate) in their drinking water until the end of the study. To assess differences in primary tumor growth, tumor volume was recorded every 2-3 days throughout the study and end of study tumor weight was measured.
Results
Results from our models demonstrate that mice orally supplemented with Akkermansia muciniphila or exogenous SCFAs and treated with DOX and anti-PD-1 ICB have significantly ($p>0.05$) smaller tumors when compared to isotype control animals.
Conclusions
Our data demonstrate direct oral supplementation of Akkermansia muciniphila or its associated-derived SCFA metabolites leads to improved chemoimmunotherapy efficacy in murine models of TNBC. These data suggest combination therapy efficacy in TNBC is potentiated by the gut microbiome and modulating these parameters could enhance patient outcomes.

13. Development of biomaterials incorporating decellularized ECM for fabrication of GI cancer organoids

Zachary Congress, PhD Candidate Dr. Shay Soker, PhD

Sachdeep Singh
Biomedical Engineering
Basic Science- Student

Introduction: Colorectal cancer (CRC), the second deadliest cancer worldwide, represents a burgeoning public health crisis which requires the development of advanced in vitro models for further research. When CRC is not detected early on, advanced CRC develops, which often becomes metastatic and holds a bleak prognosis. Current in vitro models for CRC are devoid of critical components present in the colon ECM, making them inadequate representations of intestinal tissue following carcinogenesis. The colonic ECM consists of a heterogeneous mix of proteins, mainly Collagen I-IV, as well as stromal cells which both support and direct the development of cancer. Current models utilizing non-native ECM such as Matrigel do not come close to recapitulating the cancerous tumor microenvironment. Without the inclusion of native proteins present in the cancerous stromal ECM, models of CRC are not capable of displaying authenticity in terms of cell-cell and cell-ECM interactions, ECM remodeling, drug response, and much more.

Methods: Human small intestinal tissue was first defatted and then decellularized to produce native dECM. Briefly, defatting involved scraping off the mucosal layer, mincing the tissue into small pieces, blending the tissue with several pulses, and then shaking the tissue in acetone for one hour. For decellularization, defatted tissue was subjected to osmotic shock and then treated with SDS for 4 hours followed by a long series of rinses to remove detergent. Decellularized tissue was then lyophilized, cryomilled, digested with pepsin in 0.1M HCl, dialyzed, and then re-lyophilized in preparation for use in our bioink. Varying percentages of derived dECM and GelMA were combined in phenol-free media and warmed at 37 °C to prepare our bioink. Two cell types were studied: an aggressive intestinal cancer cell line (HCT-116) and a hepatic stellate fibroblast cell line (LX2). Organoids of 50 uL in volume were manually printed by exposing them to UV light for 10 seconds at an intensity of ~350 mW/cm2. Both cell types were cultured in high glucose DMEM, 10% FBS, & 1% AA, and were printed at a density of 5E6 cells/mL.

Results: We first tested for collagen and glycosaminoglycan (GAG) content following the defatting and decellularization process and verified that both key proteins were retained within the tissue. Both cell types experienced a high degree of cell viability over a course of 7+ days, which indicated that our bioink lacks toxicity and promoted natural cell growth. H&E staining showed natural and physiologically accurate phenotypes for both cell types by day 7; which included spindle-like fibroblasts in LX2 cells and smaller round migrating HCT116 cells. Remarkably, we were able to see a very distinct change in LX2 phenotype that was dependent on the percentage of dECM added, directly showing the impact that the incorporation of natural dECM had on the model. Only in the 1% dECM/ 6% GelMA group did LX2 fibroblasts form unique sphere-like cell-cell connections, while this phenomenon was not present when additional ECM was present.

Conclusions: In conclusion, this study provided direct evidence that by altering the dECM percentage in our bioink, we were able to alter the phenotype of fibroblasts within printed organoids. We believe that only the 1% dECM/ 6% GelMA group promoted this type of peripheral, sphere-like cell-cell connections in fibroblasts due to having a preferred stiffness that promoted migration. Moving forward, we aim to test additional percentages of dECM/GelMA as well as the combination of both cell types to see how both stiffness and ECM percentage impacts the self-aggregation of cells within printed organoids. Once an optimal model that best mimics natural CRC has been selected, we will begin high-throughput DLP printing and start testing combinations of chemotherapies on our system.

14. Outcomes of Children with Optic Neuritis

Tanya Correya, MD Robert Tauscher, MD

Andrew Van, Lydia Marcus, Sanford Williams, Miguel Arias, Robert Tauscher, Jayne Ness
Surgery-Ophthalmology
Clinical Science- Resident

Optic neuritis (ON) is frequently the initial event in children with demyelinating disease. However, given its relative rarity in children, the presentation and outcomes are not thoroughly characterized. This study aims to describe features, diagnoses, and outcomes in children with an initial episode of ON.

Methods:
We retrospectively reviewed prospectively collected data on 155 consecutive children presenting with new-onset ON from 1991 to 2024 and included those who had testing for MOG and AQP4 antibodies (n=51). Demographic data, ON features, treatment, follow-up duration, diagnosis, and relapse rates were evaluated.

Results:
The cohort's mean age at presentation was 11.9 years (range 3.9-17.8), with 65% being female. 45% were Black, 45% White, 4% Hispanic, and 4% Asian. Mean follow-up duration was 3.9 years (range 3 weeks - 32 years). ON was unilateral in 59%. Ultimately, 37% were diagnosed with MOG antibody-associated disease (MOGAD), 20% with seropositive NMOSD, 22% with MS, 12% with clinically-isolated syndrome (CIS), 6% with seronegative NMOSD, 2% with acute disseminated encephalomyelitis, and 2% with mitochondrial disease. Approximately half of patients had at least two ON attacks, and a quarter had three or more. Of those with relapses, 71% had MOGAD (n=8) or seropositive NMOSD (n=10).

Conclusions:
Half of children with new-onset ON have another demyelinating episode, while a quarter have three or more episodes. Approximately 2/3rds of these children are MOG or AQP4 seropositive, which portends a higher relapse rate.

15. COMPARISON OF POST-OP VENOUS THROMBOEMBOLIC EVENTS FOR DISTAL PANCREATECTOMY BY OPERATIVE APPROACH

Deanna Cotsalas, MD Perry Shen, MD

D. Cotsalas, G Leonard, R D'Agostino Jr., C Clark, P Shen.
Surgery-Oncology
Clinical Science- Resident

Background

The incidence of post-operative venous thromboembolic events (VTE) for minimally invasive distal pancreatectomy has not been evaluated against the transitional open approach. This study aimed to compare the rate of postoperative deep vein thrombosis requiring therapy and pulmonary embolism between open and minimally invasive distal pancreatectomy for malignant disease.

Methods
The National Surgical Quality Improvement Program (NSQIP) database was reviewed to identify 814 patients who underwent distal pancreatectomy for malignant disease in 2020. The incidence of VTEwas compared based on approach. Minimally invasive surgery (MIS) included robotic and laparoscopic cases. Propensity score stratification was used to balance patient demographics, co-morbidities, functional status, ASA class, and cancer staging. Primary outcome included: pulmonary embolism occurrence and deep vein thrombosis requiring therapy within the 30 day post-operative period (VTE event).

Results
A total of 814 patients had a distal pancreatectomy for malignancy in 2020 (open: n = 568; laparoscopic: n = 144, robotic: n = 102). Patients were divided into 4 balanced quartiles using propensity score methods (PSM) to stratify for confounding factors. Before stratifying, the VTE event rate was 3.66% among MIS patients, and 4.75% among open case patients ($p > 0.58$). After stratifying, there were 810 patients total that were without differences in matched factors. After adjustment with PSM, the MIS group had a 2.96% VTE event rate and the open group had a 4.82% VTE event rate ($p > 0.36$). The quartile with the highest rate of VTE events, (7.06%MIS and 5.98% open), was also the group that had the highest mean weight (181.67 lbs for MIS and 187.83 lbs for open). Patients had similar median operative times when comparing MIS vs open, 240 mins vs 252 mins respectively ($p > 0.176$).

Conclusion
After adjustment using propensity score stratification, there was no significant difference in VTE incidence for distal pancreatectomy cases based on approach. Although not statistically significant, there was a trend toward higher weight being associated with increased rate of VTE. Postoperative DVT prophylaxis is warranted for this procedure regardless of operative approach.

16. Comparative Analysis of Parascapula, Scapula, and Fibula Osteocutaneous Free Flaps in Mandibular and Maxillary Reconstruction: Examining the Impact of Flap Type, Defect Characteristics, and Patient Factors on Postoperative Outcomes

Samuel Craig Allison A. Slijepcevic, MD

Lilian D. Galarza Paez, Benjamin E. Flyer, Erich Mildner, Brianna R. Maniscalco, Sabine L. Abukhadra, Brian N. White, James D. Browne, Hafiz S. Patwa, Joshua D. Waltonen, Christopher Sullivan, Kenneth R. Feehs, Allison Slijepcevic
Surgery-Otolaryngology (Dentistry)
Clinical Science- Resident

Background: Defects of the maxilla and mandible resulting from malignancy, trauma, or osteoradionecrosis often necessitate complex surgical intervention. Repair of these defects using osteocutaneous free flaps (OFF) is the mainstay of treatment. Common flap types include parascapula, scapula, and fibula free flaps. This study aims to determine the impact of reconstruction type on postoperative outcomes in these repairs.
Methods: Retrospective chart review of patients undergoing osteocutaneous free flap repair of mandibular and maxillary defects at Atrium Health Wake Forest Baptist Hospital between 2010-2020.
Results: Patients: 177. Gender: 103/177 (58%) males, 74/177 (42%) female. Flap type: scapula 83/177 (47%), fibula 27/177 (15%), parascapula 67/177 (38%). Flap type showed did not show a significant association with operative revision within 30 days of surgery ($P = 0.09$), or flap survival ($P = 0.16$). Scapula flaps demonstrated the highest rates of post-operative complications: venous congestion (95% CI: 0.01-0.11), arterial thrombosis (0-0.06), flap necrosis (0.05-0.19), and fistulas (0.16-0.35) ($P = 0.03$). Maxillary defects demonstrated the highest rate of wound dehiscence (0.10-0.70), while defects including the maxilla and mandible showed the highest rates of overall postoperative complications ($P = 1.1x10\text{-}4$). Flaps that reconstructed small mandibular defects (0-5 cm) demonstrated high rate venous congestion (0.06-0.80) ($P = 8.9x10\text{-}3$). Larger defects undergoing OFF reconstruction demonstrated higher rates of postoperative infection. Preoperative radiation significantly increased the rate of post-operative flap arterial thrombosis (0-0.9), necrosis (0.05-0.33), and infection (0.08-0.37) ($P = 2.6x10\text{-}5$). Smoking status showed no association with complications ($P = 0.29$).

Conclusion: High rates of post-operative flap complications were demonstrated in maxillary and mandibular reconstructions. Defects including both the maxilla and mandible, large defect sizes, and pre-operative radiation significantly increased post-operative complications. Optimizing flap selection and focusing on surgical planning may improve post-operative reconstructive outcomes.

17. Evaluating BMI and Abdominal Wall Thickness as Predictors for DIEP Flap Eligibility

Joyce Cui, BA Bennett White Calder, MD

Eric Zeng, Mary Duet, Marion Tapp, Attila Kuka Dos Santos, Bennett Calder, Adam Katz, J. Michael Robinson
Surgery-Plastic & Reconstructive
Clinical Science-Student

Introduction: BMI cutoffs ranging from 30.0 to 32.7 kg/m2 have been recommended to mitigate post-operative donor site morbidity in autologous breast reconstruction. However, BMI does not accurately represent body composition for all individuals. Previous studies have reported conflicting results regarding complication rates when stratified by BMI. Notably, no prior studies have utilized this method of abdominal wall thickness measurements. This study employs a new measuring method and evaluates the relationship between abdominal wall thickness and post-operative complication using a large, multi-institutional, DIEP-specific database.

Methods: A retrospective chart review of 793 patients (1310 flaps) who underwent DIEP flap reconstruction from November 2017 to May 2024 at two medical institutions was conducted. Demographics, medical history, operative course, and post-operative complications were reviewed. Subcutaneous abdominal wall thickness was measured on CTA at four landmarks: one-third the distance from the umbilicus to the most lateral point of left and right abdominal wall, and 5 cm above and below the umbilicus.
Results: The mean age of included women was 50.54 years and the mean BMI was 30.34 kg/m2. BMI was strongly correlated with abdominal wall thickness ($r = 0.68$, $p < 0.001$), and both variables were strong predictors for complication rates ($p < 0.001$, $p < 0.001$). Patients were stratified by BMI (<25, 25-30, 30-35, and >35) and abdominal thickness (<20 mm, 20-40 mm, and >40 mm). In each BMI bin, all patients with outlier abdominal thicknesses were analyzed. Three out of four patients with low BMI <25 and thick abdominal walls experienced complications. All four patients with high BMI >35 and thin abdominal walls had zero complications. Using logistic regression modeling, the threshold wall thickness was determined to be 29.16 mm.

Conclusion: Abdominal wall thickness may serve as a valuable adjunct tool in determining DIEP flap eligibility, particularly for patients with a high BMI and thin abdominal wall, or vice versa. Logistic regression model suggests a threshold abdominal wall thickness of 29.16 mm. Further prospective studies are warranted to validate these findings.

18. Staging Tissue Expander to Deep Inferior Epigastric Perforator Flap Breast Reconstruction: Impact on Revision Surgeries and Complications

Caitrin Curtis, MD Ramon Llull, MD PhD

Eric Zeng Kelsey Lloyd Mary Duet Marion Tapp Jason Korn Thomas Steele Ramon Llull
Surgery-Plastic & Reconstructive
Clinical Science- Resident

Background
The staging technique of tissue expander (TE) placement at time of mastectomy, prior to deep inferior epigastric perforator (DIEP) flap reconstruction preserves the breast pocket, thought to enhance the final aesthetic outcome. Additionally, TE placement following mastectomy has the potential to reduce the need for subsequent revision surgeries. However, staging with a tissue expander prior to DIEP flap reconstruction is optional and poses the risk of complications during the expansion phase.
Methods
A retrospective review of patients undergoing DIEP flap reconstruction at two institutions over a 3 year period (2020-2022)

was conducted. Patient demographics, medical history, operative course, post-operative complications, and the number of revision surgeries were reviewed. Major complications were defined as those requiring a return to the operating room. Patients were categorized according to the staging of their procedure as (1) immediate to DIEP, (2) delayed to DIEP, (3) tissue expander to DIEP, or (4) implant to DIEP.

Results
A total of 439 patients were included, with 64 in the immediate DIEP group, 149 in the delayed to DIEP group, 166 in the tissue expander to DIEP group, and 60 in the implant to DIEP group. There was no significant difference between groups with regards to revision rate following DIEP flap reconstruction (p=0.663). During tissue expansion, patients experienced a major complication rate of 35%, with 14% requiring an unplanned hospital admission.

Conclusion
Our findings suggest that staging DIEP flap reconstruction with a tissue expander does not significantly affect the anticipated number of revision surgeries. This approach is not without risk, as suggested by the major complication rate during the expansion period. These findings underscore the importance of careful patient selection and counseling regarding potential risks. Further studies are warranted to evaluate the patient's experience in addition to the long-term aesthetic outcome of patients undergoing staged TE to DIEP flap reconstruction.

19. Development of a 3D Bioprinted Vascularized Thick Liver Construct for Spaceflight Testing

Timothy Dobroski James Yoo MD, PhD

Jin-Oh Jeong, Kelsey Willson, Young Wook Moon, Colin Bishop, Anthony Atala, Sang Jin Lee, James J. Yoo
Biomedical Engineering
Basic Science- Student

Introduction:
In the United States over 120,000 people are currently on the organ transplantation list, and it is estimated that another is added every 10 minutes. The fields of Tissue Engineering and Regenerative Medicine have made great strides in engineering cell-based tissue constructs with the goal of eliminating this wait time that claims 20 lives a day. Establishing proper vasculature within engineered tissues and organs is essential to overcoming this challenge as most prefabricated microchannels in the engineered tissue constructs insufficient to provide oxygen and nutrient exchange. Thus, it is essential to design an efficient structure that allows fluid flow to pass through the entire tissue construct evenly. This study aimed to produce technologies capable of creating a viable thick (>1 cm3) metabolic tissue that could be used to advance research on human physiology, fundamental biology, and medicine. To achieve this goal, we developed thick, human vascularized liver tissue in an in vitro environment while maintaining metabolic functionality similar to the native liver throughout the 30-day survival period.

Methods:
1 cm3 bioengineered liver constructs were bioprinted with an internal gyroid design in a digital light projection (DLP) printer using an optimized bioink formation containing human hepatocytes (HepG2's). Then, the interconnected vascular channel walls in the bioprinted cell-laden constructs were covered with human umbilical vein endothelial cells (HUVECs). Finally, the liver constructs were loaded into perfusion flow chambers connected to a media reservoir for continuous perfusion and collected for analysis at predetermined time points (10, 20, and 30 days).

Results:
Live/Dead staining of the cells in the printed liver constructs demonstrated >85% cell viability at day 0, 10, 20, and 30. During perfusion, HepG2 cells settled and self-aggregated to form cell clusters. These gradually formed well-defined cell aggregates over 30 days. Immunofluorescent staining confirmed the presence of hepatocytes and HUVECs 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 endothelial cell 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:
We successfully developed thick, human vascularized liver tissue in an in vitro environment while maintaining metabolic functionality similar to the native liver 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. Our

next step is to evaluate whether these results show the same results on the space station. The test model will be evaluated by maintaining the basic framework and collaborating with NASA and independent companies to study the effects of microgravity on vascular development on the International Space Station. Such an in vitro model could be utilized as a strategic tool to examine changes in tissues including the liver under microgravity.

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20. Biomimetic Vascular Scaffold with Sustained Angiogenic Factor Delivery Enhances Vascularization and Renal Tissue Formation in vivo

Timothy Dobroski James Yoo MD, PhD

Juhyun Park, J. William Vaughan, Ickhee Kim, John D. Jackson, Young Min Ju,
Ji Hyun Kim, Anthony Atala, James J. Yoo
Biomedical Engineering
Basic Science- Student

Introduction:
Chronic kidney disease affects approximately 10% of the world's population, leading to high blood pressure, stroke, and death. Cell-based tissue engineering approaches have become an alternative strategy to restore renal function. However, establishing rapid vascularization remains a major hurdle in creating clinically relevant tissue-engineered constructs. We developed a renal tissue construct replicating native renal vasculature that captures the three-dimensional geometry of native kidney vasculature. We previously demonstrated that the vascular construct supports vascularization and improves cell survival in vivo. The present study explores the potential of accelerating vascular integration and renal tissue formation using biomimetic renal tissue constructs by delivering and sustaining the release of angiogenic factors.

Methods:
The collagen-based kidney scaffold was fabricated using a vascular corrosion casting technique. Our vascular scaffold is then conjugated with vascular endothelial growth factor (VEGF), a potent angiogenic factor, and seeded with human umbilical vein endothelial cells (HUVECs). The vascular renal tissue construct was created by seeding human renal cells (hRC) or human renal cell-derived organoids. The scaffold's ability to form renal tissue and vascularization was examined in vitro and in vivo using a rat kidney tissue defect model.

Results:
Renal vascular morphology and VEGF conjugation of the vascular scaffold were confirmed using scanning electron microscopy (SEM) imaging and anti-VEGF immunostaining. The cell-seeded renal constructs demonstrated the formation of viable renal structures in both the hRC and renal organoid groups in vitro. The cell-seeded biomimetic vascular scaffolds showed renal cell survival, renal tissue formation, and vascularization at 1, 2, and 4 weeks post-implantation.

Conclusion:
The biomimetic vascular renal scaffold conjugated with angiogenic factors demonstrated the ability to improve cell survival and renal tissue structure formation in vivo. Our ongoing study investigates the effects of mixed endothelial and renal cell aggregates to enhance renal structure formation in vivo using an anatrophic nephrotomy rat model. The sustained delivery of bioactive angiogenic factors combined with biomimetic vascular scaffolds may provide a solution to developing transplantable kidney tissue constructs to treat chronic kidney diseases.

21. Post-operative outcomes of free flap repair following soft palate cancer ablation

Mary Dover, MD Allison A Slijepcevic, MD

Lilian Galarza Paez, Lucas Klever, Sam B Craig, Zoe-Ann V Robertson,
Kenneth R Feehs, Joshua D Waltonen, Christopher A Sullivan,
J Dale Brown, Allison A Slijepcevic
Surgery-Otolaryngology (Dentistry)
Clinical Science- Student

Background: Soft palate cancer comprises around 15% of oropharyngeal cancers and may be treated with palatal ablation. Palatal reconstruction is complex and is associated with high rates of post-operative nasal regurgitation and hypernasal speech. Large tumor resection creates defects that necessitate free flap reconstruction to restore anatomical integrity and function. This study aims to evaluate the optimal type of free flap reconstruction of multicomponent soft palate defects to restore speech and swallowing function.
Methods: Retrospective chart review of patients who underwent soft palate reconstruction at Atrium Health Wake Forest Baptist between 2010 and 2020.
Results: Total patients: 26. Average age: 61.5 ± 11.4. Females 10/26 (38%) males 16/26 (62%). Reconstructive flap types: parascapula 8/26 (31%) and radial forearm 18/26 (69%). Squamous cell carcinoma was the most common indication for surgery: 22/26 (85%). Overall complication rate: 16/45 (36%). Most common complications: fistula 4/26 (15%) and wound dehiscence 2/26 (8%). All flaps survived and 3/26 (12%) required minor revision surgery. Long-term g-tube placement was noted in 9/26 (35%) patients for oropharyngeal dysphagia. Hypernasal speech developed in 2/26 (8%). There was no significant difference in complication rate between flap types. Prior radiation therapy was significantly associated with long-term g-tube placement (OR = 0.107, 95% CI: 0.015, 0.770, p=0.028).
Conclusions: Soft palate defects can be successfully repaired with multiple soft tissue free flaps. The high rate of permanent g-tube dependence highlights the morbidity of soft palate ablation and reconstruction. Prior radiation therapy may increase the risk of permanent g-tube placement.

22. Structured Direct Antiviral Agents Treatment Pathways May Obviate the Need of Liver Transplantation for HCV-related Cirrhosis, with or without HCC, by the End of This Decade

Peter Drossopoulos, MS Dionisios Vrochides, MD PhD

Peter Drossopoulos, Nathanael Haynes, William Archie, Souma Kundu, Carly Janusek, Katheryn Peterson, Gabriella Taghian, Vincent Casingal, Roger Denny, David Levi, Lon Eskind, Jose Soto, Dionisios Vrochides
Surgery-Transplant
Clinical Science-Student

Introduction: Treatment for hepatitis C (HCV) infection has advanced significantly since the emergence of direct acting antiviral (DAA) agents, achieving sustained virologic response rates (SVR) of over 90%. The impact of DAAs on HCV related indications for liver transplant, including the development of hepatocellular carcinoma (HCC), require further characterization and validation.

Methods: Patients with HCV who underwent liver transplantation between 1994 to 2023 in a single tertiary institution were retrospectively identified. Two time periods were defined: pre-DAA (1994-2014) and post-DAA (2015-2023). DAA treatment was delivered within a structured therapeutic and follow up protocol. Transplant outcomes for HCV related indications, namely cirrhosis and HCC, were compared across cohorts.

Results: 1476 patients underwent liver transplantation during this time period, of which 367 were transplanted for HCV. In the pre-DAA cohort of 296 patients, HCV-cirrhosis was the primary indication in 36.4% of patients. Of these, 17.6% (n=52) caried a comorbid HCC diagnosis. Comparatively, in the post-DAA cohort, HCV was the primary transplant indication in only 10.7% of recipients (n=71). Of these, 40.8% (n=29) of patients were concomitantly affected by HCC. Despite the relative increase in incidence of HCC among HCV transplanted patients, the proportion of simultaneous HCV/HCC as the primary transplant indication decreased in the post-DAA cohort (from 6.36% to 4.36%).

Conclusion: The advent of DAA therapies has markedly reduced the necessity for liver transplantation secondary to chronic HCV infection sequalae. The DAA era has seen a nuanced increase in HCC incidence among transplant recipients with HCV; this is attributed to the more rapid decline in transplants for HCV cirrhosis alone compared to that of HCV-HCC coinfection. Extrapolating from the observed trends, it is projected that liver transplantation for HCV (with or without concurrent HCC), will eclipse within this decade.

23. First in Human Testing of a Novel Sutureless Drain Securement Device: A Randomized Clinical Trial

Mary Duet, MD Lisa David, MD MBA

Donald T Browne, MD; Michael K Boyajian, MD; Abigail Peoples, MD; Marion Tapp, MD; Thomas Steele, MD; Bennett W Calder, MD; Christopher Runyan, MD, PhD; Lisa R David, MD, MBA
Surgery-Plastic & Reconstructive
Clinical Science-Resident

Background:
Suture-based drain securement is non-standardized and is known to cause discomfort, particularly at the site of skin fixation as drain tubing movement is transmitted to a focal point. Patients may experience skin irritation, pain, skin tugging, loosening, and unintended loss of the drain. A novel sutureless drain securement device (SDSD), branded K-LockTM, was created to address the previously mentioned factors that impact a patient's experience while maintaining the functionality and purpose of surgical drains.
Methods:
After IRB approval, twenty-one patients were enrolled in a randomized control trial after obtaining informed consent. Inclusion criteria required, patients be 18 years of age or older, and a surgical procedure requiring two or more drains. Those with skin adhesive allergies were excluded. Patients were randomized to receive a right or left K-LockTM with the contralateral site undergoing traditional suture-based drain securement. Outcomes evaluated included: time to secure drains, adverse outcomes, patient satisfaction, and a blinded evaluation of each skin site at the time of drain removal. Analysis was performed using paired t-tests.
Results:
No drain securement failure was encountered, and the average duration of drain placement was 9 days. Securement of the K-LockTM was significantly faster (p= 0.0008) when compared to traditional suture. Blinded skin site evaluations concluded there was no significant difference in erythema and blistering, (p=0.9384) and (p=0.6058) respectively. Patients favored the K-LockTM in all survey categories.
Conclusions:
The K-LockTM enhances the overall patient experience with surgical drains and offers a reliable, standardized alternative to traditional suture-based drain securement.

24. Aortic Root Replacement Reduces Morbidity and Mortality in the Setting of Stanford Type A Aortic Dissection

Jake duPlooy, BA, MS2 Bartlomiej Imielski, MD

Jorge Seoane, Spencer Tingey, Tim Craven, Bartlomiej Imielski
Surgery-Cardiothoracic
Clinical Science- Student

Purpose
Debate remains between total arch and aortic root replacement (ARR) over hemiarch and valve resuspension (AVres) for repair of Stanford Type A dissection (TAD). We investigate the outcomes of these repair techniques.

Methods
This was an IRB approved, single institution, retrospective case-control study. All patients who underwent open surgical repair of TAD between January 1, 2012 and March 1, 2024 were included. No patients were excluded. Patients were categorized as undergoing hemiarch or total arch repair, and AVres or ARR. Repair technique was at the discretion of the surgeon. Patient demographics, medical history, and presenting characteristics, as well as operative measures and outcomes were obtained from the electronic medical record. The primary outcome was 30-day mortality. Secondary outcomes of interest were major adverse cardiac events (MACE), including stroke, myocardial infarction, acute renal failure, and cardiac arrest. Data was analyzed using Chi-Square test of equality.

Results
We reviewed 136 patients. Mean age was 59.6 years (IQR 49.7, 72.0). 49 (36%) were female. 114 (86%) had hypertension,

65 (49%) were obese, and 62 (51%) were smokers. 36 (26%) had undergone previous cardiac surgery or catheterization, of whom 11 (8%) experienced iatrogenic dissection. 69 (51%) patients underwent AVres, of whom 39 (29%) underwent hemiarch and 30 (22%) total arch replacement. 67 (49%) underwent ARR, of whom 50 (37%) underwent hemiarch and 17 (13%) total arch replacement. 20 patients (15%) died during index hospitalization. 41 patients (30%) experienced MACE. Among patients undergoing hemiarch repair, root replacement was associated with lower mortality ($p = 0.04$) and MACE ($p = 0.04$) compared to valve resuspension. For patients undergoing total arch repair, there was no significant association for mortality ($p = 0.08$) or MACE ($p = 0.31$). There was no significant difference in mortality between hemiarch and total arch when stratified by aortic root management ($p = 0.17$; $p = 0.23$). However, hemiarch repair was independently associated with increased risk of MACE in patients undergoing valve resuspension ($p = 0.01$). There were no significant differences in length of stay or rate of re-operation between groups.

Conclusions
Surprisingly, electing aortic root replacement over aortic valve resuspension involves significantly lower morbidity and mortality risk, independent of the extent of arch intervention. Arch intervention did not affect survival.

25. Overview of vascular and cardiac effects of REBOA in major Hemorrhage

Kristen Dyer, BS Jim Jordan, PhD

Fahim Mobin, BS, Micaela Gomez, MD, Timothy Williams, MD, Elaheh Rahbar, MD James Jordan
Surgery-Cardiothoracic
Basic Science- Student

Purpose:
Hemorrhage, associated shock, and REBOA have each been shown to effect various processes such as tissue/organ perfusion, cardiac function, and inflammatory indicators. While the associated costs and benefits of partial vs full REBOA have been studied, there is no consensus on their utility. This study analyzed the hemodynamics, including flow and pressure, in various blood vessels as well as myocardial function indicators in full REBOA, partial REBOA, and no REBOA following a Grade III hemorrhage.
Methods:
Anesthetized swine were instrumented to measure blood flow at numerous locations across the vascular tree as well as proximal, distal, and central venous pressures. Finally, a pressure-volume catheter was placed through the apex of the heart to measure cardiac performance. Following a 30% hemorrhage performed over 30 minutes (T0-T30), animals were randomly assigned to a 30 minute intervention (T30-T60) of either no REBOA (nREBOA), partial REBOA (pREBOA), or full REBOA (fREBOA). Fluid and pressor resuscitation without REBOA occurred from T60-240. All data were digitally collected and saved using LabChart. Analysis was performed using custom coded algorithms (Python).
Results:
Both REBOA groups exhibit an initial decrease in both pressure and flow distal to the REBOA balloon. Flows remained near zero throughout intervention for fREBOA, while pREBOA exhibited a marked recovery of both distal pressure and flow through the intervention period. Proximal to the REBOA balloon, all groups responded to the intervention phase with an initial increase in pressures and flows. The increase in proximal pressures in the REBOA groups was more immediate and resulted in pressures greater than at baseline with no differences between full and partial REBOA.
Cardiac output (ascending aortic flow) for all 3 groups were similar for the first 10 minutes of intervention. Over the remaining 20 minutes, the no and partial REBOA groups recovered more than 80% of baseline CO whereas fREBOA exhibited a degradation of cardiac output. Similar to the proximal pressures, the REBOA groups had a more robust initial increase in LV pressure, surpassing baseline values. nREBOA animals did not recover baseline levels. However, all 3 groups had similar pressures at the end of the intervention at about 80% of initial LV pressure. Similarly, other cardiac function variables (SW, SV) showed an initial increase in all groups. This was followed by a gradual decrease until the end of the intervention period in both fREBOA and pREBOA while nREBOA maintained a consistent gradual recovery. Interestingly, nREBOA typically recovered function closer to baseline than either full or partial REBOA.
Discussion:
By providing an overview of various effects that REBOA has in major hemorrhage, we hope to provide a broader view of general vascular effects for providers to be aware of during treatment of non-compressible trauma patients. Particularly, our results showed supraphysiologic left ventricular and proximal pressures in both REBOA groups, and showed improved recovery in many of the cardiac function parameters for no REBOA. With this study, we hope to expand the understanding of how REBOA, in all of its forms affects the hemodynamics and myocardial function when used as an intervention for NCTH. To that end, these data may feed into computational models that can help predict outcomes and provide guidance for the usage of REBOA to clinicians.

26. Predicting Recovery: The Impact of BMI on First Rib Resection Outcomes

Lydia Faber, Medical Student Gabriela Velazquez, MD

Estefania Narvaez, Lydia Faber, Rasikh Hamid, Elizabeth Wood, Matt Goldman,
Kevin Chang, Julie Freischlag, Gabriela Velazquez
Surgery-Vascular & Endovascular
Clinical Science- Student

Background: Thoracic Outlet Syndrome (TOS) remains a rare condition, and tailored management alongside shared decision making for treatment has been shown to improve overall outcomes. While management paradigms for TOS are well established, certain patient demographics, such as BMI, have not been fully explored as potential predictors of TOS outcomes. Elevated BMI is generally recognized as a predictor of increased surgical risks and prolonged recovery times. However, its specific role as a risk factor for developing TOS and influence on recovery time following a first rib resection and anterior scalenectomy remains unclear. This study compares outcomes following first rib resection and anterior scalenectomy in patients classified as obese (BMI ≥30) versus non-obese (BMI 18.5-30).

Methods: A retrospective review of electronic medical records at our institution was performed for all patients who underwent first rib resection and anterior scalenectomy between 2016-2024. Demographic data including age, sex, race/ethnicity, and BMI were analyzed along with TOS presentation and laterality. Patients were divided into obese (BMI ≥30) versus non-obese (BMI < 30). The primary outcome was symptom relief and secondary outcomes included the need for a chest tube for intra-operative pneumothorax, return to the operating room for bleeding, and length of stay (LOS). For analysis, chi-square, t-test, logistic and linear regression were performed using R studio.

Results: In our analysis, 157 patients were included. Of these, 34 were obese, and 123 were non-obese. The average age of patients in this group was 39.38 years. Obese patients were more likely to present as neurogenic TOS than other types of TOS ($p = 0.045$). There was no statistically significant difference in symptom relief between the groups, but obese patients trended toward experiencing incomplete symptom relief ($p = 0.130$). While there is no statistical significance in length of stay ($p=0.24$), the average LOS for 1.5 days in obese patients vs. 1.25 days in non-obese patients. There is statistical significance in the obese group for requiring a chest tube ($p < 0.0001$) and returning to the operating room for postoperative bleeding ($p<0.0001$).

Conclusion: Elevated BMI is associated with longer recovery times, higher likelihood of needing a chest tube, and increased risk of postoperative bleeding. Obese patients were more likely to present with neurogenic TOS and exhibited trends toward longer hospital stays and incomplete symptom relief. These findings emphasize the need to address BMI-related risks in preoperative planning and discussions regarding potential complications. Incorporating these considerations into shared decision making can better manage patient expectations, improve recovery planning, and enhance overall outcomes in this patient population.

27. Scapular Free Flap Reconstruction of Head and Neck Defects - An Eleven-Year Single-Institution Retrospective Review

Kenneth Feehs, MD Allison Slijepcevic, MD

Lilian D. Galarza Paez Ben Flyer Sabine L. Abukhadra Allison Slijepcevic
Surgery-Otolaryngology (Dentistry)
Clinical Science- Resident

Introduction: The resection of head and neck tumors often results in complex defects that involve the mandible or midface necessitating osteocutaneous free flap reconstruction. Bony reconstruction of large maxillectomy defects allows for restoration of midface projection, orbital support, and a platform for osseointegrated dental implants. Similarly segmental mandibulectomy typically requires reconstruction, often with vascularized bone grafting to restore facial form, airway support and mastication. Various osteocutaneous flaps are available to the reconstructive head and neck surgeon including fibula, iliac crest, and composite radial forearm-all of which carry significant donor site morbidity. In recent years, scapular osteocutaneous free flaps have increased in popularity, due to limited donor site morbidity and versatility to re-establish

functional and aesthetic outcomes. Herein we describe a series of 74 patients who underwent scapular osteocutaneous free flap reconstruction of mandibular or midface defect-the largest reported series of patients undergoing scapular flaps in the literature.

Objective: To review the cases of osteocutaneous scapular free flap reconstruction of mandibular or bony midface head and neck defects at Wake Forest during the past eleven years and to compare outcome parameters to existing, reported free flap literature.

Methods: A total of 74 patients underwent osteocutaneous, scapular free flap reconstruction over the study period. The most common surgical indication was squamous cell carcinoma (82.4%; 61/74), with an average operative time of 592 minutes (95% CI [541 - 642]). The average length of stay (LOS) was 13.2 days (95% CI [10.6 - 15.9]), and 20% (15/74) of patients were discharged to a skilled nursing facility. Long-term flap survival was observed in 91.9% (68/74) of patients, and complications occurred in 37.8% (28/74) of cases. The rate of complications in this study was lower than previously reported rates for scapular free flap reconstruction. Other notable outcomes included a 20.3% (15/74) return to the operating room rate and an 8.1% (8/74) readmission rate within 30 days.

Conclusion: Osteocutaneous scapular free flap reconstruction remains a reliable method for addressing complex bony defects of the mandible and midface and carries more limited donor site morbidity compared to alternative bony free flap reconstructive options.

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28. Role of Battery Pocket on Infection rate of Sacral Neuromodulation Revision

Maya Fisher Candace Parker-Autry, MD

Martina Gabra Michelle Hsia Joni Evans Robert Evans Candace Parker-Autry
Obstetrics & Gynecology
Clinical Science- Student

Introduction
Sacral neuromodulation (SNM) is indicated for the treatment of overactive bladder, urinary retention, urinary frequency, fecal incontinence. There is a 30% rate of revision or explanation of the device. The pocket infection rate for initial implantation is estimated to be 4-10%. The objective of this study was to determine the pocket infection rate for SNM revision if the old pocket was used for battery placement compared to if a new pocket was created.

Methods
This was a retrospective cohort study of patients between the ages of 18-80 who underwent a SNM revision procedure involving replacement of device battery alone or replacement of device battery and lead in a single institution between March 1, 2013 and November 30, 2023. Demographics, antibiotic use intra-operatively and post-operatively, and post-operative complication data were collected. The primary outcome of infection based on pocket used was calculated using

chi-square.

Results
170 patients were included in the analysis. The median time from initial implantation to the first revision procedure was 57 months. The most common indications for revision included: depleted battery (52%), battery site pain (10%), ineffective response (33%), lead migration (13%), and need for MRI compatible device (9%). Twenty-five percent of patients had replacement of the battery alone and 75% had replacement of the lead and battery. The infection rate was 5% (9 participants). There was no difference in infection rate based on use of the old pocket compared to a new pocket at a separate site (4.6% vs 7.9%, p = 0.42). Forty-five percent of patients were not prescribed post-operative antibiotic prophylaxis and there were no infections in this group. Duration of surgery >34 minutes was not statistically significant however was clinically significant as there were no infections in the group with surgery duration of <34 minutes. There was no association of infection with lead and battery removal compared to battery removal alone. There was no association of infection with smoking or BMI.

Conclusion
In conclusion, the infection rate with SNM revision is similar to the infection rate for initial implantation. There was no difference in infection rate using a new pocket for SNM revision compared to using the old pocket. The use of post-operative prophylactic antibiotics was not associated with decreased rate of infection.

29. Real-Time Quality Assurance for the Critical View of Safety (RTQA-CVS): A Novel App for Quality and Learning

Olivia Fukui, MD Carl Westcott, MD

Richard Erali, Lauren McCormack, Andrew White, Barbara Yoza, Don Babcock, Joseph Rigdon, Lindsey Suttle, John Carlson, Madeline Carroll, Carl Westcott
Surgery-General
Educational Science- Resident

Introduction: The Critical View of Safety (CVS) is a widely accepted quality determinant in laparoscopic cholecystectomy. Yet, there is no assurance that this endpoint is necessarily achieved. A recent consensus conference and the SAGES safe cholecystectomy project discussed using a “time out”, a “second set of eyes” and even “picture documentation” to address adherence to dissection norms. To address this, we developed a mobile application to provide real time, crowd-sourced grading of the critical view. The scorers were divided into experts and learners.

Methods and Procedures: The mobile device application was developed as a quality project and made available through the App store. Authorized users uploaded HIPAA adherent CVS image sets as an intraoperative time out. These were sent to members of an academic surgery department including residents, fellows and attendings. A standard grading scale was used. Teaching conferences and monthly newsletters were used for education and updates. Incentives in the form of gift cards were provided to top graders and case posters. The grades were averaged and returned to the operating team. The individual graders were then given feedback on how their grades compared to the crowd and the experts.

Results: A total of 313 cases were submitted since inception of the application. A total of 8 experts and 47 learners provided 4,005 grades. 494 scores were provided within 15 minutes of case submission and subsequent push notification and 401 scores were provided between 15 minutes and 2 hours. There were an average of 13 scores provided per case. Expert performance improved over time, indicated by the declining mean squared error (MSE) values for each expert with successive images (Figure 1). Learner performance improved for selected learners, indicated by a statistically significant reduction in MSE in the last 10 images graded compared to the first 10 images graded.

Conclusion: RTQA-CVS is a powerful tool to improve education and image-based surgical decision making. It is generalizable to other image based medical decision processes. Verification and consultation is mechanized and provided in real time. The quality of an operation can be measured and documented. In addition, the resulting large image/grade database has future implications to AI and machine learning.

30. The gut and breast microbiomes mediate carcinogenic alterations of the breast tissue in the context of obesity

Mohamed Gaber, PhD Katherine L. Cook, PhD

Kayla Neary, Adam S. Wilson, Julia Holmes, Jingyun Lee, Abigail Peoples, Mary Duet, Cristina M. Furdui, Adam J. Katz, Pierre-Alexandre Vidi, and Katherine L. Cook
Cancer Biology/Surgery-Hypertension
Basic Science- Fellow

Obesity is a risk factor for breast cancer, yet the mechanisms underlying its contribution to carcinogenesis remain elusive. Obesity alters the gut and the breast microbiomes in ways that may promote breast cancer initiation, and microbiome perturbations are evident in breast cancer patients. Yet, it is unclear if these perturbations are the cause or the effect of breast cancer. Here, we investigate the impact of obesity-induced microbiome alterations on genome instability in breast epithelial cells, a hallmark of breast cancer risk. First, we showed in human samples and murine studies that obesity causes elevated systemic and breast tissue levels of two microbial-associated molecular patterns (MAMPs): lipopolysaccharide (LPS) and flagellin. In contrast, lipoteichoic acid (LTA) was not consistently upregulated in obesity. LPS, in particular, was associated with DNA breaks in human and mouse mammary tissues. Injections of LPS and flagellin in mouse mammary glands was sufficient to induce DNA damage. The immunogenicity of LPS determined the DNA damage outcomes. Highly immunogenic forms of LPS induced higher levels of damage than LPS with lower immunogenicity. In vitro experiments with breast acini cultures demonstrated the ability of LPS and flagellin (but not LTA) to induce DNA double-strand breaks via toll-like receptor (TLR) activation. These MAMPs also activated the NF-κB pathway in acini, leading to the up-regulation of inflammatory cytokines. Breast microbiome analyses revealed an enrichment of Proteobacteria in obese premenopausal subjects. Bacteria from this phylum harbors highly immunogenic LPS and the majority of them are flagellated. Proteobacteria abundance correlated with breast tissue immunoglobulins against LPS and flagellin, and was associated with DNA damage. Intriguingly, these associations were absent in postmenopausal women, possibly due to complement inactivation and immune dysfunction. Our findings show that LPS and flagellin are systemic and local mediators of obesity-induced microbiome alterations, predisposing the breast to pre-carcinogenic alterations. These results underscore the importance of considering the microbiome as a biomarker of risk to improve primary prevention of breast cancer.

31. Autologous Fat Grafting Techniques in Breast Reconstruction - A Retrospective Comparison

Mariam Gadjiko, MD Christopher Runyan, MD PhD

Daniel Zaki, Mario S. Blondin, Blake Dunson
Surgery-Plastic & Reconstructive
Clinical Science-Resident

Introduction: Autologous fat transfer has become an integral instrument in addressing volume deficits and contour irregularities for patients who have undergone breast reconstruction. Its widespread use can be attributed to its safety profile, ease, and minimally invasive nature. Since its inception, focus has been placed on creating the most efficient methods to streamline the processing of the lipoaspirate as well as the delivery of usable fat intraoperatively. However, the percent yield of usable fat as well as determinants of clinical outcomes in post-reconstruction breast revision surgery among varying fat graft techniques remain elusive. Variability in outcomes, such as graft retention and post-operative complications, underscores the need for further investigation. This study aims to elucidate any differences in the yield of usable fat between three commonly utilized fat processing techniques as well as ascertain the impact of the techniques on postoperative complications in patients undergoing breast reconstruction revision surgery with fat grafting.

Methods: A retrospective review was conducted on patients who underwent fat grafting by a single attending plastic surgeon at Wake Forest Baptist Medical Center from 2019 to 2022. Patient demographics, complications, and operative specifics were collected. Exclusion criteria included: patients less than 18 years of age, those with less than 3-month follow-up, and fat grafting volume less than 50 ml. Participants underwent fat graft harvest using suction-assisted lipectomy and subsequent processing via Lipografter, Revolve system, or Coleman centrifugation technique.

Results: Of the 50 patients (Coleman=20, LipoGrafter=9, Revolve=21), no differences were found in age, BMI, or average fat used ($p>0.05$). Complication rates were equivocal across techniques. LipoGrafter yielded a significantly higher

percentage of usable fat ($p<0.05$). Secondary revision surgery due to insufficient defect correction was more common with LipoGrafter ($p<0.05$).

Conclusion: Our data suggests that LipoGrafter may yield a higher usable fat percentage and has an increased likelihood of requiring additional fat grafting. While the Coleman technique had a longer average operative duration, no statistically significant differences were observed. Furthermore, there were no differences in post-operative complications noted among the three techniques.

32. Anterior Skull Base Reconstruction: A Literature Review

Lilian Galarza Paez, BS, BA Allison A. Slijepcevic, MD

Nuwan Meegalla, MD, Zoe-Ann Robertson, BS, Nikitha Jona, BS, Allison A. Slijepcevic, MD
Surgery-Otolaryngology (Dentistry)
Educational Science- Student

Introduction: Anterior skull base defects provide complex surgical challenges requiring meticulous reconstruction to avoid infections and complications. Various techniques, including endoscopic, nasal flaps, extranasal flaps, and free flaps, have been used to prevent CSF leaks. While the choice of reconstruction depends on defect size and location, there is limited data to guide choosing the optimal reconstruction.

Methods: We conducted a literature review using PubMed, searching for articles related to endoscopic techniques, regional grafts, and free flap reconstruction for anterior skull base defects. Our aim was to evaluate the effectiveness and outcomes of these reconstructive methods, as well as to describe the surgical techniques employed.

Results: Smaller defects can be effectively repaired with synthetic grafts and locoregional flaps including the nasoseptal flap. Moderate sized defects can be repaired with local flaps including inferior and middle turbinate flaps, turbinal flaps, and a septal flip flap. Larger defects may be reconstructed with free tissue, which provides a seal between the intracranial space and the sinonasal cavity. Endoscopic reconstruction has similar rates of CSF leak compared to open repair. Endoscopic approaches are associated with less morbidity during surgery; however, the limited working space available while using the endoscopic approach should not limit the choice of reconstruction.
Conclusion: Our study provides parameters for choosing the optimal skull base reconstruction to reduce postoperative complications.

33. Is Location Everything? The Impact of Home Zip Code on rTKA Pre-Op CT Scan Denial

Brandon Garcia Fuentes, BS Maxwell Langfitt, MD

Samuel Rosas, Robert J. Teasdall, Alexus Cooper, Maxwell Langfitt
Surgery-Orthopedics
Clinical Science-Student

Background: In Orthopedic Surgery, robotic total knee arthroplasty (rTKA) is a surgical knee replacement procedure that utilizes programmable devices such as the Mako Stryker System. This procedure requires preoperative imaging via computed tomography (CT) scan. However, the use of CT in this setting is subject to prior authorization. Prior authorizations are approval processes required for healthcare services to be reimbursed by insurance carriers. Unfortunately, these authorizations can hinder effective patient care when optimal services recommended by physicians are denied. There is limited research exploring patient factors that influence the outcomes of these authorizations. Therefore, this study aimed to identify whether a patient's Area Deprivation Index (ADI) score correlated with preoperative CT scan denials in patients undergoing Mako-assisted rTKAs. ADI scores rank neighborhoods based on socioeconomic disadvantage, incorporating factors such as education, income, and housing quality. A higher ADI score indicates a greater level of disadvantage, which could play a significant role in healthcare access and outcomes.

Hypothesis: The team hypothesized that patients with higher Area Deprivation Index (ADI) scores would be associated with an increased likelihood of prior authorization CT scan denial for patients undergoing Mako-assisted rTKAs.

Methods: After IRB approval was obtained, a retrospective chart review was performed evaluating a single surgeon's records of patients undergoing rTKA from January 2020 to January 2023. Patient zip codes were extracted from the patient's

electronic medical chart. Then, these zip codes were converted into the appropriate ADI score using the Neighborhood Atlas tool developed by the University of Wisconsin. Patients were then divided into quartiles with the first quartile being better resourced areas. Odds ratio calculations, using the first quartile as reference, were then performed using the program R.

Results: The records identified a total of 752 TKAs during the period with 649 (86.3%) being Makos. Of these Makos, 103 cases were manual, and preoperative CTs were denied on 22 cases (3.4%). For ADI decile score quartiles, the divisions were: first quartile (1-2.5) with 113 patients, second quartile (2.6-5) with 250 patients, third quartile (5.1-7.5) with 204 patients, and fourth quartile (7.6-10) with 180 patients. 5 patients had suppressed ADI score zip codes. In the analysis of Area Deprivation Index (ADI) quartiles, the odds ratios were as follows: the second quartile (reference: first quartile) had an odds ratio of 0.76 (p=0.68; 95% CI: 0.16–2.64), the third quartile showed an odds ratio of 0.79 (p=0.74; 95% CI: 0.16–2.99), and the fourth quartile presented an odds ratio of 1.61 (p=0.58; 95% CI: 0.27–9.50).

Conclusions: This study indicates that higher ADI scores (deciles) are not associated with increased odds of preoperative CT scan denial, suggesting a potential lack of disparity. However, it remains crucial for orthopedic surgeons to consider patients' socioeconomic status, as it is often linked to poorer health outcomes. Future studies with larger sample sizes could investigate the individual components of the ADI and their relationship with denial patterns which can enhance the understanding of the socioeconomic factors and their role in patient care.

34. Probing for Answers: Differences in Detection of Acute Appendicitis between Pediatric and Adult Ultrasonographers

Aaron Gilani, MD, MBA Leah M. Sieren, MD

Annie G. Elande,r Alison J. Lehane, Amy D. Lowther, Jennifer J. Dennison, Matthew O. Thompson, Scott C. Carter, Klista Gross , Misty Knight, Leah M. Sieren
Surgery-Pediatrics
Clinical Science- Resident

Background: Ultrasound of the right-lower-quadrant (RLQ) is a safe imaging modality used to detect appendicitis in pediatric patients compared to computed tomography (CT). However, identifying the appendix on RLQ ultrasound can be difficult, especially for individuals not trained in pediatric ultrasonography. We investigated the relationship between ultrasounds conducted by pediatric ultrasonographers compared to adult ultrasonographers. We aim to identify a difference in the incidence of equivocality, subsequently affecting surgical management of patients with acute appendicitis.
Methods: A retrospective review of 70 patients was performed, ages 2-16 years from 2019-2024, who presented to a tertiary care integrated children's hospital with concerns for acute appendicitis. They underwent both initial and repeat ultrasounds of the RLQ within the same encounter. "Off-shift" ultrasound was defined by an ultrasound performed during nights or weekends when pediatric ultrasonographers were not available, where as "on-shift" was defined as an ultrasound performed during normal business hours when pediatric ultrasonographers were available. Ultrasound findings were recorded utilizing the Texas Children's Appy score where non-visualized (3) or equivocal (4) were considered "equivocal." Alvarado score, a validated clinical score used to predict appendicitis, was also collected. Descriptive statistics were calculated for baseline variables such as demographics. Chi-square was used to compare categorical variables while t-tests were used to compare continuous variables.

Results: Of the 70 patients included in this study, 48% (33) had their first ultrasounds conducted by adult ultrasonographers. 26% (18) had an equivocal first ultrasound. A chi-square test comparing the equivocality of first ultrasounds between adult versus pediatric ultrasonographers revealed a statistically significant difference (p=0.049), with 43.4% of pediatric ultrasonographer conducted ultrasounds being non-equivocal, while 20.3% of adult ultrasonographer conducted ultrasounds were non-equivocal and 20.3% of adult ultrasonographer conducted ultrasounds became non-equivocal when subsequently conducted by a pediatric ultrasonographer. In addition, our findings also showed that the average Alvarado score was lower for those who had an equivocal first ultrasound and a negative repeat ultrasound (score of 4 compared to 4.9, p=0.039).

Conclusion: Ultrasonographer experience with pediatric patients is key to obtaining definitive imaging that can guide physicians toward or away from operative intervention. Our study demonstrates a significant association between the operator and their equivocality, with ultrasounds conducted by adult ultrasonographers being more likely to be equivocal compared to those conducted by pediatric ultrasonographers. These findings highlight the importance of considering both operator

experience and clinical context when interpreting ultrasound results in acute care settings.

35. Violent and Nonviolent Trauma Patients, Violent Recidivism Mortality: A Comparison

Carma Goldstein, MD Martin Avery, MD

Sharon Schiro, Aaryn Hammon, Colton Smith, Heidi Roeber, James Winslow, Martin Avery
Surgery-Trauma
Clinical Science-Fellow

Objectives Section: This patient is most at risk for nonviolent trauma recidivism mortality
Methods Section: State trauma registry data was queried for patients aged 13-45 admitted over a two-year period with five years of follow up. Unintentional motor vehicle collisions were considered a nonviolent trauma comparator group. Violent trauma included both blunt and penetrating mechanisms. Patients who experienced violent trauma (V) were compared to patients who experienced nonviolent trauma (NV) with a primary outcome of mortality due to violent or nonviolent trauma within five years.
Results Section: We identified 4,406 trauma patients meeting inclusion criteria with 1,470 in the V cohort and 2,936 in the NV cohort. In the V cohort, the mortality rates were 4.0% from all trauma and 1.5% from violent trauma. In the NV cohort, the mortality rates were 3.2% from all trauma and 0.3% from violent trauma. There was no significant difference in trauma recidivism mortality between the V and NV groups (OR 1.3, CI 0.9, 1.7). However, patients initially admitted with a violent trauma mechanism were significantly more likely to die from subsequent violent trauma than those with nonviolent trauma (OR 4.4, CI 2.1, 9.4).
Conclusion Section: Our study demonstrates that trauma recidivism mortality is high in both violent and nonviolent trauma patients. It is interesting that those with nonviolent traumas are at similar risk to those with violent traumas of having traumatic deaths from all causes within five years. While violence prevention is still clearly important in patients who experience violent trauma, this study illustrates an important need to target all cause injury prevention in all trauma patients.

36. Does Pediatric Trauma Center Designation Matter for Children in Shock from Gunshot Wounds? A TQIP Analysis

Micaela Gomez, MD Lucas P Neff, MD

Elizabeth C Wood, Maximilian Peter Forssten, Timothy K Williams, Sebastian Peter Forssten, Babak Sarani, Shahin Mohseni, Lucas P Neff
Surgery-General
Clinical Science- Resident

BACKGROUND: Recent studies have demonstrated improved outcomes for severely injured pediatric trauma patients treated at pediatric trauma centers (PTC). Nonetheless, specific injury patterns requiring immediate lifesaving intervention may offset the recognized benefits of PTC over adult trauma centers (ATC). This study aims to compare the clinical outcomes of hypotensive pediatric trauma patients with gunshot wounds (GSW), based on trauma center type. We hypothesize that outcomes are equivalent for this clinical scenario.

METHODS: The 2013-2021 TQIP dataset was used to identify all hypotensive pediatric patients (≤15 years old) with GSWs. Hypotension was defined per Pediatric Advanced Life Support Guidelines. Patients with an AIS of 6 in any region and transferred patients were excluded. In order to identify the association between pediatric trauma center verification status and outcomes, Poisson regression models with robust standard errors were employed.

RESULTS: 687 patients met criteria for analysis and 236 (34%) cases were treated at PTCs. PTC patients were slightly younger (lower quartile: 10 vs 12 years old, p = 0.037). There was no significant difference in Injury Severity Score (ISS) or crude mortality rates (68.1% vs 70.8%, p = 0.524). After adjusting for confounders, Poisson regression showed no reduction in in-hospital mortality, complications, failure-to-rescue, ICU admission, or mechanical ventilation rates at PTCs compared to ATCs.

CONCLUSION: Gunshot wounds in children pose unique clinical challenges. Majority of cases are cared for at ATCs. Analysis of best available data did not demonstrate a benefit to managing these patients at a PTC. Conversely, ATCs were

not superior, despite managing this scenario in both adults and children more often. These findings underscore the importance of ATCs in the care of this particular injury pattern and call attention to the recent pediatric readiness requirements for ACS verified trauma centers to treat pediatric firearm injuries at both PTCs and ATC.

37. Mechanism Matters for Major Vascular Injury in Children: A TQIP Analysis

Micaela Gomez, MD Lucas P Neff, MD

Maximilian Peter Forssten, Elizabeth C Wood, Timothy K Williams, Sebastian Peter Forssten, Babak Sarani, Lucas P Neff, Shahin Mohseni
Surgery-General
Clinical Science-Resident

INTRODUCTION: Trauma remains the number one cause of mortality in pediatric patients, with major vascular injury significantly impacting morbidity and mortality rates. Understanding the outcomes of high-velocity ballistic injuries to major vascular structures compared to blunt trauma may help explain the increasing prevalence of pediatric firearm fatalities nationwide. This study aimed to evaluate the mortality and complication profile of pediatric trauma patients suffering from major vascular injuries as a result of gunshot wounds (GSWs) compared to blunt mechanisms. We hypothesized that outcomes would be worse for GSWs.

METHODS: We queried the American College of Surgeons Trauma Quality Improvement Program (TQIP) database from 2013-2021 for pediatric (≤12 years old) trauma patients who suffered a major vascular injury as a result of either blunt trauma or a GSW. Patients were excluded if they had a head or face AIS ≥2 or an AIS of 6 in any other region. These groups were examined regarding demographics, clinical characteristics, and in-hospital outcomes.

RESULTS: After applying the inclusion and exclusion criteria 3,121 patients remained for further analysis. Of these, 34.1% patients (n=1,064) suffered a GSW. GSW patients were significantly more injured than blunt trauma patients (Injury Severity Score ≥16: 58.8% vs 37.8%, p <0.001). GSW injured patients had significantly higher rates of major intrathoracic as well as femoral vascular injuries, whereas intraabdominal aortic and renal vascular injuries were more common in blunt trauma patients. GSW patients accordingly demonstrated significantly higher rates of in-hospital mortality (19.9% vs 4.5%, P<0.001) and overall complications (15.9 vs 9.4%, p<0.001).

CONCLUSION: The overall lethality and complication for major vascular injury is greater after GSWs than blunt trauma. This may be attributed to the increased tissue damage resulting from higher focal kinetic energy transfer. These findings underscore the importance of firearm injury prevention and provide further insight into the new leading cause of death in children.

38. Evaluating Predictive Accuracy of Neural Network and Logistic Regression Models in Diagnosing Giant Cell Arteritis

J. Benjamin Gordon, BS Jagger Koerner, MD, MB

Landon Thompson, Jagger Koerner
Surgery-Ophthalmology
Clinical Science-Student

Background: Giant cell arteritis (GCA) is the most common primary vasculitis affecting the elderly, with the potential to cause blindness and, in some cases, life-threatening complications. The current gold standard for diagnosing GCA is a temporal artery biopsy. However, the primary systemic treatment involves glucocorticoids, which can lead to numerous complications. To aid in diagnosis and mitigate the risks of misdiagnosis, logistic regression (LR) and artificial neural networks (ANN) are commonly utilized as clinical prediction models for data classification. These models have shown promise in predicting GCA before biopsy, potentially reducing long-term consequences of misdiagnosis.

Objective: To verify the generalizability and predictability of the GCA calculator in the assessment of patients prior to biopsy using neural network and logistic regression analysis

Methods: Patients presenting to the Wake Forest Baptist Eye Clinic for GCA evaluation who underwent subsequent biopsy (n=163) were reviewed, with only those having sufficient data to complete the GCA calculator included in the study (n=143). Data collected from these patients included age, gender, race, visual acuity, disc edema, CRAO, biopsy length, time to biopsy, headache, scalp tenderness, jaw claudication, diplopia, NLP status, and percent probability as reflected by both the neural network and logistic regression calculators. Categorical variables were analyzed using Fisher's exact test. The normality of continuous variables was evaluated using plots and the Shapiro-Wilk test, which determined that all variables except age and biopsy length were non-normally distributed. Age and biopsy length were compared using an independent sample t-test and summarized with means and standard deviations. All other continuous variables were summarized with medians and interquartile ranges (IQR) and compared using the Wilcoxon rank-sum test.

Results: Significant predictors of a positive biopsy for Giant Cell Arteritis (GCA) include older age (p=0.0114), White race (p=0.0205), presence of disc edema (p=0.0498), jaw/tongue claudication (p=0.0150), elevated C-reactive protein (CRP) levels (p=0.0127), and higher platelet count (p=0.0274). Univariate logistic regression identified age (OR=1.381, p=0.0138), White race (OR=5.692, p=0.0226), disc edema (OR=2.842, p=0.0302), jaw/tongue claudication (OR=3.172, p=0.0097), diplopia (OR=3.363, p=0.0496), CRP (OR=1.092, p=0.0451), and platelets (OR=1.279, p=0.0353) as significant predictors of GCA. Multivariate analysis confirmed age (OR=1.664, p=0.0020), male gender (OR=2.929, p=0.0452), jaw/tongue claudication (OR=6.257, p=0.0008), CRP (OR=1.119, p=0.0209), and platelets (OR=1.348, p=0.0240) as independent predictors. ROC analysis showed high predictive accuracy with the neural network (c=0.7843), logistic model (c=0.7786), and average percentage (c=0.7832).

Conclusions: The GCA calculator produced statistically significant results, identifying key markers associated with an increased risk of GCA, including age, race, disc edema, jaw claudication, diplopia, CRP, and platelets. While the original GCA calculator study reports 99% sensitivity with a 10% cutoff value, our findings suggest 96% sensitivity with a 13% cutoff. Overall, the GCA calculator is an invaluable tool for assisting in the clinical diagnosis of giant cell arteritis when used correctly. Our data indicate that increasing the cutoff value from the current 8% to 13% would maintain high sensitivity while reducing unnecessary temporal artery biopsies and their associated morbidity risks.

39. Outcomes of Common Peroneal Nerve Decompression

J. Benjamin Gordon,BS Xue Ma, PhD, MD

John D. King, Chukwuweike U. Gwam, Natalie E. Cignetti, Karanpreet K. Dhaliwal, Xue Ma, Zhongyu Li
Surgery-Orthopedics
Clinical Science- Student

Background: Common peroneal nerve (CPN) neuropathy is the most common lower extremity mononeuropathy. When delayed or no recovery from CPN neuropathy is suspected, surgical common peroneal nerve decompression (CPND) is considered to relieve symptoms.

Objective: This study aimed to evaluate patient outcomes post-CPND performed by a single surgeon at a tertiary medical center.

Methods: Patient outcomes after CPND performed by a single surgeon were reviewed. Motor, sensation, and pain scores post CPND were assessed in 47 of the 46 patients. Patient demographics, including age, concomitant morbidities, time from injury to surgery, and BMI, were also analysed for correlations with outcomes after CPND by logistic regression.

Results: 29/34 patients with impaired motor function improved by at least one motor grade, 19/42 with altered sensation reported restored normal sensation, and 31/37 reported improved pain after CPND. No correlation of patient demographic factors with motor or pain improvement after CPND was observed. However, a BMI greater than 29.15 and a time between injury and surgery exceeding 506 days were associated with lower odds of reporting restored sensation.

Conclusions: Operative decompression of CPN neuropathy improves objective motor scores and subjective sensation and pain scores.

40. Development the Skin Organoid as a Universal Platform for Skin Physiology and Injury Modeling and a Pigment Delivery System in Bioprinted Skin Implants

Anastasiya Gorkun, PhD Anthony Atala, MD

K. Willson, N. Mahajan, G. Nomdedeu-Sancho, N.P. Edenhoffer, S.Soker, A. Atala
Wake Forest Institute Regenerative Medicine (WFIRM)
Basic Science- Fellow

Conventional 3D skin models are fabricated layer-by-layer and restricted by including a limited number of cell types, failing to reproduce human skin's cellular and structural complexity. In this study, we showed that the skin organoid (SO) system facilitates tissue-specific morphogenesis and recapitulates the microanatomy, functionality, and response of native skin to injury and able to develop pigmentation in bioprinted skin implants in full-excision wound healing model.
We generated skin organoids by culturing the six key skin cell types mixture in non-adhesive conditions for 21 days. Retinol and Dextran-FITC (4kDa) were used to test skin physiology and barrier integrity, respectively. SOs were exposed to UVB (600mj/cm2) for radiation modeling, and chemical damage was examined by incubating SO with 1% Triton solution, Isopropanol, Hexyl Salicylate, and 5% KOH.
We employed 3D printing to generate tri-layered skin patterned with 25% of the cells as pre-cultured skin organoids in the dermal layer (reorganized skin). Printed constructs were matured prior to implantation in 2*2 cm wounds on athymic nude mice. We have analyzed wound healing and pigmentation in full-thickness wounds treated with reorganized skin over 90 days. Wound sites were monitored and imaged weekly, with R-based digital tools for pigmentation quantification. Melanin staining and immunohistochemistry were performed on tissue sections, and qPCR assessed pigmentation-specific gene expression.
Generated SO maintained their skin-like layered microstructure for the 21 days of culture, including an epidermal layer and a dermal-hypodermal core, and reproduced skin-like functions, such as epidermal barrier integrity, vasculogenesis and melanogenesis. Also, SO showed a relevant physiological response to retinol by converting it to retinoic acid. UVB irradiation resulted in ER stress and apoptosis, and chemical irritant treatment produced a reaction similar to each compound's irritation index.
Implantation of reorganized bioprinted skin showed reduced wound contraction and resembled healthy skin histologically, demonstrating accelerated wound healing. The addition of organoids allowed for the development of human-like rete ridges and visible pigmentation, throughout the wound area, evening the pigmented skin tone. Eumelanin was detected in the mouse epidermis, likely from human organoid-derived melanocytes. Ongoing qPCR analysis seems to indicate differences in pigmentation-related gene expression across groups.
We showed that our novel multicellular SO model recapitulates skin architecture and function in a high-throughput manner. These organoids serve as a reliable model for skin physiology, chemical and radiation damage. Moreover, the results show that the bioprinted skin with skin organoids integrates into functional skin with pigmentation in full-thickness wounds. Our study advances the development of multi-layered skin constructs towards fully functional bio-printed skin for clinical skin replacements.

41. Anatomical Considerations in Fixation of Sternal Fractures and Nonunions

Sofia Griff, BS Holly Pilson, MD

Emily Barr, Kaitlin Henry, Christian Sangio, Garrett Bullock, Adrian Lata, Holly Pilson
Surgery-Orthopedics
Clinical Science-Student

Introduction: Bony apposition through compression is the most favorable environment for sternal fracture and nonunion healing, however, there are limited studies that examine the anatomy of the sternum and manubrium in relation to adjacent structures. The objective of this study is to evaluate the safety of bicortical screw fixation by investigating the dimensions of the manubrium and sternum and their spatial relationships with critical posterior anatomical structures.

Methods: A retrospective chart review was performed on a series of 40 (20 male and 20 female) adult patients presenting to a single institution's level one trauma center with normal CT scans of the chest. Measurements in millimeters (mm) were taken by two reviewers for the length, width, and depth of both the sternum and manubrium. Measurements were

then collected for the distances of the right ventricle, right atrial appendage, and major thoracic vessels to the sternum or manubrium. Inter-rater reliability was assessed for bony structures with two-way random average agreement intraclass correlation coefficients and reported with 95% confidence intervals.

Results: The smallest depth measurements of the manubrium and sternum were 10.3/9.3 mm (male/female) and 10.1/9.2 mm (m/f), respectively. The closest structures behind the manubrium were the left and right brachiocephalic veins with mean distances of 9.8/6.3 mm (m/f) and 15.5/13.5 mm (m/f), respectively. This was followed by the right brachiocephalic artery with mean distances of 20.9/16.4 mm (m/f). The closest structure behind the sternum was the right ventricle with mean distances of 8.5/8.4 mm (m/f), then the right atrial appendage with mean distances of 24.6/21.4 mm (m/f). Inter-rater reliability exceeded 0.80 for bony dimensions, indicating good reliability.

Conclusion: Our study identifies the dimensions of the sternum and manubrium, as well as the distance of vital organs posterior to the bony structures. Knowing the specific dimensions of these structures helps surgeons develop strategies to maximize safety during operative fixation of sternal fractures and non-unions when using bicortical screw fixation. Next steps involve comparing these measurements to in vivo data from patients undergoing sternotomies.

42. ORIF vs. CRPP for Supracondylar Humerus Fractures in Adolescent Patients

Jonathan Groothoff, MA Alejandro Marquez-Lara, MD PhD

Caleb D. Puckett, Kyler J. Thometz, Alejandro J. Marquez-Lara
Surgery-Orthopedics
Clinical Science Student

BACKGROUND: Literature evaluating the surgical management of supracondylar humerus fractures (SCHFs) in adolescent patients is limited. This study assessed the prevalence of different surgical procedures used to manage SCHFs and compared functional outcomes after open reduction and internal fixation (ORIF) and closed reduction and percutaneous pinning (CRPP).

METHODS: This was a retrospective review of patients between 13 and 18 years of age who underwent surgical treatment for supracondylar humerus fractures between 2012 and 2022. Electronic health records were reviewed to capture surgical technique, type of implant, presence of intra-articular extension, position of the capitellum in relation to the anterior humeral line (AHL), and days to full range of motion (ROM) after surgery. Student t-test and $\chi 2$ were used to evaluate continuous and categorical variables.

RESULTS: 33 patients met the inclusion criteria. 21 underwent ORIF, 7 were treated through CRPP, and 5 received screws or open reduction and percutaneous pinning. Intra-articular extension was present in 15 (71.4%) fractures treated through ORIF and 1 (14.3%) fracture treated through CRPP. There was greater displacement of the AHL at the time of injury in fractures treated by ORIF than those treated by CRPP. Following ORIF, patients were more likely to be immobilized in a sling (42.9%) while casting was the most common method of post-operative immobilization after CRPP (85.7%). The median time to full ROM was 91 days; CRPP was associated with a faster return to full ROM.

DISCUSSION: SCHFs in adolescent patients are more frequently treated with ORIF than CRPP. ORIF is associated with intra-articular extension, initial immobilization with a sling, and a longer return to full ROM. In contrast, CRPP is more often used in fractures without intra-articular extension, typically involves post-operative immobilization with a cast, and is associated with a shorter return to full ROM.

43. Relationship of an Electronic Frailty Index with Surgical Treatment in Patients with Glaucoma

Jonathan Groothoff, MA Atalie C. Thompson, MD MPH

James A. Rhead, Isaiah J. Miller, Nicholas D. de la Osa, Jordan A. Perry,
Joni K. Evans, Nicholas Pajewski, Atalie C. Thompson
Surgery-Ophthalmology
Clinical Science-Student

Introduction
Frailty in older adults is associated with adverse health events, increased hospitalizations, and greater mortality. However, limited research exists that evaluates the relationship between frailty and glaucoma management. The electronic Frailty Index (eFI) is a validated composite metric that calculates frailty based on deficit accumulation using diagnosis codes, laboratory results, and medications from the electronic health record. The purpose of this study was to determine whether baseline frailty, quantified by an electronic Frailty Index (eFI), was associated with the likelihood of receipt of surgery or laser procedures in patients with glaucoma.

Methods
This was a single-center retrospective review of patients presenting with glaucoma between 2015-2017 who had a calculable eFI as of 10/1/2017. Patients were followed through 2023 and were excluded if they had less than 2 years of follow-up. Demographic and treatment characteristics were collected from patient charts. Student t-test and $\chi 2$ test were used to evaluate continuous and categorical variables, respectively. A repeated measures multivariate logistic regression model was used to determine the odds of surgery among patients, and a multivariate survival model was created to assess time to surgery, including age, baseline IOP, sex, race/ethnicity, eFI, and glaucoma severity based on mean deviation in the worse eye as covariates.

Results
1,174 patients with glaucoma (41% female; 27% nonwhite or Hispanic) were analyzed. Frailty category differed significantly by sex and race ($p<0.05$), but not by age, baseline IOP or glaucoma stage. Older patients were less likely to receive surgery [OR=0.581, $p<0.001$] and had longer times to first surgery [HR=0.719, $p=0.007$]. Increased baseline IOP [OR=1.06, $p<0.001$], and having severe [OR=2.89] or moderate glaucoma [OR=1.89] increased the likelihood of surgery ($p<0.001$). Increased IOP was associated with shorter times to surgery [HR=1.11, $p<0.001$], but glaucoma severity was associated with longer times to surgery [severe HR=0.262; moderate HR=0.575, $p<0.001$]. Baseline eFI was associated with reduced likelihood of receiving surgical treatment [OR=0.672, $p<0.001$] and longer time to first surgery after presentation [HR=0.670, $p<0.001$] independent of IOP, glaucoma severity, age, sex, or race.

Conclusion
Increased age and frailty scores were associated with reduced likelihood of surgical treatment and greater time to surgery in patients with glaucoma even when controlling for baseline IOP and glaucoma severity. Future studies should investigate whether frailty impacts surgical outcomes in glaucoma.

44. Body Composition Changes During Chemoradiation for Esophageal Cancer

Celeste Hall, 2nd Year Medical Student Jonathan Salo, MD

Surgery-Oncology
Clinical Science-Student

Introduction: Nutritional deficits are prevalent in esophageal cancer patients due to the catabolic effects of cancer cachexia, decreased intake of nutrients due to gastrointestinal tract obstruction, and treatment-related toxicity. Sarcopenia, or muscle mass loss, is closely associated with this decrease in nutrition. Prior work has established a strong association between muscle mass and perioperative outcomes and survival in esophageal cancer. Enteral feeding tubes can allow for nutritional repletion in patients undergoing chemoradiation and potentially mitigate the adverse effects of undernutrition. We predicted that patients undergoing chemoRT receiving nutritional support via enteral feeding tube will have an improved preservation of muscle mass compared to those without enteral feeding support, while also reducing the incidence surgery delays after radiation therapy.

Methods: Medical records were abstracted from 523 patients with AJCC T2-4 N0-2 M0 esophageal cancer treated with chemoradiation at WFBMC or CMC. Patient information was obtained on enteral feeding tube placement. The change in skeletal muscle and adipose tissue metrics before vs after chemoradiation was characterized and the association between feeding tube placement and changes in body composition before and after chemoradiation were analyzed. Among patients undergoing surgery after chemoradiation, the link between preoperative feeding tube placement and postoperative mortality, the interval between radiation and surgery, and overall survival was quantified.

Results: Chemoradiation was associated with a median 6% decrease in muscle mass and decrease in visceral (-12%), intramuscular (-4%), and subcutaneous (-6%) adipose tissue. The loss of muscle mass was especially marked in men (-7%) vs women (-1%). Patients who received feeding tubes had overall lower amounts of skeletal muscle mass (SMI 50 vs 53 $p=0.023$) and tended to have greater BMI-adjusted weight loss prior to diagnosis (Chi-square trend test $p=0.008$). Feed-

ing tube placement prior to chemoradiation was associated with a smaller loss of muscle mass (-6% vs -7% p=0.04) and smaller loss of subcutaneous adipose tissue (-5% vs -8% p=0.015). Feeding tube placement did not influence the interval between radiation and surgery or 90-day mortality after surgery. Overall survival was longer in patients who underwent surgery after chemoradiation, younger patients, and those with lower loss of muscle mass during chemoradiation. Feeding tube placement was not associated with overall survival.

Conclusions: Chemoradiation for locally-advanced esophageal cancer is associated with a loss of muscle mass, particularly among men. Decreases in muscle mass and subcutaneous adipose tissue during chemoradiation appear to be mitigated by enteral feeding. Although loss of muscle mass during chemoradiation was associated with decreased survival in a multivariable analysis, feeding tube placement did not appear to mitigate this effect. Because feeding tubes were placed in patients with more pre-existing nutritional deficits, the precise impact of enteral feeding on outcomes is difficult to determine from this observational study.

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45. Hepatocellular carcinoma recurrence after liver transplantation is less than predicted by RETREAT score in the modern era of multimodal neoadjuvant treatments

Nathaneal Haynes, HSD Dionisios Vrochides, MD PhD

William Archie, Nathaneal Haynes, Katheryn Peterson, Peter Drossopoulos, Souma Kundu, Gabriella Taghian, Vincent Casingal, Roger Denny, Lon Eskind, David Levi, Jose Soto, Dionisios Vrochides
Surgery-Transplant
Clinical Science- Student

Introduction: There have been significant advances in diagnosis, treatment, and surveillance of hepatocellular carcinoma (HCC) in recent years. Treatment options include neoadjuvant and definitive ablative locoregional modalities, surgical resection, targeted molecular therapies, immunotherapy, and liver transplantation. Liver transplantation is the premier treatment modality because it offers the possibility of addressing both the malignancy and the underlying liver disease. Historically, 7% of these patients will have a recurrence of their HCC within 5-years of transplantation. In the majority of transplant centers, prediction of recurrence and surveillance intensity is dictated by the Risk Estimate of Tumor Recurrence After Transplant (RETREAT) score. The aim of this study is to retrospectively validate RETREAT score in our center's patient cohort diagnosed with HCC over the last five years.

Methods: A retrospective review (IRB00097121) was conducted of patients diagnosed with HCC who had a liver transplant conducted at Carolinas Medical Center, Atrium Health. A total 325 patients with HCC were diagnosed among 1504 liver transplants. Of those, 104 were transplanted between January 2018 and December 2023. RETREAT score was calculated for each patient. Patients were identified as having a low (0-3) or high (4-7) RETREAT score. HCC recurrence data was collected for each patient as identified through imaging, biochemistry, biopsy, and/or pathology reports from retransplantation. Of those who had a recurrence, days from transplantation to recurrence was calculated. 5-year survival data was also collected for all eligible patients. Overall median follow-up was 720 days.

Results: Actuarial 5-year overall survival of the HCC cohort was 88.5%. Median time from transplant to death was 552 days (37-1402). Four (3.8%) patients had HCC recurrence during the follow-up period. All patients with a recurrence had a high RETREAT score. None of the four patients with recurrence is currently alive. For those patients, median time from transplant to recurrence was 316 days (82-786), and median time from transplant to death was 669 days (153-1303.

Conclusion: Overall, a lower HCC recurrence rate was observed compared to the national average. This is probably due to the application of more effective, neoadjuvant modern treatments that include repeat MWA, sub-selective TARE, and SBRT that lead to improved pretransplant HCC response. Notably, recurrence occurred only in patients with a high RETREAT score, typically within their first year after transplantation. If this observation is verified by further outcomes research, radiographic surveillance in patients with low RETREAT score might not be needed in the modern era of multimodal HCC treatment.

46. Evaluating the cardioprotective effects of multipotent stem cell therapies in a cardiac organoid model of Ischemia-Reperfusion Injury

Caleb Heathershaw Joshua Maxwell, PhD

Jacolby Roddey, Sreekela Shenoy, Kiarash Astani, Olivia Latham
Wake Forest Institute Regenerative Medicine (WFIRM)
Basic Science- Student

Cardiovascular diseases (CVDs) are the leading cause of mortality worldwide, the most common of which is a myocardial infarction (MI). In MI, a coronary or microvascular blockage causes permanent damage to the heart muscle due to inadequate oxygen supply, resulting in redox imbalance, myocardial cell death, and scarring. Tissue reperfusion is employed clinically to prevent further ischemic injury; however, the reperfusion of oxygen causes a secondary injury known as ischemia-reperfusion injury (IRI), characterized by oxidative stress, mitochondrial dysregulation, apoptosis, and ultimately, cardiovascular complications. Current clinical strategies offer limited benefits to patients without repairing the damaged myocardium. However, cardiovascular regenerative medicine has emerged as a potential therapeutic strategy for MI that focuses on using cell-based therapies to repair the damaged myocardium itself. Stem cell therapies have demonstrated successful reduction of MI injury in preclinical settings, but clinical trials have had mixed outcomes. Part of this failure can be attributed to a preclinical reliance on small animal models. New approaches predictive of human pathophysiology of MI are needed. The objective of this study was to compare the post-MI repair efficacy of two adult multipotent stem cell populations (mesenchymal stromal cells, MSCs; placental stem cells, PSCs) in a novel 3D human cell model of the heart. We have generated 3D human-derived cardiac organoids (hCOs) containing induced pluripotent stem cell-derived cardiomyocytes, fibroblasts, and endothelial cells on 96-well plates. We exposed them to hypoxic conditions for 8 or 24 hours to induce IRI. Then, we measured their contractile function and viability to see how hypoxia damaged the organoids. Next, we exposed groups to MSCs and PSCs at doses reflective of clinical trial treatment ratios. Initially, we incorporated the cells into the organoids but have shifted to a paracrine approach that uses transwells to suspend the MSCs above the organoids in culture.

We found that contractile function was significantly impaired in correlation with hypoxic exposure time, particularly after 24 hours but sustaining for at least three weeks. Additionally, we found that live/dead staining reflected this damaged state. After characterizing our injury model, we began evaluating therapeutic approaches by incorporating MSCs and PSCs upon reperfusion of the spheroids after hypoxia. Our contractile and live/dead data indicate a negative effect of PSCs on damaged spheroids and mixed effects of incorporated MSCs on damaged spheroids.

In conclusion, we were able to generate a human in vitro model of the heart and confirm a dose-dependent hypoxic injury. We were able to evaluate the effects of treatment with MSC or PSC therapies. Our future experiments are aimed at further biochemical and functional characterization of IRI in our model and collecting data regarding optimal timing, dose, and cell type for cell-based therapies for MI.

47. Facial Injuries Secondary to Fireworks - A Review of the Literature

Abigail Heilenman, BS Christopher Runyan, MD, PhD

Anna Kaneb Samuel Kogan Madison Hinson Christopher Runyan
Surgery-Plastic & Reconstructive
Clinical Science-Student

Introduction: While the discourse of firework injuries predominantly revolves around the risks of hand trauma, a notable shortage exists in the literature regarding the incidence and management of facial trauma, particularly among pediatric populations. An estimated 19% of firework injuries affect the head, face, and ears. Despite the widespread use of fireworks during festivities, the scholarly literature on pediatric facial trauma caused by firecrackers remains sparse. This paucity of research not only underscores a significant gap in our understanding, but also poses critical implications in clinical practice, public health interventions, and injury prevention strategies. Thus a meticulous exploration of this under-examined domain is imperative to elucidate the prevalence, patterns, and optimal management pursued for pediatric facial trauma resulting from firecrackers.

Methods: A literature search was conducted on PubMed and Google Scholar utilizing search criteria "(((firework) OR (firecracker)) AND (injury)) AND (face)" and "facial AND injury AND firework OR firecracker" respectively between the date

ranges of 1993 - 2024 and resulted in the identification of 256 unique articles. Within this limited group, only 16 articles met inclusion criteria, focusing specifically on the management of facial trauma resulting from firecracker injuries. The remaining articles were excluded as they predominantly centered on epidemiological aspects, offering insights into the prevalence and demographics of firecracker-related injuries, rather than delving into clinical management strategies. This stark disproportion underscores the need of scholarly attention afforded to the clinical nuances and therapeutic interventions pertinent to pediatric facial trauma caused by firecrackers.

Results: Among the 16 articles reviewed, the majority were case reports, many originating from countries outside the United States. These reports predominantly featured young male patients, often injured during firework shows or while playing with friends. The injuries largely involved burns, lacerations, lower jaw and ocular trauma in the periorbital region. Management strategies typically involved wound debridement, surgical repair, and in severe cases, multistage reconstruction using grafts or flaps. Ophthalmologic interventions were key in preventing long-term vision loss. Outcomes were generally favorable with a multidisciplinary approach, although permanent scarring and loss of facial function were reported in severe cases. The lack of standardized protocols and preventive measures was a recurring theme in the literature, especially within the pediatric population.

Conclusion: Moving forward, there is a critical need for further research and standardized protocols specific to pediatric facial trauma, particularly in diverse patient populations. By advancing our understanding of the unique anatomical and developmental considerations inherent in pediatric facial injuries, healthcare providers can tailor treatment approaches to optimize outcomes and minimize complications. Additionally, ongoing education and collaboration among clinicians, researchers, and educators are essential in addressing the gaps in knowledge and enhancing the quality of care for pediatric patients with facial trauma. Overall, the literature showed that there is a lack of literature on managing pediatric facial trauma complications particularly with fireworks and firecrackers.

48. Achilles Tendon Rupture versus Limb Dominance

Kaitlin Henry, BS Paula Gangopadhyay, DPM, FACAS

Garrett S. Bullock, PhD,DPT Clark K. Brackney, DPM Robert Teasdall, MD Aaron T Scott, MD
Paula Gangopadhyay, DPM, FACAS Kerry A. Danelson, PhD, MS, MBA
Surgery-Orthopedics
Clinical Science- Student

INTRODUCTION While Achilles tendon ruptures (ATRs) are a common and significant cause of morbidity for patients, limited research exists exploring the relationship between upper and lower extremity dominance and laterality of rupture. This study aims to investigate the relationship between ATR laterality and hand or leg dominance, with the goal of better understanding of risk factors involved.

METHODS After institutional IRB approval, ATRs treated from 2008-2018 by three senior surgeons within a single health system were identified using CPT, ICD 9, and ICD 10 codes. Medical records were reviewed for demographic information, and patients were interviewed by telephone to ascertain hand and leg dominance through a brief survey. Odds ratio with 95% CI was utilized to compare ATR laterality with limb dominance.

RESULTS 136 patients with ATRs were identified. Within this cohort, 74 patients were successfully contacted and completed the follow-up interview. 64 patients (86%) reported right-hand dominance, and 68 patients (92%) reported right leg dominance. 33 right and 41 left-sided ATRs occurred. 55% of patients sustained an Achilles rupture ipsilateral to hand dominance. 45% of patients sustained an Achilles rupture ipsilateral to leg dominance. When controlling for age, body mass index, and previous Achilles injury, patients had 8.9 greater odds of sustaining an Achilles injury ipsilateral to hand dominance. Unadjusted models demonstrated no difference in odds of sustaining an Achilles rupture ipsilateral to hand or leg dominance.

CONCLUSION To the authors' knowledge, there is no previously published literature that specifically examines upper and lower extremity dominance with the laterality of an ATR. In an adjusted model, our study identified a greater odds of sustaining an Achilles injury ipsilateral to hand dominance. This underscores the need for further research to refine our understanding of the risk and prognostic factors associated with Achilles tendon ruptures.

49. Anatomic Evaluation of Percutaneous Flexor Tenotomy

Antonella Henson-Vendrell, BS Paula Gangopadhyay, DPM, FACFAS

Devon Niewohner, Hayden Bush, Lindsay LeSavage, Ashleigh Wells Medda, Paula Gangopadhyay
Surgery-Orthopedics
Clinical Science-Student

Introduction: An estimated one in seven people with diabetes will develop a foot ulcer during their lifetime, making foot ulcers the leading cause of hospitalization in this population, with a high risk of infection and amputations. Claw toes and hammer toes, common in diabetic patients, can exert pressure on the distal toe tips, increasing the risk of pressure ulcers. Initial treatment for these lesser toe deformities often involves conservative measures; however, surgical procedures can offer corrective solutions and relieve pressure on the toes. Percutaneous flexor tenotomies (PFTs) are minimally invasive foot procedures frequently utilized to correct lesser toe deformities; however, without being able to visualize the anatomy, we are often left to wonder if we safely and effectively preformed this “blind” procedure. To our knowledge, this is the first anatomical evaluation of percutaneous tenotomy of the flexor digitorum longus tendon using a No.18g needle, and the first to assess how results vary with the surgeon’s experience level. The objective of this study is to 1) evaluate the safety and efficacy of FDL needle PFT’s and 2) assess how the efficiency of this procedure might change when performed by surgeons with different levels of experience.

Methods: Fifty-four cadaveric toes, digits two through four, were used. A post-transection longitudinal dissection was performed to ensure the integrity of the plantar nerves and asses how successful the needle tenotomy was as transecting the FDL.

Results: Of 54 cases, only ten tenotomies resulted in complete transections of the FDL tendons. Interns and residents showed statistically less aptitude in tendon resection (~1.5 mm less resection) when compared to attendings. Following dissection, the surrounding neurovascular structures and soft tissue were found intact in all 54 cases. There was no difference observed in the overall resection rates between the digits, regardless of the surgeon performing the tenotomy, as the needle tenotomy was not more effective on one type of digit than another.

Conclusion: Regardless of level of surgeon, needle percutaneous needle tenotomies have been shown to be safe at respecting the surrounding structures. Our anatomical study is the first to demonstrate the performance differences in needle tenotomy among surgeons with varying experience levels, with interns and residents showing less proficiency in tendon resection than attending physicians. The findings raise questions about the necessary experience and case repetitions for a podiatry surgeon to become proficient in performing PFT’s.

50. Postoperative Infection after Functional Septorhinoplasty: Rates and Risk Factors at a Tertiary Referral Center

Lauren Himes, MD Candace Waters, MD

Ashley Harris, Samuel Kirse
Surgery-Otolaryngology (Dentistry)
Clinical Science-Resident

Introduction
Postoperative infections after functional septorhinoplasty (SRP) are relatively uncommon. Despite low infection rates, many surgeons still elect to prescribe postoperative antibiotics in hopes to prevent this complication. The use of postoperative antibiotics is best supported after complex SRP, which is typically defined as a revision case or one where grafts or implants are utilized. Tertiary care centers often perform higher rates of complex and revision cases, and there is a paucity of recent data delineating the specific operative factors that predispose a patient to infection after SRP in this setting. Ongoing research is warranted to better characterize the role of postoperative antibiotics after SRP.

Methods
A retrospective study was performed of patients greater than 18 years old who underwent SRP by board-certified facial plastic surgeons at Atrium Health Wake Forest Baptist from 2019-2023. Ultimately, 329 patients met inclusion criteria from

2019-2023. Rates of infections as well as risk factors-including demographic data, operative factors, and postoperative management-were assessed.

Results
Patients undergoing SRP were predominantly Caucasian and middle-aged, with nearly even split between male and female patients. 36% of patients had undergone prior nasal surgery, and 7% had prior SRP or rhinoplasty. At discharge after their surgery, 40% received post-operative antibiotics, with Keflex/cephalexin being the most commonly-prescribed medication. Minor infections (cellulitis) occurred in 13% of patients and rates of abscess formation were 4.8%. Several patients required hospitalization or re-operation for washout of abscess. When cultures were obtained, drug-resistant bacteria were common. Use of irradiated donor rib for grafting was a statistically significant risk factor for development of postoperative abscess (p=0.032). Patient factors such as older age and diabetic status did not appear to increase risk for development of infection. Use of postoperative antibiotics was not protective from infection when irradiated rib was implicated.

Conclusions
Rates of postoperative infection after septorhinoplasty remain low. However, when infections occur it is more commonly in the setting of donor rib grafting, and drug-resistant bacteria may be involved. The benefit of antibiotics in the postoperative setting is still not clear.

51. Safety First: The Role of Protective Devices on Facial Trauma Severity and Outcomes in Pediatric Patients

Madison Hinson, BS Christopher Runyan, PhD, MD

Avery Wright, Amelia Davidson, Samuel Kogan, Christopher Runyan
Surgery-Plastic & Reconstructive
Clinical Science- Student

Introduction: The misuse of protective devices in motorized vehicles increases the risk of severe facial injuries in pediatric populations. This study examines pediatric facial fracture cases from patients treated at two high-volume Level 1 Trauma Centers, focusing on factors that influence injury severity, management of facial fractures, treatment outcomes, and potential preventive strategies, with an emphasis on the patients' residential counties at the time of injury.

Methods: A retrospective review was conducted on pediatric facial trauma patients under 18 years old who were treated at Atrium Health Wake Forest Baptist and Atrium Health Carolinas Medical Centers between January 2020 to December 2022. Motorized vehicles included cars, trucks, motorcycles, lawnmowers, golf carts, and aquatic vehicles. Safety device usage at the time of injury (e.g., helmets, car seats, seat belts) was documented. Data on demographics, facial injuries, trauma management, fracture severity, and post-discharge outcomes were collected and analyzed using Chi-Square, Independent T-tests, and Logistic Regression Models, with significance set at 0.5%.

Results: Among 2,977 pediatric facial trauma cases, 206 involved motorized vehicle accidents (MVA) resulting in at least one facial fracture. Rural-residing patients were significantly more likely to be transferred from outside facilities (p=0.007) and to be involved in ATV accidents (p=0.006). Urban-residing patients who did not use proper safety devices sustained significantly more low-energy trauma injuries (p=0.012), had higher injury severity scores (p=0.019), and experienced longer hospital stays (p=0.014). Rural-residing who used safety devices demonstrated better follow-up care for facial trauma (p=0.037) and greater resolution of residual symptoms one year post-discharge (p=0.004).

Conclusion: This study highlights the critical importance of safety device usage in improving pediatric facial trauma outcomes. Patients without proper safety device use experienced more severe injuries and longer hospital stays. In contrast, rural-residing who utilized safety devices had better follow-up care and greater resolution of symptoms. Improper use of safety devices was associated with more severe injuries, lower rates of symptom resolution, and reduced follow-up care. Further research is needed to enhance follow-up care for rural-residing patients and improve long-term outcomes. Future efforts should focus on reducing the misuse of safety devices in these communities through targeted education and prevention strategies.

52. Navigating the Complexity of Facial Trauma: Impact of Hospital Transfer Patterns on Management and Outcomes in Pediatric Patients

Madison Hinson, B.S Christopher Runyan, PhD, MD

Avery Wright, Amelia Davidson, Samuel Kogan, Christopher Runyan
Surgery-Plastic & Reconstructive
Clinical Science-Student

Introduction: Pediatric patients with facial fractures often require transfer to specialized pediatric trauma centers for comprehensive, multidisciplinary care. We propose that various factors influence the management and outcomes of these patients based on whether they are initially evaluated at trauma centers or transferred from other institutions. Understanding these differences and implementing this recommended protocol may improve the management and outcomes of pediatric facial trauma patients.

Methods: A retrospective chart review of pediatric facial trauma patients under 18 years old treated between January 2020 and December 2022 at Atrium Health Wake Forest Baptist and Atrium Health Charlotte Medical Centers. Data on patient demographics, transfer patterns, facial injuries, and outcomes were collected in a REDCap database. Statistical analysis was performed using Chi-Square and Student T-tests, with significance set at 5%.

Results: Among 2,977 patients evaluated for facial trauma injuries, 603 sustained at least one facial fracture at the time of their injury. Patients directly evaluated at the trauma centers had a significantly higher occurrence of midface fractures, while transferred patients more frequently sustained mandible fractures ($p<0.001$). Transferred patients with multiple facial fractures, including at least one midface fracture, were significantly more likely to sustain open fractures ($p<0.001$) and comminuted fractures ($p=0.02$). These patients were also more likely to be transferred for conservative evaluations ($p<0.001$), had longer hospital stays ($p=0.01$), and required more procedures when surgery was indicated ($p=0.004$). Furthermore, they reported more persistent symptoms post-discharge ($p=0.01$), were more likely to receive and continue follow-up care for facial trauma ($p<0.001$), and had a lower likelihood of symptom resolution within one year post-discharge ($p=0.02$). Conversely, patients directly evaluated with isolated midface fractures were less likely to have open fractures ($p=0.001$) and had shorter hospital stays ($p=0.0001$). For isolated mandible fractures, transferred patients were significantly more likely to have comminuted fractures ($p<0.00001$), while directly evaluated patients experienced longer hospital stays ($p=0.0001$). No significant differences were noted in other broad categories of facial fractures.

Conclusion: This study emphasizes the need for further research into optimizing the management of complex midface fractures, particularly in transferred patients with facial trauma. These patients, who were often transferred for conservative management at trauma centers, faced a higher likelihood of multiple procedures when surgery was necessary, highlighting the complexity of these injuries. These findings emphasize the intricate nature of pediatric facial fractures and the need for tailored treatment approaches to minimize complications. We propose interfacility transfer guidelines for pediatric facial trauma patients to streamline care pathways and improve outcomes in this vulnerable population.

53. Predicting Readmission Among Surgical Patients: When You Calculate a Risk Score Matters

Lauren Hostettler, BS Justin Hurie MD, MBA

Joseph Rigdon, Justin Hurie, Thomas Houston
Surgery-Vascular & Endovascular
Clinical Science- Student

Introduction. Predicting readmission risk can help drive discharge planning that is tailored to the patient. We evaluated the predictive power of a standard readmission risk score for surgical patients within a frequently adopted electronic health record.
Methods. Using the electronic health record data, we constructed a longitudinal cohort of surgical (emergent and non-emergent) patients admitted between 2019 and 2021. Using Clinical Classification Software (CCS) codes, we included 93 surgical procedure groups (N = 38,699 unique patients). The primary independent variable was the readmission risk scores (calculated daily during the index admission) and the dependent variable was 30-day all-cause readmission to our healthcare delivery system.

Results. General Surgery (19.8%), Neurosurgery (12.3%) and Orthopedics (10.7%) were the specialties with the highest discharge volumes. Patient population was diverse (mean age 59 years [SD = 16], 44.5% female, 22.2% non-white). Overall, 30-day readmission rate was 8.36%. The predictive performance of the readmission risk score varied with time (ROC curve C-statistic of risk score nearest to admission = 0.63 versus C-statistic 24 hours post-procedure = 0.66 versus C-statistic nearest to discharge = 0.68).

Conclusions. Although several readmission prediction scores exist, their predictive power has been mostly tested among patients admitted to a medical service. In surgical patients, the performance of the risk score improved post-procedure. Risk score performance calculated at 24 hours was similar to prior reports in non-surgical patients.

54. Effectiveness of an institution wide pre-operative antibiotic protocol using cephalosporins in patients with penicillin allergies during primary total joint arthroplasty

Kyle Hrabovsky, BS John Shields MD

Kyle S. Hrabovsky, Robert J. Teasdall, Kathleen E. Williams, Emily M. McMurtrie, Garrett S. Bullock, John S. Shields
Surgery-Orthopedics
Clinical Science-Student

Background: Perioperative cephalosporin antibiotic administration is proven to reduce surgical site infections, a morbid complication in total joint arthroplasty (TJA). Historically, patients with reported allergic reactions to other beta-lactam antibiotics (i.e. penicillin (PCN)) received alternate, less effective antibiotics due to potential cross-reactivity. New literature indicates patients with a PCN allergy, including anaphylaxis, are safe to receive cephalosporins without additional precautions or testing. We believe our institution wide protocol offers a safe and effective algorithm that will increase cefazolin usage in TJA.

Hypothesis: Our institution wide protocol is effective at decreasing infection risk for TJA patients compared to the prior standard of care. Patients with a PCN allergy are safe to receive cephalosporins for total joint replacement surgical prophylaxis.

Methods: This was a retrospective cohort study that looked at patients who underwent primary TJA for osteoarthritis from 2022-2024. IRB approval was obtained for the study. Investigation was performed for demographics, type of surgery, antibiotic received, details on documented PCN allergy, adverse reaction from antibiotic received, and if patient developed a PJI.

Results: Our records identified a total of 3910 patients, of which 41% underwent total hip arthroplasty and 59% underwent total knee arthroplasty. Of the total patients, 667 (17%) had a documented allergy to PCN, and 67 (1.7%) had a documented anaphylactic reaction to PCN prior to surgery. Of the patients with a PCN allergy, two (0.29%) had an intra-operative non-anaphylactic adverse reaction, but this could not be directly associated with the antibiotic received. Twenty-one of the total patients sustained a PJI. Of these 21 patients,19 did not have an allergy to PCN, and two had an allergy. There were no significant differences in infection after implementation of the new institution wide protocol, the overall infection risk ratio was 0.83 (95% CI: 0.49, 1.40), p = 0.480.

Conclusions: There were no significant differences in infection after implementation of the new institution wide protocol. However, there were only two adverse reactions in the total patient population, neither of which were anaphylaxis, nor could they be directly associated with the antibiotic. Our data supports our institutional protocol that cephalosporins are safe in those with documented PCN allergy, including anaphylaxis.

55. Amplifying Lymphocyte Response Against Primary Peritoneal Malignancy Cells Through a Personalized Immunocompetent Organoid Microfluidic Platform

Damian Hutchins, M.S. (PhD Student) Konstantinos Votanopolous, MD, PhD

Cecilia R. Schaaf, Tiefu Liu, Mitra Kooshki, Nicholas Edenhoffer, Steven Forsythe,
Robyn Greissinger, Lance Miller, Pierre Triozzi, Edward A Levine, Shay Soker,
Adam Hall, and Konstantinos Votanopoulos
Surgery-Oncology
Clinical Science-Student

Background: Adoptive cellular therapy (ACT) is a promising antitumor immunotherapy showing success in select trials/patients. However, major challenges limit ACT in all tumors including insufficient cell numbers and failure to target heterogeneous tumors. To improve ACT, we developed a novel biomimetic device where patient-derived tumor organoids, enriched with antigen presenting cells, are cocultured with autologous peripheral blood mononuclear cells (PBMCs) in a microfluidic tumor-on-a-chip system (TOC). As PBMCs circulate through the device, they are exposed to dispersed tumor polyclonal neoantigens, leading to formation of patient- and tumor-specific organoid interacting lymphocytes (OILs).
Objectives: Demonstrate that a 3D tumor-on-a-chip (TOC) platform generates organoid interacting lymphocytes (OILs) with enhanced antitumor reactivity.
Methods: Specimens were collected from 26 surgical patients: mesothelioma (10), and metastatic appendiceal adenocarcinoma (16). Tumor cells were combined with autologous antigen presenting cells (healthy spleen/lymph node) in a 3D matrix to generate immune-enhanced tumor organoids in the TOC system. Autologous PBMCs circulated through the system to produce OILs (7 days). Uncirculated PBMCs and tumor infiltrating lymphocytes (TILs) were cultured as controls. Resultant CD8+ controls and OILs were examined by single cell proteomics to compare cytokine secretion profiles and polyfunctionality. To assess anti-tumor reactivity, OILs and controls were reintroduced to autologous tumor cells via coculture. Secreted bulk cytokine profiles were compared by Isoplexis CodePlex and confirmed by ELISA. NanoString Geomx spatial proteomic analysis of coculture PTOs identified key lymphocyte activity and phenotypes during anti-tumor reactivity. Coculture cytotoxic lymphocyte activation and tumor cell death was confirmed by flow cytometry. Data were analyzed using student t-test and differential expression from linear mixed-effect model.
Results: Compared to uncirculated CD8+ PBMCs and TILs, CD8+ OILs showed increased polyfunctionality within single cells immediately after training, particularly in effector T-cell associated cytokine profiles. Upon re-introduction to PTOs, OILs excreted significantly increased inflammatory-associated proteins IFN-γ and Granzyme A ($p<0.05$). Furthermore, OIL re-exposure to tumor led to significantly increased tumor cell death compared to controls ($p<0.05$).
Conclusion: Compared to controls, OILs produced in the TOC system show enhanced cytotoxic lymphocyte polyfunctionality and induce tumor cytotoxicity, independent of tumor type. With further validation of the OILs' increased tumor-targeting efficacy, we propose a new potential ACT modality to target a broad array of tumors previously untreatable by current therapies.

56. Readmissions After Surgery For Colorectal Liver Metastases: A Propensity Score Analysis From The Colorectal Liver Operative Metastasis International Collaborative (COLOMIC)

Wesley Iobst, BA Perry Shen, MD

Heidy Cos, Christian Valenzuela, Omeed Moaven, Grey Leonard, John Stauffer, Nico R Del Piccolo, Tan To Cheung,
Carlos U Corvera, Andrew Wisneski, Charles Cha, Kathleen Cummins, Greg Russell, Perry Shen
Surgery-Oncology
Clinical Science-Student

Introduction: Metastasectomy for colorectal liver tumors has been shown to improve survival in patients with stage IV colorectal cancer. Current advances in perioperative care of these patients have also resulted in a shorter postoperative length of stay. With increased survival and shorter postoperative LOS, more information is needed about readmission rates and risk factors for hospital readmissions after surgery for colorectal liver metastases (CLM). Methods: The Colorectal Liver Operative Metastasis International Collaborative retrospectively examined 935 patients with CLM from 2000 to 2018. 90-day readmissions were studied using propensity score matching (PSM) in a 1:2 ratio of cases to controls, matched for age, tumor size and Charlson-Deyo comorbidity scores. Student's t-test, Fisher's Exact Test, and Chi-square estimates of the Log-Rank tests were used for applicable variables. The Kaplan-Meier estimates were used to estimate overall survival (OS). SAS (version 9.4, Cary, NC, USA) was used for all analyses. P-values <0.05 were considered to be statistically significant. Results: 935 patients underwent surgery for metastatic colorectal liver disease from 2008-2018. The mean age was 59 (SD=11.4) years, and 59% of patients were males. The overall readmission rate was 6.9% (N=65). Median time to readmission after surgery was 19 days (range 4 - 90). Readmitted were paired via PSM with non-readmitted patients (n=130). Readmitted patients had significantly higher rates of organ space infection (28% vs 2%, $p<0.001$), bile leak (26% vs 1%, $p=0.036$) and post-operative liver failure (9% vs 2%, $p=0.018$). There were no significant differences in median

index-admission LOS (7 days vs 6 days, p=0.37), overall survival (median 39.7 months vs 43.3 months, p=0.93) or rate of adjuvant therapy (66% vs 68%, p=0.54) between readmitted and non-readmitted patients, respectively. Conclusion: Patients who are readmitted for management of intermediate and late complications after surgery for CLM can recover and receive adjuvant therapy with no apparent adverse effect on overall survival. Organ space infection, bile leak, and liver failure are highly associated with readmission.

57. Clinically applicable and functional human pancreatic islets structure with physiomimetic microenvironment for type 1 diabetes

Wonwoo Jeong Giuseppe Orlando

Wonwoo Jeong[1,†], Quentin Perrier[1,†], Arunkumar Rengaraj[1], Lori Byers1, Grisell Gonzalez[2], Emmanuel Opara[3], Rita Bottino[4], Alice Tomei[2], Amish Asthana[1], Sang Jin Lee[1], and Giuseppe Orlando[1,*]
[1] Wake Forest Institute for Regenerative Medicine, Wake Forest University School of Medicine, Medical Center Boulevard, Winston-Salem, NC, USA
[2] Diabetes Research Institute, Miller School of Medicine, University of Miami, Miami, FL, USA
[3] Virginia Tech-Wake Forest School of Biomedical Engineering and Sciences, Wake Forest School of Medicine, Winston-Salem, NC, USA
[4] Imagine Islet Center, Imagine Pharma, Pittsburgh, PA, United States
Wake Forest Institute Regenerative Medicine (WFIRM)
Basic Science- Fellow

Introduction
Pancreatic islet transplantation holds promise as an effective treatment for Type 1 diabetes, but approximately 10,000 iEQ/kg is needed for therapeutic outcomes. Microencapsulation of islets has been studied to support allogeneic implantation and long-term functionality. However, volumetric tissue manufacturing is limited, as human primary pancreatic islets (HPPIs) are highly sensitive to mechanical stress and hypoxic environments.
Methods
This study demonstrates the fabrication of functional structures composed of HPPIs using a clinically relevant bioprinting process. Alginate-based bio-inks with detergent-free decellularized extracellular matrix (dECM) were used for encapsulation to maintain viability. To optimize the 3D bioprinting process, 2,500 clusters/mL of NIT-1 were printed under varying extrusion pressures (30–50 kPa) and printing speeds (20–120 mm/min) to prevent deformation and preserve viability and functionality.
Results and Conclusion
The optimized bioprinting parameters achieved over 90% viability of HPPIs (2,500 iEQ/mL) from three donors, with stable glucose-stimulated insulin secretion comparable to free islets over 7 days. High-density printing at 10,000 iEQ/mL demonstrated the potential for volumetric tissue manufacturing. The printing conditions maintained cytocompatibility, achieving 90% viability and a stimulus index (SI) of 3.7 ± 0.6 on day 21, surpassing the SI of free islets (2.6 ± 0.4). In conclusion, this study presents a clinically relevant approach for 3D bioprinting of HPPIs with optimized bio-inks, advancing the scalability of islet transplantation. These findings provide a foundation for future developments in diabetes treatment and regenerative medicine.

58. High throughput screening of patient-derived breast cancer with improved physiological relevance by basement membrane matrix for clinical application

Wonwoo Jeong Sang Jin Lee

Wonwoo Jeong[1], Dongju Kim[1], Nadeem Wajih[1,2], Hyun-Wook Kang[3], James J. Yoo[1], Anthony Atala[1], Shay Soker[1,4] and Sang Jin Lee[1]
[1]Wake Forest Institute for Regenerative Medicine, Wake Forest University School of Medicine, Medical Center Boulevard, Winston-Salem, NC, USA
[2]Department of General Surgery, Wake Forest Organoid Research Center, Wake Forest University School of Medicine, Medical Center Boulevard, Winston-Salem, NC, USA
[3]Department of Biomedical Engineering, Ulsan National Institute of Science and

Technology, Ulju-gun, Ulsan, South Korea.
[4]Virginia Tech-Wake Forest University School of Biomedical Engineering and Sciences, Wake Forest School of Medicine, Winston-Salem, NC, USA
Wake Forest Institute Regenerative Medicine (WFIRM)
Basic Science- Fellow

Introduction
Triple-negative breast cancer (TNBC) comprises 10-15% of breast cancer cases, is highly aggressive and influenced by basement membrane (BM) components like collagen IV and laminin. Patient-derived organoids fail to reflect the ongoing physiological environment that modulate cancer aggressiveness.
Methods
To address this, segmented organoids with agile reassembly (SOAR) printing was developed for TNBC organoids compartmentalized with a BM in order to simulate differential aggressiveness. As a result, increasing BM concentration elevated organoid stiffness to approximately 2 kPa. This led to the formation of desmoplasia-like structures and enhanced cancer aggressiveness, as evidenced by nuclear pleomorphism, increased Ki-67 expression, and β-catenin translocation.
Result and Conclusion
SOAR-printed organoids were integrated into a high-throughput drug screening (HTDS) platform, revealing increased drug resistance with rising BM concentration, as quantified by elevated IC_{50} and reduced drug efficacy for doxorubicin, paclitaxel, and cyclophosphamide. At last this platform successfully captured differential patient-specific drug responses induced by cancer aggressiveness control in patient-derived TNBC organoids (PTBOs).
SOAR printing demonstrated scalability, cost-effectiveness, and the rapid formation of patient-specific organoids within 7 days for use in personalized medicine. The versatility of this technique suggests it as a promising in vitro platform for organoid manufacturing, applicable to toxicology and drug screening for regenerative medicine.

59. Does Robotic Versus Manual Total Knee Arthroplasty Influence Predicted Implant Size?

Blake Jones, MS Maxwell Langfitt, MD

Matthew Gwilt, Garrett Bullock, Maxwell Langfitt
Surgery-Orthopedics
Clinical Science- Student

INTRODUCTION: Preoperatively templating allows surgeons to anticipate implant size, thus maximizing efficiency while in the operating room. Variables such as height, weight, sex, and ethnicity in continuous multilinear models have predicted the final fitted construct within one size 79-92% of the time. This led us to question which additional preoperative factors can be assessed to increase predictive accuracy, and whether the application of robotic TKA will impact final component sizing.

METHODS: A retrospective review was performed on 1485 patients who underwent TKA at our institution from 2016-2023 with a single fellowship-trained arthroplasty surgeon. Final construct size was gathered from operative notes. Data was stratified by those who received a manual (n=889) or robotic (n=591) procedure. Cumulative odds multivariable logistic ordinal regressions with proportional odds were conducted to investigate the effects of height, weight, age, ethnicity, laterality, cement use, and cruciate-retaining or posterior-stabilized designs on femur and tibia implant sizes separately for both robotic and manual procedure groups for a total of four models. Confusion matrices then assessed each of the models' ability to accurately predict femur and tibia component size.

RESULTS: The models accurately predicted final construct size (±1) 92-96% of the time, with exact matches ranging from 49-55%. Models built on manual data predicted with slightly greater ±1 accuracy as compared to robotic models. Sizes 3-6 were the most accurately predicted sizes for all models. Height, age, weight, and sex statistically impacted all four models. No cement use increased the odds of larger tibial component size in both manual and robotic models more than any other variable with odds ratios of 2.1 and 2.5, respectively.

DISCUSSION/CONCLUSION: Readily obtainable demographic information and preoperative determination of construct design accurately predict TKA implant size for both manual and robotic-assisted procedures. This may help reduce operative time and surgical expenditure from multiple sizing trays.

60. A Characterization of the Involvement of Facial Trauma Subspecialists in the Management of Pediatric Facial Gunshot Wounds

Anna Kaneb, MS Christopher Runyan, MD, PhD

Anna Kaneb, MS, Abby Heilenman, BS, Sam Kogan, MD, PhD, Madison Hinson, BS,
Mario Blondin, MD, Christopher Runyan, MD, PhD
Surgery-Plastic & Reconstructive
Clinical Science-Student

Background: This study sought to evaluate a series of pediatric GSWs that were managed by the Plastic and Reconstructive Surgery Service (PSU) and the Otolaryngology Service (ENT) at Atrium Health Wake Forest Baptist Medical Center and Atrium Health Carolinas Medical Center to identify key characteristics of pediatric GSW injury patterns that warrant the involvement of a specialized facial trauma team.

Methods: A search was conducted from January 2020 to December 2022 covering all pediatric facial trauma cases within this time period to identify patients who experienced a single mechanism of injury through a GSW. Cases where PSU/ENT were consulted in the initial management of the trauma were evaluated based on type of injury sustained, broad fracture pattern, and fracture type.

Results: From an initial report of 1,094 pediatric traumas, 30 patients were identified with isolated GSW as the mechanism of injury. Twelve of these cases carried an initial PSU/ENT consultation. Two were later excluded due to lack of trauma and/or acute concerns (Table 1). The most common fracture type that prompted PSU/ENT consultation was comminuted fractures (n=8, 80%; Figure 2). The most common broad fracture pattern within this cohort was fractures of the mandible (n=6, 60%; Figure 3).

Conclusion: Mandibular fractures were the most frequent injury that warranted intervention and management from facial trauma subspecialists. Non-displaced fractures and depressed fractures were consistently deemed non operative by PSU/ENT, suggesting that these fracture patterns do not require urgent consultation from a facial trauma subspecialist.

61. A Multicenter Review of Diabetic Osteomyelitis: Oral Versus Intravenous Antibiotics

Jennifer Kipp, DPM Cody Blazek, DPM

Lindsay LeSavage, Joni Evans, Travis Denmeade, Julia Tolin,
Julianne Vesce, Ricardo Arbulu, Jeffrey Manway, Cody Blazek
Surgery-Orthopedics
Clinical Science-Resident

Introduction: According to guidelines provided by the Infectious Diseases Society of America, residual osteomyelitis warrants an extended course of antibiotics. Recent literature has shown that oral antibiotics are not inferior to intravenous antibiotics when treating orthopedic infections. In a recent study, we investigated the outcomes of oral versus intravenous antibiotics in diabetic foot infections at a single academic medical institution.
Methods: The goal of this study is to evaluate therapeutic success in 196 patients receiving oral versus intravenous antibiotics for treatment of residual diabetic osteomyelitis after amputation at two Level 1 trauma academic medical centers. A retrospective chart review was performed on 196 patients who were treated with either oral or intravenous antibiotics following confirmation of osteomyelitis at the residual amputation site margin. The primary outcome was treatment success, which is defined as a healed post operative wound without an unplanned return to the operating room within one year of the index procedure.
Results: There was no difference determined in treatment success between groups at WFBMC ($p<0.3392$) and UPMC ($p<0.999$). No difference in success was found when combining institutional data ($p<0.5182$). The median time to healing for oral antibiotic treatment was 3.21 months compared to 3.85 months for intravenous treatment ($p<0.1560$). Reoperation rates did not differ among treatment types ($p<0.5264$). Hemoglobin A1c was the only characteristic with a statistically significant difference in treatment success (8.6±2.3), versus treatment failure (9.5±2.5) ($p<0.0161$).
Conclusion: The results of the present study suggest oral antibiotics for treatment of residual osteomyelitis are not inferior to intravenous therapy and should be considered for use in certain patients.

62. Minimally Invasive Oral Airway Plate Outcomes in Pierre Robin Sequence: A Meta-Analysis

Kara Klomparens-Fisher, MD Christopher Runyan, MD, PhD

Eric Zeng, Elsa Katarina Acosta, Kate Lambert, Christopher Runyan
Surgery-Plastic & Reconstructive
Clinical Science-Resident

Introduction
Pierre Robin Sequence (PRS) is classically described as hypoplasia of the mandible causing the tongue to be displaced superiorly and posteriorly between the palatal shelves and thereby preventing their fusion. This developmental error causes glossoptosis, micrognathia and cleft palate. This can lead to devastating outcomes and often requires major operations to protect the airway including tracheostomy and mandibular distraction. These surgeries carry large risks and are associated with significant complications.

Oral airway plates (OAP) have shown promising outcomes in these patients. OAPs are custom orthodontic appliances that consist of a palatal base plate, a velopharyngeal extension and extraoral fixation wires. The velopharyngeal extension functions to push the tongue anteriorly, opening the airway and thereby preventing invasive surgeries. While results of OAP thus far have been promising, most of the literature has been performed outside of the United States and its implementation has been limited.

Methods
A meta-analysis was conducted including studies that compared pre and post OAP treatment outcome measures in patients with PRS such as sleep study analysis, feeding tube requirement, jaw index and/or desaturation index. Statistical analysis was conducted using weighted means and standard deviations with comparisons evaluated by Z-tests and ANOVA, adjusting for weighted variances.

Results
Eight studies were included that fit the above criteria with a combined 728 patients. When combining all data, the weighted mean of the mixed-obstructive sleep apnea index (MAOI) had a statistically significant decrease ($p<.0001$) from 10.29 (± 4.46) pre-treatment to 1.13 (± .61) post-treatment. The percent of patients requiring a feeding tube for adequate nutrition was reported in five studies (n=345) and also demonstrated a statistically significant decrease ($p<.0001$) from 58.02% pre-treatment to 15.55% post-treatment. Two studies included jaw index data (n=199) which showed a significant improvement ($p<.0001$) from pre-treatment (16.4±.94) to post-treatment (11.94 ±.71). Three studies additionally reported desaturation index (n=92) and showed a significant improvement ($p<.001$) from .63 (±3.12) to 0.00 (±.43).

Conclusions
Oral airway plates have been shown to be an effective and minimally invasive treatment method for patients with PRS. Studies demonstrate significant improvements in respiratory status as shown by MAOI and desaturation indices as well as improved feeding ability. Widespread application of this technique has been limited, however, by the difficulty of the manufacturing process as well as lack of provider awareness of its efficacy.

63. Impact of Plastic Surgery Residents on an Established, High-Volume Microsurgical Breast Practice

Samuel Kogan, MD, PhD Christopher Runyan MD, PhD

Eric Zeng Christopher Runyan
Surgery-Plastic & Reconstructive
Educational Science- Resident

Introduction: Resident involvement in complex microsurgical procedures is critical for advancing surgical training, yet it remains a point of apprehension for both patients and attending surgeons. This challenge is intensified by heightened scrutiny on medical errors, patient outcomes, and operative efficiency. While some studies have explored the impact of resident involvement on general surgical outcomes, the field of microsurgery, characterized by its complexity and steep learning

curve, remains under-investigated. This study explores a rare, case control-like opportunity resulting from a healthcare merger to evaluate plastic surgery resident involvement in an established microsurgical breast practice.
Objective: To evaluate the impact of plastic surgery resident involvement on postoperative outcomes and complication rates in DIEP flap breast reconstruction.
Methods: A retrospective chart review was performed on all patients (n = 395) who underwent DIEP flap reconstruction from December 2021 to May 2024 at a high-volume institution. Patients were stratified into three cohorts based on the operative team: dual attending surgeons without a resident (n = 174), with a plastic surgery resident (n = 147), or with a general surgery resident (n = 38). Demographics, operative details, and postoperative outcomes were reviewed. Key outcomes included overall complication rates, flap ischemia time, infection occurrences, length of stay, and need for revisional surgeries.
Results: Baseline demographics, including comorbidities, ASA status, and history of radiation and chemotherapy, were similar across all cohorts. Although flap ischemia time was marginally longer in the plastic surgery resident cohort compared to the attending only cohort (46 minutes vs. 39 minutes, p = 0.001), the difference was not clinically significant. Importantly, the plastic surgery resident cohort showed no increase in the rates of overall complications, including flap loss, return to the operating room, hematoma, seroma, or wound infection. Additionally, the length of stay was comparable across all groups.
Conclusion: Operative experience during surgical residency is essential for the training of competent graduates. A recent healthcare merger provided for a natural experiment to assess the impact of plastic surgery resident involvement in a high-volume microsurgical breast practice. Notably, the involvement of plastic surgery residents did not negatively impact any patient related outcomes. Flap ischemia time was statistically, though not clinically, increased, with no statistically significant increase in total operative time. These findings suggest that attending surgeons allowed for resident involvement in the highly technical steps of microsurgical anastomosis with no change in patient outcomes. Taken together, this research holds broad implications for surgical education and healthcare delivery. It supports the notion that involving residents in complex surgeries is not only safe, but essential for developing the next generation of skilled surgeons.

64. Creating the methodology infrastructure for a multi-institutional trial investigating the impact of illustrated educational interventions on patients and caregiver comprehension in pediatric liver transplantation

Souma Kundu, MD Dionisios Vrochides, MD PhD

Maria Baimas-George, Souma Kundu, William Archie, Mary Alice Boulware, Katheryn Peterson, Darci Grochowski, Vincent Casingal, Lon Eskind, Vani Gopalareddy, David Levi, Alisha Mavis, Dionisios Vrochides
Surgery-Transplant
Clinical Science- Resident

Background: Lack of healthcare knowledge is a well demonstrated barrier to solid-organ transplant. Improved access to resources and low-risk interventions could serve benefit to that end. This proposal seeks to evaluate the effectiveness of illustrated books for liver transplant pediatric candidates and caregivers on comprehension, compliance, and outcomes.

Methods: This is a prospective, collaborative multi-institutional trial between five pediatric transplant centers (Atrium Health, Massachusetts General Hospital, Stanford University, University of Colorado, and University of Pittsburgh). The proposal was also presented at the Starzl Network for adoption (15 U.S. centers). Five illustrated books were created addressing: 1) the basics of liver transplantation; 2) preoperative evaluation and the waiting list; 3) perioperative care and immediate postoperative care; 4) long-term postoperative care and immunosuppression; and 5) transition to care. A survey book with 20 multiple choice questions was created for each book to assess comprehension. The trial will enroll caregivers of patients on the waiting list for liver failure. Caregivers will complete the first survey book after which they will receive the first book. After two weeks, they will complete an identical survey to see if the book improved comprehension. This process will be duplicated with each book. Surveys and charts review will be used to assess outcomes.

Results: Study costs include book ($11.21/unit) and survey booklet acquisition costs ($2.50/unit). We estimate use of 100 books and 200 survey books annually per center, thus resulting in annual costs of $8,100 for the initial five centers. We expect improvement in survey scores after book use. We also expect to improve clinic and medication compliance, reduce readmission rates and emergency department utilization, and reduce phone calls to transplant coordinators and nursing staff.

Conclusion: Initiatives to support patient experience and comprehension come at a relatively low cost. Research funding

can serve a dual purpose and cover this cost. Due to Atrium Health's emerging role as a pediatric liver transplantation center, we plan to cover all initial expenses for the Starzl Network and co-investigative institutions for the first two years through internal unrestricted research funding.

65. What Plastic Surgeons Can Learn About Macromastia and Headache from Collaboration with Neurology Colleagues

Elizabeth Laikhter, MD Lisa David, MD, MBA

Kristyn Pocock, Mary Duet, Paige Estave, Lisa David, Lauren Doyle Strauss, Sandhya Kumar, Barbara Nye, Rebecca Erwin Wells
Surgery-Plastic & Reconstructive
Clinical Science-Resident

Introduction: Over 100,000 women with symptomatic Macromastia undergo reduction mammoplasty annually in the United States for symptom relief. Up to 69% of these women cite headache as a reason for pursuing this surgery, and nearly 50% of these patients report post-operative headache improvement. Despite such strong anecdotal association between headache and macromastia, a scoping review, previously conducted by our group, of studies addressing macromastia and headache, determining that a majority of studies are published in plastic surgery journals and there are no manuscripts published in neurology journals on this topic. Collaboration with neurology colleagues to better understand the types of headaches our patients with macromastia experience fills a gap in literature. Our first specific aim was to determine the number of patients with macromastia and headache undergoing reduction mammoplasty who meet criteria for migraine or tension-type headache.
Methods: A cross sectional survey-based study was performed at Atrium Health Wake Forest Baptist, recruiting patients over a 4 month period from the plastic surgery clinic who had insurance approval for reduction mammoplasty, experienced any type of headache, and met the remaining inclusion and exclusion criteria. Patients were administered preoperative surveys including questions from validated surveys ID-Migraine, monthly Migraine Disability Assessment Score (MIDAS), Allodynia Symptoms Checklist (ASC), Berlin questionnaire, Stigma Scale for Chronic Illness 8-item version (SSCI-8). Descriptive statics were used to characterize the study population and their headache type. All subject recruitment and data collection was completed after IRB approval was obtained under protocol number IRB00092402.
Results: A total of 34 patients were recruited who met inclusion and exclusion criteria. All patients (34/34) considered neck pain as a reason for undergoing reduction mammoplasty and 31 of 34 (91.18%) patients considered headache as a reason for reduction mammoplasty. Other reasons for considering reduction mammoplasty included back pain (31/34, 91.18%), difficulty exercising (30/34, 85.29%), difficulty finding clothing that fits (29/34, 85.29%), and negative mental health (21/34, 61.76%). Regarding therapies pursued prior to reduction mammoplasty, most patients (31/24, 91.18%) had tried supportive bras, while only 10/24 (29.41%) tried physical therapy, and 13/34 (38.24%) had used tripans for headaches. All patients had greater than 4 headache days a month. Overall, 29/34 (85.29%) answered 2 out of 3 questions positive for migraine from a three item subset of the MIGRAINE ID questionnaire including disability, nausea, and sensitivity to light. Cutaneous allodynia was reported by 14/34 (40.18%) of patients, with 9/14 of those patients (64.28%) having episodic migraines, and 5/14 (35.71%) having chronic migraines.
Conclusions: Collaborating with neurology colleagues allows plastic surgeons to better characterize and understand the types of headaches that impact our patients undergoing breast reduction. Most of our study population has evidence of migraine-type headaches. Collaboration between specialties may optimize patient care.

66. Morphometric Analysis of Arterial Anatomy for Emergent Endovascular Resuscitation Interventions

Bonnie Laingen, MS Timothy Williams, MD

Elizabeth Wood, Thomas Sullivan, James Patterson, Gabriel Cambronero, Gloria Sanin, Magan Lane, Lucas Neff, Timothy Williams
Surgery-Vascular & Endovascular
Clinical Science-Student

Introduction: Thoracic and abdominal hemorrhage due to trauma is one of the leading causes of death worldwide. Aortic

occlusion is an effective strategy in temporarily controlling traumatic hemorrhages; endovascular techniques are becoming more favorable compared to open aortic cross clamping. However, endovascular techniques may rely on imaging to assess bleeding location and intervention success, which is not always available in critical trauma situations that require immediate intervention. The objective of this study was to comprehensively describe aortic morphometry trends in a diverse patient population in order to better guide image-free aortic occlusion interventions in hemorrhagic trauma.

Methods: A retrospective chart review of adult trauma patients (age ≥ 18 years) at Wake Forest Baptist Medical Center between 2016 - 2022 was performed. TeraRecon (TeraRecon Incorporated, North Carolina) was used to compile contrast computed tomography (CT) scans of included patients in order to measure aortic diameter at various levels and distances from thoracic aorta (TA) to bilateral common femoral arteries (CFAs) and skin level. Centerline measurements were also made to determine intra-aortic (IA) distance from TA to bilateral CFAs. Statistical analysis included regression analysis comparing BMI and height to the above measurements.

Results: 220 participants (148 male) with a median (IQR) age of 49.9 years (35.6 years) and BMI of 27.94 kg/m² (8.3 kg/m²) were included. A moderate to strong relationship between BMI and variability in TA to skin distance was found bilaterally (left $R^2 = 0.430$, right $R^2 = 0.386$). Height and BMI versus TA to bilateral CFA were weakly associated, with $R^2 < 0.02$ and $R^2 < 0.005$ respectively. IA distance from TA to the left CFA versus height demonstrated a stronger relationship ($R^2 = 0.3360$) when compared to the right CFA ($R^2 = 0.182$). There was weak association in IA distance from TA to bilateral CFAs versus BMI ($R^2 < 0.004$). Overall, R^2 values comparing various distances to height or BMI on left demonstrated stronger relationships than those on the right.

Conclusion: In conclusion, this retrospective study successfully analyzed aortic morphometry in a diverse patient population. Both height and BMI have differing influences on the variability seen in distances from thoracic aortic to CFA and overlying skin bilaterally. This indicates the need for further exploration into these variations in order to better guide emergent aortic occlusion interventions and hemodynamic monitoring in hemorrhagic trauma.

67. Loss of cancer cell CD73 promotes immunosuppression through counterbalancing an inflammatory environment in endometrial carcinomas

Hannah Lee, MD Candidate

Jessica Bowser, PhD

Xingyuan Zhang, Suzanne M. Crumley, Russell R. Broaddus, Rebecca M. Hirsch, Emily M. Rabjohns, Jessica L. Bowser
Cancer Biology
Basic Science Student- Student

Introduction: Uncovering mechanisms that contribute to the unique pathobiology of endometrial cancer (EC) has the potential to reveal opportunities for improving patient outcomes. CD73, a cell surface 5'nucleotidase, has emerged as an attractive therapeutic target. Inhibiting CD73 therapeutically restores antitumor immune responses. While anti-CD73 agents are in clinical trials and appear promising, the biology of CD73 in EC is proving to be complex and distinct from other solid tumors. Although CD73 is upregulated in many tumors, supporting tumorigenesis, we previously reported CD73 is downregulated in aggressive histological subtypes of EC and its loss is associated with worse overall survival. We sought to determine if CD73 is predictive of patient outcomes in EC subtypes with heterogenous expression of CD73. Secondly, we pursued the question of defining the role of CD73 in the immunobiology of these tumors.

Methods: Two retrospective cohorts of microsatellite stable grade 2 endometrioid EC with intact mismatch repair from the Gynecological Tumor Bank at the University of Texas MD Anderson Cancer Center (MDACC) and the Cancer Genome Atlas (TCGA) for uterine cancer were assessed for CD73 expression in relation to inflammatory and immunosuppression gene expression. For the MDACC cohort of surgically resected tumors (n=119), immunohistochemistry for CD73 and PD-L1 was performed. These tumors were selected for their heterogeneity of CD73 (tumors with high and low expression). Computational analyses were performed with TCGA data. CRISPR-edited EC cells with deleted CD73 were used to corroborate these findings.

Results: Using the approaches above, we show that loss of cancer cell CD73 expression, as opposed to its upregulation (as seen in other tumors), reprograms EC cells to develop immunosuppressive features. CD73 cancer cell downregulation results in proinflammatory cytokine/chemokine (e.g., CXCL10, CXCL9, CCL8, IL11, IL32) upregulation. Consequently, to counterbalance the proinflammatory environment, cancer cells upregulate immunosuppressive genes (e.g., PD-L1 and

CD40). Loss of cancer cell CD73 expression associated with aggressive clinical features (e.g., increased clinical stage, myometrial invasion, lymphovascular space invasion, and lymph node metastases) and worse recurrence-free and overall survival. Stromal cell CD73 expression did not associate with clinical features or outcomes.

Conclusions: We report a novel role for CD73 in regulating cancer immunobiology in EC that diverges from the current paradigm set by other cancers. Our study also highlights CD73 as a potential biomarker to corroborate with current surgical staging procedures for capturing patients at risk for aggressive disease.

68. Identifying Key Factors Associated with Trauma Recidivism in Pediatric and Young Adult Populations

Alison Lehane, MD Thomas Pranikoff, MD

Elizabeth Wood, Sarah Pranikoff, Martin Avery, Thomas Pranikoff
Surgery-Pediatrics
Clinical Science- Resident

Introduction: Traumatic injury is the leading cause of death among children.(1) In the adult trauma population, rates of recidivism are well described and published. Much can be gleaned from the adult literature in understanding the characteristics that lead to recidivism in efforts to establish interventions for prevention. Pediatric/Young Adult trauma recidivism is less studied and understood. Our study aims to evaluate the rates, demographics, and features of pediatric trauma recidivism.

Methods: This was a retrospective single-institution review at a level 1 pediatric trauma center of children and young adults (ages 0-28) with traumatic injuries from January 2008 to April 2023. Data was obtained from the institution's pediatric trauma registry, adult trauma registry, emergency department (ED) logs, and state trauma registry. Patients with 1 or more prior visits to our institution's trauma center for a new traumatic injury (recidivists) were identified and compared with those with single admissions (nonrecidivists). Chi-square tests were used to statistically analyze the two groups.

Results: Pediatric/Young adult trauma recidivists were 2.1% of the total trauma population (n=14614) captured from 2008 to April 2023 which accounted for 14,614 total patients. Of the total pediatric and young adult trauma group, 55% were under 18 years old. Recidivists had higher percentages of patients who were male (82% vs. 69%, $p<0.01$), African American (36% vs. 24%, $p<0.01$), involved in penetrating trauma (33% vs. 17%, $p<0.01$), self-pay/uninsured (17% vs 12%, $p<0.01$), and have abuse reported (5% vs 4%, $p=0.04$). The primary county for recidivism patients was Forsyth with the majority of patients from zip code 27105. The average time between visits for recidivists was 1,071 days with a median of 619 days.

Conclusions: Pediatric/Young Adult trauma recidivism in this group is associated with specific characteristics including male sex, African American race, penetrating trauma, and uninsured status. Recidivists are primarily presenting from a zip code with low socioeconomic status according to income data from the US Census. Developing targeted interventions is crucial for preventing trauma in this population of recidivists, as we have the opportunity to intervene when they first access the trauma system.

69. Exploring the Influence of Community Resources on Pediatric Trauma Recidivism

Alison Lehane, MD Thomas Pranikoff, MD

Elizabeth Wood, Sarah Pranikoff, Martin Avery, Thomas Pranikoff
Surgery-Pediatrics
Clinical Science - Resident

Introduction: Traumatic injury is the leading cause of death among children. While studies have shown factors associated with risk for traumatic injury in the young adult/pediatric population as well as the risk of trauma recidivism, efforts are ongoing to determine how to prevent injury. This study aimed to determine the association between community programs and pediatric trauma, specifically penetrating injury and recidivism.

Methods: This is a retrospective review at a level 1 pediatric trauma center of children/young adults (ages 0-28) with traumatic injuries from January 2008 to April 2023. Patients with 1 or more prior visits to the institution's trauma center for

a new traumatic injury (recidivists) were identified and compared with those with single admissions (nonrecidivists). The top 5 most prevalent zip codes were included to then investigate amount of community resources utilizing the Community Resources and Assets Forsyth County map. Pairwise Pearson correlation coefficients were calculated to determine the correlation between amount of community resources by zip code and recidivism, pediatric penetrating injury, and child abuse associated injuries.

Results: Pediatric/young adult trauma recidivists were 7.7% (n=258) of the total trauma population (n=3,362) from the top 5 zip codes. Penetrating trauma accounted for 29% of injuries (n=983). The analysis revealed a moderately strong positive correlation between the total number of community resources by zip code and the rate of trauma recidivism (r = 0.5668). A very strong positive correlation was observed between the number of community resources and the prevalence of penetrating trauma (r = 0.9118). The correlation between community resources and penetrating trauma among children under 16 was also strong (r = 0.7466). Additionally, a very strong positive correlation was found between the number of community resources and child abuse cases (r = 0.9448).

Conclusions: The findings of this study suggests that community resources are currently present in areas where pediatric/young adult trauma recidivism, pediatric penetrating trauma, and child abuse cases are all prevalent. These findings are significant as the availability of resources does not seem to decrease pediatric trauma. Ensuring community engagement with available resources may have a positive impact on pediatric trauma and recidivism. The next steps include improving access and awareness of community resources to these target areas through institutional trauma prevention initiatives.

70. Modification of Hyaluronic Acid to incorporate functional neurogenic and angiogenic peptides

Qingqi Li, MD, PhD Eric J. Marrotte, DO, PhD

Eric J. Marrotte, Joseph A. Criscitiello, Paul Marcet, Rebecca Calafiore, Queena Chen, Thomas L. Wilson, Anthony Atala
Wake Forest Institute Regenerative Medicine (WFIRM)
Basic Science- Fellow

Introduction: Paralysis resulting from spinal cord injury (SCI) impairs the capacity of patients to perform everyday activities of daily living. Unfortunately, there is currently no clinically efficacious therapy that will restore motor function after SCI. Glial scar formation serves as one of the formidable obstacles that inhibit repair and reinnervation of injured spinal cord tissue after SCI. The use of stem cells has been shown to have therapeutic potential, however; stem cell therapy lacks the capacity to overcome glial scar formation. As an innovative approach, we are developing a hyaluronic acid-based injectable synthetic extracellular matrix (sECM) with the incorporation of bioactive peptides, integrated with progenitor stem cells (PSCs) that will polymerize in situ in an acute traumatic SCI model. This sECM aims to mitigate the formation of the glial scar and facilitate the induction of neurogenesis and angiogenesis. Methods: We combined a functional acrylate group to the hyaluronic acid via Michael addition reaction, peptides were derived from 1) laminin, 2) fibronectin and a cleavable site derived from 3) collagen, followed by TNBSA assay and SDS page to verify the peptide attachment. Then we injected the sECM into injured spinal cords (IACUC A20-002), injured spinal cords were recovered after 12 weeks and stained for NF/BetaIII-tubulin (neuron marker), VE cadherin(angiogenesis) with HuNu (PSC) and Ki67. Histologic outcomes were analyzed between two groups: the control group, induced spinal cord injury only verse PSC only and PSC+sECM combined therapy. Results: We characterized the sECM with a multistep process for the formation of a functionalized bioactive hyaluronic acid. The 2,4,6-Trinitrobenzene Sulfonic Acid reaction demonstrates the binding of functional peptides and the SDS assay results are consistent with migration of peptides bound to hyaluronic acid. In vivo, we found that the administration of sECM combined with PSC has led to enhancements in neurogenesis and angiogenesis at the spinal cord injury site in acute traumatic injury. Conclusion: Our initial data indicate that sECM with selected bioactive peptides in combination with PSC will induce neurogenesis and angiogenesis at the site of acute traumatic spinal cord injury.

71. Growing a Thoracic Outlet Syndrome (TOS) Clinical Practice at an AMC

Justin Linden Julie Freischlag, MD

Dr. Julie Freischlag, Lydia Faber
Surgery-Vascular & Endovascular
Clinical Science- Student

Introduction: TOS is a rare disease that involves compression of the neurovascular structures within the thoracic outlet. This includes the brachial plexus, subclavian artery, and subclavian vein leading to specific symptom paradigms depending on the structure compressed. TOS is uncommon in the population and is infrequently encountered in vascular surgery clinics, providing challenges for learners to gain clinical exposure to the disease and its treatment. As an American Medical Center (AMC), Atrium Health Wake Forest Baptist's obligations expand beyond patient care and include a duty to provide medical education to students, physician assistants, residents, and fellows. Thus, the aim of this study is to evaluate the growth of the TOS Vascular Surgery Clinic at Atrium Health Wake Forest Baptist since 2015 and its potential to serve as a model for other AMCs in increasing learner exposure to the disease.
Methods: All TOS patients who received a first rib resection and anterior scalenectomy (FRRAS) at Atrium Health Wake Forest Baptist were retrospectively reviewed via the electronic medical record. Following IRB approval, patient information was collected and maintained in a HIPPA compliant database. Demographic and clinical factors collected included age, sex, race, TOS subtype, first time vs redo, length of stay, and intraoperative complications. Clinic growth was evaluated by separating FRRASs into two different chronological categories, both by year performed and by cases performed before 2020 and cases after 1/1/2020, then comparing these factors to determine significant differences.

Results: Since 2015 the TOS Vascular Surgery Clinic at Atrium Health Wake Forest Baptist has performed 212 FRRASs for indications of neurogenic (n=92 [43%]), neurogenic with arterial symptoms (n=17 [8%]), neurogenic with venous symptoms (n=6 [3%]), venous (n=75 [35%]), venous with neurogenic symptoms (n=14 [7%]), arterial (n=6 [3%]), and arterial with neurogenic symptoms (n=2 [1%]) TOS. The number of cases performed has increased annually from 2015 to 2023, although there is a decrease in 2020 (from 26 cases performed to 25), and 2021 (from 25 to 17), a result of the COVID-19 pandemic and surgical delays. When comparing cases performed before 2020 with cases performed following 2019, the second period had a larger number of TOS subtypes (no cases of arterial, arterial with neurogenic symptoms, or neurogenic with venous symptoms before 2020) and more cases of each TOS subtype (neurogenic before 2020: 17 cases vs after 2019: 75, neurogenic with arterial symptoms before 2020: 4 vs after 2019: 13, venous before 2020: 22 vs after 2019: 53, venous with neurogenic before 2020: 6 vs after 2019: 8). Further, there was an increase in the number of FRRASs performed on patients who had previously undergone an FRRAS on the same side (Before 2020: 1 case, After 2019: 13 cases). Regarding patient demographics, there was increase in FRRASs performed during the second period of the study on males (15 vs 59), females (34 vs 105), and children (10 vs 34).

Conclusion: Our results indicate the successful growth of the TOS Vascular Surgery Clinic at Atrium Health Wake Forest Baptist over the previous decade. The expansion of the TOS clinic provides an opportunity for learners to gain increased exposure to TOS, including increased access to the treatment of different subtypes of TOS and redo FRRAS cases, which can often be far more complex. Further, the establishment of Atrium Health Wake Forest Baptist as a regional provider of TOS treatment draws in TOS patients of a wider age variety, specifically children, for learners to engage with. Ultimately, the TOS Vascular Surgery Clinic at Atrium Health Wake Forest Baptist serves as an excellent model for growing a TOS clinical practice at an AMC and for providing learners with increased exposure to an uncommon disease and an improved understanding of its treatment.

72. Cell-Mediated Drug Delivery Strategies to Address Ineffective Catheter-directed Thrombolysis

Veronica Lisi, PhD Sophie Maiocchi, PhD

Suhon Kim, Emily Barnett, Erica Burham, Rachel Pollard, Nancy Buechler, Nathalie Pinkerton, Sophie Maiocchi
Biomedical Engineering/Surgery-Hypertension
Basic Science- Fellow

Each year, nearly 1 million Americans suffer from Venous Thrombo-Embolic Disease (VTE), including deep vein thrombosis (DVT) and its potentially fatal complication, pulmonary embolism (PE). Despite advancements, current treatments, such as catheter-directed thrombolysis, are limited by inadequate penetration of thrombolytics deep into the core of thrombi, contributing to incomplete clot dissolution. Additionally, these treatments carry a significant risk of fatal bleeding, complicating patient management. To address these critical issues, our objective is to optimize a cell-mediated drug delivery (CMDD) strategy to enhance therapeutic efficacy by improving the penetration of therapeutic nanoparticles (NPs) deep within venous thrombi. Our approach leverages the natural ability of immune cells to infiltrate tissue injury. Our central hypothesis is that CMDD of NP-encapsulated anti-thrombotic therapies will improve targeted therapeutic accumulation to thrombi in vivo and improve treatment of venous thrombosis. Our focus is to harness the natural homing activity of neutrophils, which are actively recruited into thrombi and can be rapidly loaded with polymeric NPs. This innovative approach is designed to overcome the major limitation of inadequate thrombolytic penetration, offering a novel solution to improve therapeutic out-

comes. Additionally, we will explore a complementary therapeutic target: the destruction of Neutrophil Extracellular Traps (NETs). NETs are extracellular networks of decondensed chromatin that trigger thrombosis and increase clot resistance to thrombolysis. DNase I, an enzyme that cleaves extracellular DNA, has demonstrated efficacy in preclinical models for preventing thrombosis and enhancing clot dissolution ex vivo when combined with thrombolytics. Importantly, as NETs do not play a role in critical hemostatic mechanisms, their degradation will not pose a risk of dangerous bleeding. To generate our NPs, we utilize next-generation NP synthesis technology, inverse Flash Nanoprecipitation (iFNP), to encapsulate DNase I protein in polymeric NP. Our approach uses CMDD to improve drug penetration and effectively treat thrombi, combining NET-degrading enzymes with traditional treatments like tPA. This strategy aims to close the clinical gap for unresolved thrombi, reduce bleeding risks, and enhance VTE treatment.

73. Tumor Cellularity Predicts Organoid Response to Organoid Interacting Lymphocytes Adoptive Cellular Therapy

Tiefu Liu Konstantinos Votanopoulos, MD, PhD

Cecilia Schaaf, Damian Chance Hutchins, Nadeem Wajih, Mitra Kooshki, Eleftherios Makris, Perry Shen, Edward Levine, Konstantinos Votanopoulos
Surgery-Oncology
Basic Science- Fellow

Background: Patient-derived tumor organoids (PTO) have been employed in screening of systemic treatments and adoptive cell therapy (ACT) in several types of rare carcinomas including appendiceal cancer, peritoneal mesothelioma, Merkel cell carcinoma, and sarcoma. However, factors predicting response of PTO to chemotherapy, immunotherapy or cellular therapy are not well defined.

Methods: PTOs were generated by introducing cells obtained from surgical specimens of 26 cases and 47 tumor sites into thiol-modified hyaluronan/heparin and methacrylated collagen hydrogel. Tumor cellularity on H/E images was evaluated using ImageJ software. Efficacy of routine chemotherapy cocktails of FOLFOX or FOLFIRI was tested against PTOs using CellTiter-Glo 3D cell viability assay. Immune checkpoint inhibitors (ICI) efficacy of ipilimumab, pembrolizumab and nivolumab, was similarly tested against immune system enhanced organoids. For ACT screening, organoid-interacting lymphocytes (OIL), expanded PBMC (ePBMC) and TILs were prepared in the presence of IL-2 and their cytotoxicity was tested against patient-matched tumor by live/death staining and flow cytometry analysis. The statistical correlations between tumor cytotoxicity and surgical specimen cellularity were performed with GraphPad Prism software.

Results: 28 specimens were tested with chemotherapy, 9 with immunotherapy and 10 with ACT. No correlation was observed between resected tumor cellularity and FOLFOX or FOLFIRI derived cytotoxicity (p=0.8249 and P=0.8405, respectively). Tumor cellularity negatively impacts organoid response to all ICI immunotherapies with r =-0.9363, P=0.0001 for pembrolizumab, r=-0.6873, P=0.0408 for ipilimumab, r=-0.7475, P=0.0206 for nivolumab, and r=-0.7322, P=0.0249 for combined ipilimumab and nivolumab.
Resected tumor cellularity is positively associated with tumor cytotoxicity derived from ePBMCs and OILS with the Pearson correlation coefficient being [r]=0.6970/P=0.0306 and r=0.7939/P=0.0088, respectively. However, tumor cellularity is not related with increase TIL cytotoxicity (p= 0.2000).

Conclusion: Increased tumor cellularity predicts response of the organoid to OILs and negatively impacts response to check point inhibitors. Tumor cell staining of primary tissues should be performed in future to confirm these observations.

74. Staging Tissue Expander to Deep Inferior Epigastric Perforator Flap Breast Reconstruction: Impact on Revision Surgeries and Complications

Kelsey Lloyd, MD Ramon Llull MD, PhD

Caitrin Curtis MD, Eric Zeng BS, Kelsey Lloyd MD, Mary Duet MD, Rion Tapp MD, Jason Korn, MD, Thomas Steele, MD and Ramon Llull, MD
Surgery-Plastic & Reconstructive
Clinical Science-Resident

Background
The staging technique of tissue expander (TE) placement at time of mastectomy, prior to deep inferior epigastric perforator (DIEP) flap reconstruction preserves the breast pocket, thought to enhance the final aesthetic outcome. Additionally, TE placement following mastectomy has the potential to reduce the need for subsequent revision surgeries. However, staging with a tissue expander prior to DIEP flap reconstruction is optional and poses the risk of complications during the expansion phase.

Methods
A retrospective review of patients undergoing DIEP flap reconstruction at two institutions over a 3 year period (2020-2022) was conducted. Patient demographics, medical history, operative course, post-operative complications, and the number of revision surgeries were reviewed. Major complications were defined as those requiring a return to the operating room. Patients were categorized according to the staging of their procedure as (1) immediate to DIEP, (2) delayed to DIEP, (3) tissue expander to DIEP, or (4) implant to DIEP.

Results
A total of 439 patients were included, with 64 in the immediate DIEP group, 149 in the delayed to DIEP group, 166 in the tissue expander to DIEP group, and 60 in the implant to DIEP group. There was no significant difference between groups with regards to revision rate following DIEP flap reconstruction (p=0.663). During tissue expansion, patients experienced a major complication rate of 35%, with 14% requiring an unplanned hospital admission.

Conclusion
Our findings suggest that staging DIEP flap reconstruction with a tissue expander does not significantly affect the anticipated number of revision surgeries. This approach is not without risk, as suggested by the major complication rate during the expansion period. These findings underscore the importance of careful patient selection and counseling regarding potential risks. Further studies are warranted to evaluate the patient's experience in addition to the long-term aesthetic outcome of patients undergoing staged TE to DIEP flap reconstruction.

75. The Relationships Between Neck Anatomy and Internal Jugular Vein Pressure Gradients in the Context of Idiopathic Intracranial Hypertension

Connor Margraf, BS Kyle Fargen, MD

Jack Midtlien, Kyle Fargen
Surgery-Neurosurgery
Clinical Science-Student

Background: Idiopathic Intracranial Hypertension (IIH) is a condition characterized by elevated intracranial pressure. It may present with headache, vision problems, tinnitus, brain fog, and a host of other symptoms1. This disease is closely associated with impaired functionality of the cerebral venous outflow system. Recently, disruption to the internal jugular (IJ) veins has been hypothesized to play a role in impaired venous outflow from the brain2, as IJ pressure gradients often develop during head rotation or flexion. These movements are largely controlled by the sternocleidomastoid (SCM) muscles. The distensible nature of veins leaves the IJs prone to compression by these muscles, as well as other muscles, boney prominences, the carotid arteries, and lymphatics.

Purpose: To determine the relationships between SCM size, IJ size, BMI, neck adiposity, age, and IJ pressure gradients.

Methods: A retrospective chart review was conducted among 46 patients who received a standard-of-care pseudotumor workup and CTA within one year of each other for evaluation of IIH. Patients with a jugular venous stent or styloidectomy were excluded. TeraRecon software was utilized to attain radiographic data. A curved planar reformat was conducted along the IJs, with cross-sectional areas taken at C3, C5, and C7. Next, cross-sectional areas of the SCMs were taken at the same levels. Lastly, distance from center of the IJ to the surface of the skin was measured to estimate neck adiposity. These variables were then compared with rotational venous manometry data and other variables to assess for interplay in gradient development. All categorical variables are presented as count (frequency) and continuous variables as mean (SD). All analyses were performed using R Statistical Software (v4.1.1; R Core Team 2021).

Results: No significant association was found between stenotic gradient and SCM or IJ when controlling for age, adiposity, gender, and side. Age ($p = 0.02$) and adiposity ($p = 0.004$) had significant associations with stenotic gradient. An increase in age of 1 year would expect to decrease the stenotic gradient by 0.08 mmHg, while an increase in adiposity of 1 unit would expect to increase the stenotic gradient by 0.12 mmHg. BMI is a significant predictor of adiposity ($p < 0.001$). Adiposity is expected to increase by 0.71 units with a 1 unit increase in BMI.

Conclusions: There was less influence of SCM size and IJ size on stenotic gradient than anticipated. However, BMI, neck adiposity, and age proved to have a significant relationship with stenotic gradient. This provides further support for the notion that higher body fat content plays a role in the development of IIH. This may help providers target weight management as a primary means of prevention and treatment for IIH. It should be noted that this investigation presents preliminary results with a small sample of 46 patients; further research is being conducted to expand the sample size and increase study power.

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76. Efficacy of Vertebral Artery Origin Stenosis Interventions: Bare Metal Stents vs Drug-Eluting Stents

Connor Margraf, BS Stacey Wolfe, MD

Reid Christensen, Kaycie Meinhardt, Sam Tarry, Brock Yager, Omar Ashraf, Stacey Wolfe
Surgery-Neurosurgery
Clinical Science- Student

Background: Vertebral Artery Origin Stenosis (VAOS) is a condition characterized by narrowing of the most proximal section of the vertebral artery, immediately after branching off the subclavian artery. This portion of the vessel is prone to stenosis, often from calcification1. Reduction of blood flow through these vessels or thromboembolism can lead to posterior circulation strokes. In fact, 20% of posterior circulation strokes are related to vertebral artery stenosis2. Management of VAOS is controversial, with at least five potential treatment options: stent placement, balloon angioplasty, best medical management, transposition of the vertebral artery, or a hybrid approach. Stenting is the most common interventional treatment modality, and multiple options are available for stenting of the vertebral arteries. Bare metal stents (BMS) have conventionally been used for this indication, although there is a growing body of evidence to suggest that drug eluting stents (DES) are a viable option with lower rates of restenosis. Drug-eluting stents were developed for use in cardiovascular applications to limit rates of restenosis3, and their use in cerebrovascular interventions is an growing topic of interest. Questions loom regarding the degree to which DES reduce the risk of restenosis and whether the drugs they emit are safe for cerebral blood flow. Additional complications such as thromboembolization (and subsequent stroke), stent fracture, transient neurological deficits, and death can occur4 in BMS and DES, although the difference in risk between the two is uncertain.

Methods: A review of PubMed was conducted to analyze the current state of literature regarding stenting for treatment of VAOS. Search criteria were entered into PubMed and exported to Covidence, a software used to conduct systematic reviews. Following a title and abstract screen and 2-reviewer full-text review, data was extracted and compiled.

Results: The search yielded 205 studies, 18 of which met criteria for this review. Across the selected studies, a total of 324 patient were treated with DES and 461 were treated with BMS, though only 384 BMS patients received follow-up evaluation for restenosis. Mean follow-up period was 15.58 months for the DES group and 14.49 months for the BMS group. Mean degree of stenosis before treatment was 76.97% for the DES group and 81.36% for the BMS. Mean degree of stenosis immediately following the procedure was 11.59% for the DES group and 11.30% for the BMS group. Restenosis rates, defined as 50% or greater stenosis of the vertebral artery lumen, were 12.44% for the DES group and 21.77% for the BMS group. Stroke, TIA, stent fracture, and other complication rate was 3.15% for the DES group and 3.87% for the BMS group.

Conclusions: Both DES and BMS are effective treatments for VAOS, establishing patency of the vertebral artery lumen and increasing blood flow through the vertebrobasilar pathway. Compiling the results of multiple studies highlights the potential for DES implementation in VAOS treatment, due to its lower rates of restenosis and similar stroke/complication rate. There remains a degree of clinical equipoise regarding the use of DES vs BMS due to the limited number of studies on this topic and the relatively small sample size of patients from which conclusions are drawn. This highlights the need for high-quality prospective studies to evaluate the long-term outcomes of DES and BMS stenting.

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77. A Single-Arm, First in Human Clinical Investigation Evaluating the Safety and Feasibility of ADIPEARLTM Scaffold

Dominic Massary, MD Ramon Llull, MD, PhD

Surgery-Plastic & Reconstructive
Clinical Science-Resident

Objective: The evaluation of the safety of ADIPEARL scaffold after implantation in the abdominal subcutaneous tissue of healthy participants
Method: All enrolled healthy volunteers were implanted with the investigational medical device IMD ADIPEARL scaffold. The investigation was intra-individually controlled with a sham control, saline solution. Eligible participants were randomly assigned to one of 3 groups. Group 1 abdominoplasty and explantation of the implant at 1 week. Group 2: abdominoplasty and explantation of the implantation site at 12 weeks. Group 3: abdominoplasty and explanation of implantation site at 24 weeks. Based on body habitus, either 4 or 6 implants were placed into each abdomen. With 4 implants 1 was sham control, with 6 implants 2 were sham control. Implant sites were randomized and participants, including pathologists were blinded.
Results: All 12 participants were ADIPEARL scaffold and saline solution controls. No adverse device effects or adverse evends related to device deficiencies were reported. No participants were withdrawn from the study due to an adverse event.
Conclusion: Based on the results of this investigation on 12 healthy females, ADIPEARL scaffold is well tolerated and safe when implanted into the abdomen. No significant consistent safety risks or concerns were reported. However, the safety and tolerability need to be confirmed in larger population studies.

78. The Natural History and Burden of Vertebral Artery Origin Stenosis in Untreated Patients

Kathleen C. Meinhardt, BS Stacey Q. Wolfe, MD

Kathleen C. Meinhardt BS[1], Reid R. Christensen BS[1], Connor R. Margraf BS[1], Samuel T. Tarry BS[1], Brock R. Yager MD[1], Omar Ashraf MD[1], Debra I. Diz PhD[2], Carol A. Kittle MS[3], Zhidan Xiang PhD[1,2], Stacey Q. Wolfe MD[1]
[1]Wake Forest University School of Medicine, Department of Neurosurgery, Medical Center Blvd, Winston-Salem, NC 27157
[2]Wake Forest University School of Medicine, Surgery/Hypertension and Vascular Research, 575 N Patterson Ave, Winston-Salem, NC 27101
[3]Wake Forest School of Medicine, Division of Public Health Sciences, Department of Biostatistics and Data Science, Medical Center Boulevard, Winston-Salem, NC 27157
Surgery-Neurosurgery
Clinical Science- Student

Introduction
Stroke is the third leading cause of death worldwide and a leading cause of long-term disability, impacting more than

795,000 people in the United States annually. (1) Although stroke incidence has declined, increased stroke survival rates and an aging population contribute to the increasing prevalence of stroke today. (2) Additionally, the resulting increase in stroke survivors has led to a growing population with long-term disability. (1) Despite the significant healthcare burden it poses, however, posterior circulation stroke (PCS) remains disproportionately under-researched, particularly in the context of vertebral artery origin stenosis (VAOS).

Atherosclerosis of the vertebral artery is a major cause of posterior circulation strokes (PCSs). (3,4) The vertebral artery origin is particularly susceptible to atherosclerosis due to its hemodynamic properties, where low blood flow, tortuosity, and high turbulence predispose the site to atherosclerotic disease development. (5) Despite this, there is limited understanding of the natural history and burden in untreated patients, both asymptomatic and symptomatic, which may inform the risks and benefits of angioplasty and stenting. (4,6) Therefore, further research into the natural history and burden of VAOS in untreated patients is critical to elucidate potential contributors to stroke-related events. This study aims to explore the natural history and burden of VAOS, highlighting its associated morbidity and mortality risks.

Methods

In this systematic review, we explored the PubMed database through Covidence software using the search terms 'vertebral artery,' 'natural history,' 'stenosis,' 'disease progress,' 'clinical course,' 'burden,' 'outcome,' 'morbidity,' 'stroke,' 'medical therapy,' and 'anti-platelet.' The search was restricted to studies published through 2024 that focused on VAOS and sought to summarize the current knowledge regarding pathophysiology; associations with stroke, stroke recurrence, and mortality rates; or stratification by stroke severity or thromboembolism versus vertebrobasilar insufficiency. Additional papers were identified through cross-referencing key articles.

Results

262 papers were identified on PubMed, of which 40 met inclusion criteria. From included papers, 211 patients with VAOS were identified. In all studies, VAOS was defined as stenosis of the vertebral artery >50%. Although only 4% of VAOS patients experience a stroke, VAOS was observed in 16.2% of stroke patients. In VAOS patients who had strokes, there was a higher incidence of posterior circulation strokes in VAOS patients (45.5%) compared to non-VAOS patients (24%, $P < 0.01$).

VAOS is associated with a shorter 5-year survival rate compared to non-VAOS patients (67% versus 89%, $P < 0.01$). One retrospective review also revealed that plaque irregularity and tandem lesions are associated with more severe clinical outcomes in these patients. Another revealed carotid artery stenosis increases the risk of PCS 3-fold in asymptomatic VAOS patients.

Conclusions

Although the risk of stroke is low in VAOS patients, morbidity and mortality rates are higher compared to non-VAOS patients. Our findings reveal a distinct association between VAOS and posterior circulation stroke, particularly in patients with additional comorbidities such as carotid artery stenosis, which further increases the risk. The rate of posterior circulation stroke in patients with VAOS underscores the importance of understanding the degree of stenosis at the time of stroke and its role in thromboembolism. This understanding can help guide clinical decision-making on when intervention is warranted. Given the substantial morbidity and mortality risk associated with VAOS, targeted management strategies and risk stratification are essential to improving patient outcomes.

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79. The Correlation Between Intracranial Pressure and Venous Sinus Pressures Changes After Venous Sinus Stenting

Jackson Midtlien, BS Kyle Fargen, MD, MPH

Ankitha M. Iyer, Carol A. Kittel, Lucas A. Klever, Angelina H. Wiater, Emily Chang, Connor Margraf, Kyle M. Fargen
Surgery-Neurosurgery
Clinical Science-Student

Background: The pathophysiology of idiopathic intracranial hypertension (IIH) and other cerebral venous outflow disorders (CVD) has largely been unexplored. While a correlation between venous sinus pressure and opening pressure (OP) has been previously noted, there is limited data on this relationship in patients with prior venous sinus stenting (VSS).

Methods: A single-center retrospective chart review was conducted on CVD patients who underwent diagnostic cerebral venography with manometry followed immediately by lateral decubitus lumbar puncture (LP) from 2016 to 2024.

Results: 206 patients underwent 216 total procedures and were included. Among all patients, there was a moderate nearly 1-to-1 correlation between OP and torcular or superior sagittal sinus (SSS) pressures. Thirty-two patients underwent testing after having undergone VSS. Patients with previous VSS showed a significantly altered relationship between venous pressures and OP, whereby as venous sinus pressures increase, OP increase more gradually in previously stented patients compared to non-stented patients. For example, when OP was fixed at 21 mmHg and BMI at 30 kg/m2, predicted mean SSS pressure was 19.47 mmHg in non-stented patients versus 16.91 mmHg in stented patients.

Conclusion: This study confirms a strong relationship between OP and venous sinus pressure in CVD patients. However, patients with prior VSS demonstrate an altered relationship with higher CSF pressures relative to venous pressures compared to naïve patients. This finding may have important clinical implications in the management of IIH patients.

80. Investigating the Role of Cerebral Venous Contents in the Pathogenesis of Idiopathic Intracranial Hypertension

Jackson Midtlien, BS Kyle Fargen, MD, MPH

Connor Margraf, Kyle Fargen
Surgery-Neurosurgery
Clinical Science- Student

Background: Idiopathic Intracranial Hypertension (IIH) is a condition characterized by elevated intracranial pressure. It may present with headache, vision problems, tinnitus, brain fog, and a host of other symptoms. This disease is closely associated with impaired functionality of the cerebral venous outflow system, but other factors may contribute to this disease's pathogenesis. While cerebral venous pressure gradients have been tied to IIH, a study investigating the contents of the venous blood has never been conducted.

Methods: Ten IIH patients undergoing standard-of-care cerebral venous stenting were enrolled in a prospective study involving collection and analysis of venous blood. During their standard-of-care procedure, 3 mL of blood was aspirated from three separate locations: the superior sagittal sinus, sigmoid sinus, and right atrium (control). Blood was sent to the lab and results were analyzed. One-sample Wilcoxen signed rank tests were used to investigate whether there were significant percentage changes among blood products along the pathway.

Results: Ten blood products were analyzed: pH, pO2, pCO2, O2 saturation, lactate, glucose, calcium, protein, anion gap, and C-reactive protein. Among these, only lactate and protein displayed significant ($p<.05$) percentage changes between sampling locations. None of these displayed a significant relationship between percentage change and pressure gradient along the outflow pathway.

Conclusions: IIH can lead to disabling symptoms and diminished quality of life. Yet, as the name implies, there is much left

to discover about this disease. This study did not demonstrate a buildup of most metabolites upstream to the site of dural venous constriction. Though limited by a small sample size, this study suggests that most metabolic waste products are relatively uniform throughout the cerebral venous outflow tract. Hopefully this study will help direct future investigations into this disease.

81. Comparing Outcomes between Fibula and Osteocutaneous Radial Forearm Free Flap Reconstructions - A Twenty-Year Retrospective Review

Erich Mildner, BS (medical student) Allison Sljepcevic, MD

Ben Gordon BS, Kyle Hrabovsky BS, Samuel Craig BS, Brianna Maniscalco BS, Kenneth Feehs MD, Greg Russell MA, James D. Browne MD, Hafiz S. Patwa MD, Joshua D. Waltonen MD, Chris A. Sullivan MD, Allison Slijepcevic MD
Surgery-Otolaryngology (Dentistry)
Clinical Science- Student

Introduction: Fibula free flaps and osteocutaneous radial forearm flaps may be used to reconstruct complex head and neck defects following cancer ablation and trauma. This study aimed to compare the reconstructive outcomes of defects rehabilitated with fibula or osteocutaneous radial forearm flaps.

Methods: Retrospective chart review completed over 20 years of adult patients greater than 18 years of age undergoing reconstruction of head and neck defects with fibula or osteocutaneous radial forearm free flaps.

Results: Total patients: 52. Reconstruction type: 26/52 (50%) fibula, 26/52 (50%) osteocutaneous radial forearm. Mean surgical time: 697 minutes fibula, 576 osteocutaneous radial forearm (p=0.002). Fibula reconstructions lasted 19% longer on average. Charlson Comorbidity Index: 4.6 fibula, 4.7 osteocutaneous radial forearm (p=0.43). There was no significant difference in flap survival rate. Survival rates of fibula and osteocutaneous radial forearm flaps: 23/26 (88%) survived, 2/26 (8%) total loss, 1/26 (4%) partial flap loss (p>0.99). There was no significant difference in post-operative complications between flap types. Postoperative complications: 10/26 (38%) fibula, 9/26 (35%) osteocutaneous radial forearm (p>0.99). There was no significant difference in post-operative infection rate. Post-operative infection rate: 7/26 (27%) fibula, 7/26 (27%) osteocutaneous radial forearm (p >0.99).

Conclusion: Osteocutaneous radial forearm free flaps provide reconstruction of composite defects with significantly shorter operative times compared to fibula flaps. Post operative flap survival and post operative complication rates were similar in both fibula and radial forearm free flap reconstructions. Although osteocutaneous forearm flaps may not undergo dental implantation, they may optimally reconstruct composite defects in patients unable to undergo prolonged procedures.

82. Prescriber Implementation of Guideline-Directed Medical Therapy Remains Poor in the Peripheral Artery Disease Population

Caroline Minnick, BS Matthew Goldman, MD

Ashlee Stutsrim, Timothy K. Williams, William Downey, Matthew S. Edwards, Matthew P. Goldman
Surgery-Vascular & Endovascular
Clinical Science-Student

Background
Peripheral Artery Disease (PAD) is one of the most prevalent forms of cardiovascular disease, with many progressing to CV morbidity/death. Adherence to guideline-directed optimal medical therapy (OMT) in PAD is vital. This study evaluated adherence to prescribing OMT in patients with PAD.
Methods
A retrospective study of 3,471 patients with PAD between 2017 and 2022 undergoing vascular laboratory imaging was performed. OMT was defined by 2016 AHA guidelines. Adherence to guidelines was denoted by active prescriptions for antiplatelet and statin therapy. Presence of high-intensity OMT (HIOMT) was defined as prescriptions for an antiplatelet and high-intensity statin. Prevalence and incidence (change to OMT /HIOMT within 60 days of index vascular laboratory visit) of OMT were evaluated. Multivariable models were created evaluating predictors of OMT and HIOMT prevalence

and incidence.
Results
OMT prevalence was 45.3% while HIOMT prevalence was 23.6% at the time of index vascular laboratory. Incident OMT was 24.3% while incident HIOMT was 11.2% within 60 days. Age, min/max ABI, insurance status, smoking status, and comorbidities were associated with prevalent OMT/HIOMT (table 1). Age, gender, min/max ABI, smoking status, and HgbA1c were associated with incident HIOMT (table 2). In multivariable models, incident HIOMT was less likely in women (OR 0.7; 0.52-0.91) whereas lower ABIs were predictive of HIOMT (OR 0.6; 0.51-0.72).
Conclusions
Despite clear guidelines regarding OMT in patients with atherosclerotic cardiovascular disease, in this real-world study of guideline directed prescription management of PAD, adherence to OMT remains low, especially for HIOMT. Predictors of incident HIOMT include lower ABI while females were less likely to be on HIOMT. Given the high prevalence of PAD, heterogeneity of caregivers, widespread availability of screening, this population should be targeted for better adherence to HIOMT to prevent CV morbidity and death.

83. Development of a multi-modal artificial intelligence model to detect degrees of hemorrhage

Fahim Mobin, Grad Student James Jordan, PhD

Antonio C. Renaldo, Micaela K. Gomez, Sandra Januszko, Jacob Dooley, James E. Jordan, Oguz Akbilgic, Timothy K. Williams, Elaheh Rahbar
Surgery-Cardiothoracic
Clinical Science Student

Introduction
Hemorrhagic shock is a leading cause of preventable deaths in people aged 1-44, making early detection of hemorrhage levels critical for improving patient outcomes. This study focuses on developing AI models to assess hemorrhage severity using machine learning and deep learning techniques. A multi-head 1D CNN will analyze raw blood pressure data, while decision tree (DT) and random forest (RF) models will be applied to feature-engineered parameters. Traditional methods like mean arterial pressure (MAP) are often imprecise, highlighting the need for data-driven approaches. By leveraging arterial pressure data, AI can provide real-time, accurate assessments, improving clinical decisions in trauma settings.

Methods
Yorkshire swine subjected to 10%, 20%, and 30% (n=18/group) total blood volume hemorrhage over 30 minutes. AI models to classify blood loss based on hemodynamic data. A multi-head 1D CNN will be applied to the raw waveform data. In parallel, features will be engineered from those same waveforms and passed to DT and RF models. Additionally, genetic algorithms will be applied to the RF models for feature selection. This approach will enable an evaluation of how effectively each model predicts blood loss. It is hypothesized that the random forest model will perform best, as it can analyze complex data combinations and handle smaller datasets more efficiently.

Results
The study found that advanced RF models using genetic algorithms and CNN models performed the best, with accuracies >60% due to their advanced feature selection and deep learning techniques. In contrast, simpler models like DTs and the RFs without genetic algorithms performed the worst, highlighting the need for more feature engineering or tuning.

Conclusions
This study leverages AI models for time-series analysis, presenting an innovative approach that may prove to be effective and require less tuning compared to traditional waveform analyses in the context of hemorrhage.

Keywords
controlled hemorrhage, multi-head 1D CNN, multi-modal AI, decision tree, random forest, hemodynamics, pressure waveforms, genetic algorithms

84. Development of a batch process to mine and analyze carotid duplex ultrasound

Fahim Mobin, Graduate Student Timothy Williams, MD

Micaela K. Gomez, Timothy K. Williams, Aarti Sarwal, Oguz Akbilgic, and Elaheh Rahbar
Surgery-Vascular & Endovascular
Clinical Science-Student

Background and Objectives
Carotid arterial stenosis (CAS) is a common etiology for ischemic stroke, with > 50% of stroke patients having varying degrees of ipsilateral carotid stenosis. Refined methods to improve risk stratification in patients with asymptomatic CAS are needed. Carotid duplex ultrasound is used clinically to classify CAS patients using pulse wave Doppler velocity (PWV), but there is not yet a quantifiable way to leverage them. We postulate deep learning analysis will improve stroke risk predictions.
Methods
Carotid duplex ultrasounds were extracted (N=3500) and deidentified utilizing a custom web scraping bot to extract DICOM images from Intellispace Cardiovascular at WFBMC. A natural language processing (NLP) algorithm was developed for interpreting physician reports to provide data labels. Image segmentation utilized a Faster R-CNN algorithm, and a custom algorithm digitized PWV into 3D.

Results
DICOM images were effectively de-identified and the NLP algorithm has insofar interpreted physician reports with high fidelity. Image segmentation using Faster R-CNN was performed, resulting with PWV graphs isolated and digitized in 3D. Clinically correlation analysis for stroke prediction is pending.

Conclusions
The project presents a multi-faceted approach to analyze CAS data, integrating AI algorithms and data extraction techniques. Successful completion of these initial stages demonstrates study feasibility. Further analyses will reveal clinical correlations for the data to clinical events and other stroke prediction models.

Keywords
carotid arterial stenosis, DICOM, pulse wave velocity, deep learning, natural language processing, faster R-CNN, 3-D CNN

85. The Disconnect Between Papilledema Resolution and Symptomatic Improvement after Venous Sinus Stenting in Idiopathic Intracranial Hypertension

Christina Molkenthin, Medical Student
Kyle Fargen, MD, MPH

Jack Midtlien
Surgery-Neurosurgery
Clinical Science- Student

Introduction/Purpose: Venous sinus stenting (VSS) has recently emerged as a leading intervention in patients presenting with idiopathic intracranial hypertension (IIH). Long-term follow-up data on this intervention is sparse, with more recent data reporting as high as 70% chance of symptom recurrence or no improvement post-VSS, most commonly being pressure headaches and pulsatile tinnitus. Despite this, improvement in papilledema remains as a consistent attribute to VSS. This discrepancy between papilledema improvement alongside poor symptomatic outcomes encourages further exploration into the factors that play the largest role in treatment success, and is necessary for future enhancements of candidacy criteria in VSS.

Materials and Methods: This study included patients who underwent VSS for IIH and had pre-VSS and post-VSS ophthalmological records via Frisen Grading scale and outcome data in the form of WHO-BREF QoL and HIT-6 Headache scores.

Results: 83 patients met the study criteria, and 51 (61.4%) reported the presence of pre-procedural papilledema. Mean HIT-6 and WHO-BREF QoL scores pre-procedure were 63.5 (10.2) and 62.3 (17.1), respectively. When controlling for BMI, age, race, and sex, pre-procedure HIT-6 scores were predictive of WHO-BREF QoL scores ($p = 0.03$). Analysis of HIT-6 scores and WHO-BREF QoL scores taken pre-procedure demonstrated no significant difference between those with papilledema pre-VSS and those without ($p = 0.73$). Of the 51 patients with pre-VSS papilledema, 39 (76.5%) demonstrated significant improvement in papilledema post-VSS. Improvement in papilledema was not associated with either positive or negative changes in WHO-BREF QoL or HIT-6 scores post-procedure ($p = 0.96$, $p = 0.46$).

Conclusion: These observations challenge the traditional emphasis on papilledema as a primary metric for assessing the severity and improvement of IIH symptoms following VSS. While papilledema improvement post-VSS remains significant, it does not appear to correlate with changes in patient-reported outcomes. The incorporation of additional measures,

particularly those from the patient's perspective, are encouraged in future interventions, as such data may be useful in establishing clearer guidelines for VSS candidacy.

86. Detection of immediate delayed graft function and ongoing renal allograft performance over one year using Raman Molecular Urinalysis

Alexandra Monetti, BS Giuseppe Orlando, MD, PhD

AM Monetti, R Senger, AS Issa, J Vyas, J Savino, A Cabrales, H Davis, TE Dotya, G McPherson, RJ Stratta, CJ Jay, E McCracken, AC Farney, CJ Webb, J Robertson, G Orlando
Emergency Medicine
Basic Science- Student

Introduction
The means to assess donated organ quality at time of procurement, as well as organ performance following implantation, is one of the Holy Grails in renal transplant medicine. The well-recognized high discard rate for deceased donor (brain-death or cardiac death) (DCD) kidneys and increased demands for renal transplantation mandates use of less-than-ideal organs and discernment of good (i.e., transplantable) from bad (i.e., non-transplantable) renal allografts. Detection of delayed allograft function (DGF) and sub-optimum graft performance after engraftment dictates ongoing medical management of transplant recipients. Our primary objective was development and application of a novel, inexpensive, rapid technology (Raman Molecular Urinalysis - RMU) for detection of DGF and for monitoring DCD allograft function over a one-year post-transplantation interval.

Materials and Methods
Urine specimens were obtained from 22 patients before transplantation and then periodically (up to one year) after renal allograft transplantation. Samples were frozen (-15oC) immediately after collection and then thawed for RMU and physical analysis. The Raman spectral dataset was analyzed with chemometric methods including principal component analysis, discriminant analysis, and cluster analyses. Results of RMU analyses were correlated with standard-of-care clinical and laboratory metrics.

Results
Significant differences in the urine Raman spectra of patients experiencing DGF were detected within one day of transplantation, compared to spectra from patients not experiencing immediate allograft dysfunction. These differences persisted for up to seven days and then resolved gradually, as all allografts (initial DGF, non-DGF) stabilized. No significant differences in Raman spectra of initial DGF vs. non-DGF patient urines could be seen by one year. RMU detected multimolecular pattern spectral "fingerprint" differences in individual patients experiencing episodes of rejection or transplant procedure-associated viremia (BK/CMV viruses). RMU results showed promising but weak correlations with measured eGFR values. This is not unexpected as a comparison of single serum analytes (creatinine) with hundreds of molecular species in urine (RMU) are measuring different aspects of physiology and metabolism.

Conclusions
RMU is a simple, inexpensive, rapid technology that can be useful for studying DCD renal allograft performance. Analysis of samples is rapid (results can be obtained within minutes, including sample processing and computations) and could be done at points-of-care with placement of appropriate analytical devices. Ongoing studies will be directed to analysis of fluids derived by flushing allografts prior to implantation to determine if RMU could provide a predictive "liquid biopsy" of organ viability prior to transplantation.

87. A time course analysis of serial biopsies after kidney transplant reveals a time zero cell state negatively associated with delayed graft function

Alexandra Monetti, BS Giuseppe Orlando, MD, PhD

Alexandra Monetti, John Savino, Tracy Doty, Hollie Davis, Gwen McPherson, Jigishkumar Vyas, Christopher Webb, Alan Farney, Colleen Jay, Emily McCracken, Robert Stratta, Andrew Malone, Benjamin Humphreys, Amish Asthana,

Giuseppe Orlando
Surgery-Transplant
Basic Science- Student

Background
One fifth of the kidneys procured for transplantation in the US are discarded. Identification of kidneys with sufficient functional reserve at the time of procurement may increase the number of kidneys transplanted. We hypothesized that single-cell RNA-seq analysis of allograft biopsies obtained at time 0, 1 and 12 months will identify a signature of functional reserve predictive of successful graft function in marginal organs and thus minimize discard rates.

Methods
As part of the Double R study (IRB00027118) we analysed time 0, 1 and 12 month biopsies of DCD kidney allografts from 6 patients with either DGF (n=3) or no DGF (n=3). We performed single nucleus RNA-seq on snap frozen biopsies using the 10X FLEX kit. We used Seurat and Monocle2 to generate data objects and perform analyses. We also estimated the proportion of male cells with chromosome Y loss (LOY) per cell type over time.

Results
We integrated 17318 post-QC cells from 6 patients with and without DGF across three time points (0, 1, 12 months) post DCD kidney transplant. These included 5658 proximal tubule cells. Using Monocle we identified a cell state present in time 0 biopsies that did not develop DGF (figure1A+B). This cell state was absent in biopsies that progressed to DGF but recovered by 1 month. This cell state was defined by upregulation of fructose metabolism genes and had a high median LOY per cell (0.2459) (figure1C).

Conclusions
We identified a time zero cell state that is negatively associated with DGF in the setting of DCD kidney transplantation. These renal proximal tubule cells differentially express fructose metabolism genes and have a high proportion of LOY cells.

88. Priority for Prior Living Kidney Donors and Trends in Waiting Times According to Race

Saad Mujtahedi, MD Colleen Jay, MD

Emily McCracken, Christopher Webb, Alan Farney, Giuseppe Orlando, Amber Reeves-Daniel, Ebony Boulware, Robert J Stratta, Colleen Jay
Surgery-Transplant
Clinical Science-Resident

INTRODUCTION: The risk of developing end-stage renal disease among living kidney donors (LKDs) is estimated at 0.3%, but kidney transplant waiting times (WTs) for LKDs who develop kidney failure have not been well documented.

METHODS: Using United Network for Organ Sharing (UNOS) data, we compared kidney calculated WTs and time on dialysis for LKDs (including differences according to race/ethnicity) with a non-LKD control group from 1993 to 2022. Calculated WTs is waitlist end date (removal, transplant, or last follow-up) minus initial date (of registration). Controls were matched for age, gender, race, diabetes, and body mass index.

RESULTS: There were 712 first transplants among 858 unique LKDs listed, representing an 83% transplant rate compared to 50% in controls ($p<0.001$). Median calculated WTs were 93 (IQR 27-371) days for LKDs versus 692 (IQR 233-1351) days for controls ($p<0.001$). For LKDs, 56% were on dialysis before listing and 61% before transplant, with a median dialysis time of 500 (IQR 252-1180) days, all lower than controls ($p<0.001$, see Table). Median time to listing following kidney donation was 15.9 (IQR 11.7-20.2) years. Proportion of living donor transplants was low among prior LKDs (4% vs 24% for control, $p<0.001$).

Proportion transplanted, WTs, and time to listing after donation were comparable across race/ethnicity. Significant racial disparities existed in median dialysis times [White 434 (IQR 224-810), Black 589 (IQR 294-1482), Hispanic 512 (IQR 230-934), Other 569 (IQR 315-1494) days, $p=0.003$ for all groups and $p=0.0002$ for Black vs White LKDs]. More Black LKDs were on dialysis at listing (Black 61% vs White 52%, $p=0.02$).

CONCLUSIONS: LKD allocation priority is associated with a high transplant rate and significantly lower WTs for most LKDs compared to matched controls. Disturbingly, more than half of LKDs start dialysis before listing and 61% before transplant.

Additionally, 25% of donors waited more than one year. Black LKDs experience 36% longer dialysis times compared with Whites. These findings suggest that improved post-LKD monitoring and earlier transplant referral are needed in addition to allocation priority to improve access to transplant for LKDs.

89. Single Center Long Term Outcomes Comparing Alemtuzumab and Antithymocyte Induction in Pediatric Kidney Transplantation

Saad Mujtahedi, MD Alan Farney, MD

J. Vyas, C. Webb, A. Chen, E. McCracken, C. Jay, G. Orlando, R. Stratta, A. Farney
Surgery-Transplant
Clinical Science-Resident

INTRODUCTION: Few studies have assessed the long-term effectiveness of lymphocyte depleting induction in Pediatric Kidney Transplant (PKT) recipients. No study has compared alemtuzumab vs antithymocyte globulin (rATG) induction at a single center. The study provides a single center experience using alemtuzumab vs rATG induction in PKT recipients. Alemtuzumab is administered as a single IV dose at the time of transplantation, whereas rATG is administered as multiple IV doses, at the time of transplantation and then again over the next 4-7 days. Alemtuzumab is also relatively inexpensive compared to rATG.

METHODS: Single center retrospective cohort study comparing long term longitudinal data of mortality and graft survival in PKT recipients receiving alemtuzumab vs rATG induction.

RESULTS: There were 102 recipients of which 79 received alemtuzumab and 23 received rATG over the duration of 20 years (2003 to 2023). Both groups mostly had male recipients (65.8% vs 56.5%) with a similar race distribution (Black: 38%% vs 39.1%, White: 50.6% vs 47.8%, and other: 10.2 vs 8.7%). Congenital Anomalies of the Kidney and Urinary Tract (CAKUT) as the most common etiology of renal failure in both groups, 53.2% in alemtuzumab group vs 56.5% in rATG. Both groups had similar donor types with Alemtuzumab group having 27 (34.2%) vs rATG having 8 (34.8%) living donors. The overall rejection was lower in alemtuzumab group (35.4%) vs rATG group (52.2%). Most first episodes of rejection were within the first year, about a third (35.7%) patients in Alemtuzumab group vs half (50%) in rATG group. Median time to first episode of acute rejection was 16.5 months in Alemtuzumab group vs 11.2 in rATG group. Graft failure occurred at similar median durations after transplant in both groups, 45 months alemtuzumab group vs 69 months in rATG group. Alemtuzumab group had a relatively lower mortality rate (8.9%) compared to the rATG group (17.4%). Mortality occurred at similar median durations in both groups 5.62 years in Alemtuzumab group vs 4.98 years in rATG group.

CONCLUSIONS: Our study provides long term results of Alemtuzumab vs rATG induction in PKT recipients. Our data showed a trend toward less early rejection with alemtuzumab, but the overall long term results show equivalency between the two induction therapies.

90. Cryopreservation of testes in novel cryoprotectant polymer and viability study comparing between liquid nitrogen and -80°C

Chenchu Srujan Nagarakanti, MD Hooman Sadri-Ardekani, MD, PhD

Chenchu Srujan Nagarakanti, MD[1], Megan Escott MD[1,2], Antony Atala, MD[1,3], Xu Han, PhD[1,3], Hooman Sadri-Ardekani, MD, PhD[1,2,4]
[1]Wake Forest Institute for Regenerative Medicine (WFIRM), Winston-Salem, NC.
[2]CryoCrate LLC, Winston-Salem, NC.
Wake Forest Institute Regenerative Medicine (WFIRM)
Basic Science- Fellow

Introduction:
The standard protocol for long-term testes tissue storage is stored in the Liquid Nitrogen (LN) tank to maintain their structure and viability. However, there are a few disadvantages of using LN, such as multiple freezing steps and large volumes of LN being utilized for freezing test samples with a cooling chamber, which makes the traditional techniques expensive and difficult to afford in many facilities. This study compares rat biopsy samples stored in an LN tank to those stored at

-80°C. We compared the traditional cryoprotectant media used in LN called the Male Fertility Research Group (MFRG) medium, the mixture of Minimum Essential Medium (MEM), 20% Fetal Bovine Serum (FBS), and 8% Dimethyl sulfoxide (DMSO) in LN to novel cryoprotectant media C80EZ-Tissue plus 5% DMSO and Odin-Sol in 80°C. These novel serum-free media contain biocompatible polymers that form cubic ice formation around the tissue instead of regular hexagonal structure, stabilizing the structure and improving thermal stability.
Methods:
For this study, five rats aged 15-17 weeks were sacrificed. After receiving the testes from each side, both sides of the testicular seminiferous tubes combined. For future histology comparison, each rat tissue was fixed in Davidson's fixation before cryopreserving. Each rat testes tissue is divided into four equal parts for two periods. Before storing the vials containing tissue and medium in the freezer, they were placed at room temperature for half an hour as a pretreatment procedure, which allows the polymers in cryoprotective media to permeate throughout tissues to protect the structure. All the labeled vials in Mr. Frosty containing alcohol were stored at -80°C. After 24 hours, MFRG frozen vials were transferred to the Liquid Nitrogen tank. Tissue viability was studied using Alamar Blue Assay. Later, the tissue was fixed in Davidson fixation for histology evaluation.
Results:
The hematoxylin and eosin staining of the seminiferous tubule in each rat sample was compared with a fresh rat with three conditions. The testes' tissues were thawed after three months of cryopreservation storage; H&E showed structures were adequately preserved in all freezing conditions. Alamar blue assay viability, C80EZ frozen tissue was not significantly different from MFRG frozen tissue, but the Odin-Sol frozen tissue was significantly reduced compared to MFRG frozen tissue.

Conclusion:
The seminiferous tubule structures were adequately preserved in all groups. The viability and structure of testis tissue could be maintained for at least three months at -80°C using a novel nano polymer cryoprotectant. It is crucial to evaluate longer storage time points and to test human materials before moving to clinical usage of this novel cryoprotectant.

91. WHOLE TESTES CRYOPRESERVATION FOR FUTURE AUTO-TRANSPLANTATION: COMPARISON OF DIFFERENT FREEZING METHODS

Chenchu Srujan Nagarakanti, MD Hooman Sadri-Ardekani, MD, PhD

Chenchu Nagarakanti, MD1; Robert R.A. Wilson, Bsc1; Elizabeth D Greene, LATG.2; Ibrahim Hacibey, MD1; Megan Escott, MD1,4; Yalcin Kulahci1; Vijay Gorantla1; Anthony Atala, MD1,3; Kelvin G.M. Brockbank, PhD2,3; Hooman Sadri-Ardekani, MD, PhD1,3
1Wake Forest Institute for Regenerative Medicine (WFIRM), Wake Forest School of Medicine, Winston-Salem, NC
2Tissue Testing Technologies LLC, North Charleston, SC
3Department of Bioengineering, Clemson University, Clemson, SC
4Department of Urology, Wake Forest School of Medicine, Winston-Salem, NC.
Surgery-Urology
Basic Science- Fellow

INTRODUCTION:
In the past decades, survival rates of cancer patients have increased significantly, though infertility remains a long-term complication of cancer therapy. Whole testes (WT) cryopreservation for successive transplantation is one of the potential fertility-sparing strategies in childhood cancer patients with solid tumors.

METHODS:
The study involved eight rats; each was sacrificed and submitted to orchiectomy. WT organs from each rat were randomly assigned to four groups: Group A, fresh tissue (control); Group B, slow freezing with 10% DMSO and rewarmed at 37°C; Group C, slow freezing with 10% DMSO and rewarmed on ice, and Group D, Vitrification testes were slowly warmed to -100°C followed by rapid warming to melting. Each group had two replicates from different rats. Each testicle was measured metrically and with an orchidometer. Histological examination was conducted to assess morphological changes in the testicular tissues. Immunohistochemical staining techniques, specifically targeting PGP, Calretinin, Vimentin, and Smooth Muscle Actine (SMA), were employed to identify undifferentiated spermatogonia, Leydig cells, Sertoli cells, and peritubular cells. Additionally, micro-CT scanning was used to evaluate the distribution and effectiveness of DMSO within the testicular tissue across different loading times (from 6 hours to 4 days).

RESULTS:
Slight morphological alterations were observed in the experimental groups compared to the control, including testicle

tubule tissue shrinkage in vitrified samples. Frozen tissue demonstrated more significant tubule tissue shrinkage, minor disruption of the epididymal tissues, and more significant disruption of the endothelial layers of the blood vessels in the vascular pedicle. Arterial vasospasm was present in all four groups. PGP 9.5 IHC identified undifferentiated spermatogonial cells. 1-way ANOVA test showed a statistically significantly lower number of cells in the three experimental groups than in the control. It found that 10% DMSO gave 10% concentration in the testes after 12 hours of loading time, which is close to optimum.

CONCLUSION:
Slow freezing with loading 10% DMSO for 12 hours could preserve WT structure cell-specific sensitivity to the freeze-thaw process has been detected. All methods revealed significantly decreased PGP9.5 and calretinin expression, and further studies are necessary to optimize PGP 9.5 and calretinin expression and confirm testicular tissue function for possible auto-transplantation

92. Skin-integrated melanoma organoids to study the tumor microenvironment-mediated mechanisms of melanoma development, progression, and metastasis in vitro

Gemma Nomdedeu-Sancho , PhD Candidate Anthony Atala, MD / Shay Soker, PhD

Gemma Nomdedeu-Sancho, Anastasiya Gorkun, Nicholas P. Edenhoffer, Naresh Mahajan, Christine Ahn, Anthony Atala, Shay Soker
Wake Forest Institute Regenerative Medicine (WFIRM)
Basic Science- Student

Melanoma is the deadliest type of skin cancer due to its high metastasis rate. Despite the success of targeted therapies and immune checkpoint inhibitors in improving patient outcomes, overcoming resistance to these treatments remains a challenge in melanoma management. The tumor microenvironment (TME) -- which in melanoma comprises the surrounding skin cells, the cancer-associated fibroblasts (CAFs), endothelial and immune cells, the ECM, and signaling factors -- has been shown to provide a tumor-supportive environment that enhances melanoma progression, invasion, and drug resistance, thus arising as a valuable therapeutic target for melanoma treatment. However, the development of effective TME-directed therapies has been limited by the unavailability of human in vitro melanoma models that recapitulate different aspects of the melanoma TME and their effects on tumor progression.
By aggregating primary skin cells and two different melanoma cell lines (primary and metastatic melanoma-derived), we generated self-assembling melanoma/skin organoids (mSOs) that display 1) the normal skin anatomy, including the presence of a cornified epidermis and a dermal-hypodermal core, and 2) typical melanoma histological features such as epidermal invasion, Pagetoid spread, melanocytic atypia and migration outside of the organoid, evidencing their invasive properties.
To further add more components of the TME in the system, we embedded the mSOs in fibroblast-laden collagen I gels, providing a dermis-like environment to which melanoma cells could migrate. The addition of these gels did not disrupt the normal mSO architecture. However, it enhanced the invasive and migratory capabilities of melanoma cells, which we measured using a custom image analysis tool. Analyses of gene expression and collagen properties revealed that dermal fibroblasts embedded in the surrounding collagen gels acquired a CAF-like phenotype and were active in remodeling the collagenous ECM. This could explain the enhanced melanoma spreading observed in the organoids. Therefore, we generated skin-integrated melanoma organoids that can reproduce some of the TME-mediated mechanisms of melanoma invasion. To show that these models could be adapted for personalized medicine, we incorporated patient-derived melanoma cells in the organoids and observed a similar melanoma behavior as the established cell lines.
In summary, our novel skin-integrated melanoma organoid model reproduces key aspects of the melanoma TME and can be used as a platform to elucidate and pharmacologically target both the cell-intrinsic and TME-dependent processes involved in melanoma spreading. By incorporating patient-derived melanoma cells, these models can potentially improve personalized melanoma treatment.

93. A Pilot Study on the Effect of Amniotic Fluid Stem Cell Conditioned Media on Inflammation in Osteoarthritic Chondrocytes

Ayobami Ogunsola, MD, MPH Xu Ma, PhD

Lauren Crosby; Hailey K. Bennett; Siyuan Li; Xue Ma

Surgery-Orthopedics
Basic Science- Resident

Introduction: Osteoarthritis (OA) is a leading cause of disability in the United States, affecting 32.5 million adults and accounting for $16.5 billion in health care spending. The etiology of OA is multifactorial, but joint inflammation is one of the main components of its pathophysiology, with the nuclear factor Kappa B (NF-KB) pathway being the central dogma of inflammation. This study aimed to evaluate the impact of amniotic fluid stem cell-conditioned media (AFS-CM) on the NF-KB pathway in OA.

Methods: Differential gene expression (DEG) analysis was performed on OA and healthy samples, and RNA sequencing count data were obtained from the Gene Expression Omnibus (GEO) database (GSE114007; 18 healthy samples and 20 OA samples). Additionally, pathway analysis using Gene Set Enrichment Analysis (GSEA) and Kyoto Encyclopedia of Genes and Genomes (KEGG) was performed to identify the important inflammatory pathways in the OA setting. Cartilage obtained from patients who underwent TKA (n =6) were processed for chondrocyte extraction. Chondrocytes were cultured in 10% fetal bovine serum in Dulbecco's modified medium (10% DMEM). Subsequently, the cultured chondrocytes were starved using 5% DMEM and treated for 6 days with a single dose of high-dose AFS-CM (10 mg/ml), Interleukin 1 beta (IL1-β, 10 ng/ml), AFS-CM and IL1-β, and control (no treatment). RNA extraction was performed using a Qiagen RNA kit, and quantitative polymerase chain reaction (qPCR) was performed to determine the relative expression of genes of interest across treatment groups.

Results: DEG analysis revealed differences in gene expression between OA and healthy samples. Pathway analysis of the DEG results revealed significant upregulation of the NF-KB pathway and other inflammation-related pathways in OA (T17 differentiation pathway, mitogen-activated protein kinase pathway, and hypoxia inducible factor pathway). The average gene expression and percentile rank of the genes from DEG analysis were calculated. Genes directly or indirectly related to the NF-KB pathway had a higher percentile rank, including matrix metalloproteinase 1 (MMP 1) related genes (ICAM 1 = 0.856, RELA = 0.876, MAP3K7 = 0.808, IKBKB = 0.582, TRAF1= 0.723, etc.). qPCR analysis was performed to measure the expression of selected genes (MMP 1, MMP 13, ACAN, COL2A1, Kindlin2, Runx2, and SOX 9). AFS-CM showed a trend toward reduced MMP1 expression compared to both IL-1β and control groups, with a large effect size (Cohen's d = -1.14, p = 0.06). However, no significant differences were observed in the expression of other selected genes.

Conclusion: This study supports the existing literature that there is significant ongoing chronic inflammation in osteoarthritis. Additionally, AFS-CM may help attenuate cartilage degradation by reducing the expression of MMP1 in end-stage chondrocytes. Therefore, AFS-CM may have the potential therapeutic effects in mitigating inflammation and preventing cartilage degradation in end-stage OA. Further studies of proteomics and greater sample size are required to confirm these preliminary results and explore other potential underlying mechanisms of AFS-CM.

94. A Retrospective Cohort Study Comparing Survival After Surgery in Patients with Neovascular Glaucoma and Primary Open Angle Glaucoma

Laura Palmer, BS Atalie Thompson, MD, MPH

Levi D. Kauffman; Greg Russell; Atalie C. Thompson*; Gillian G. Treadwell* *Co-senior authorship
Surgery-Ophthalmology
Clinical Science-Student

Purpose
To investigate mortality rates in patients who have undergone surgical management for neovascular glaucoma (NVG) or primary open angle glaucoma (POAG).

Methods
This was a retrospective study comparing survival rates of adult patients with a history of tube shunt or transscleral cyclophotocoagulation (CPC) surgery with either a diagnosis of NVG (N=186) or POAG (N=190). Kaplan-Meier survival estimates and Cox proportional hazard models were used to compare mortality between NVG and POAG, proliferative diabetic retinopathy (PDR) and central retinal vein occlusion (CRVO) as etiologies of NVG, and tube shunt surgery versus CPC laser.

Results
Patients with NVG had a higher mortality rate after surgery than patients with POAG in both the unadjusted (HR 2.22 95% CI (1.59, 3.10)) and age adjusted (HR 2.99 95% CI (2.12, 4.22)) models respectively ($p<0.0001$). The two most common etiologies for NVG in this cohort were PDR (59.1%) and CRVO (23.1%). In an age-adjusted model, patients with PDR had a higher mortality rate after surgery than patients with CRVO (HR 2.00 95% CI (1.19, 3.45) $p<0.0001$)). Patients treated with CPC laser also had a higher mortality rate compared to those who underwent tube surgery (HR 1.91 95% CI (1.40, 2.61)) ($p<0.0001$).

Conclusion
Patients with NVG had a higher mortality rate than patients with POAG after surgery. Patients with NVG secondary to PDR had a lower survival rate compared to NVG secondary to CRVO. Patients treated with CPC laser had a higher mortality rate than tube shunt surgery. Understanding mortality risk can guide clinical decision making for both glaucoma and systemic health.

95. Underrepresentation of Surgical Faculty in the Preclinical Years

Abby Peoples, MD Bennett Calder, MD

Mary Duet, Abby Heilenman, Eve Glenn, Julia Faust, Dawn Laporrte, Amanda Cooper, Bennett Calder
Surgery-Plastic & Reconstructive
Educational Science- Resident

Background:
Previous research has highlighted that early mentorship in specific fields of medicine is associated with a medical student's choice of specialty. Pre-clinical students spend the majority of their time in the traditional classroom setting with ancillary skill-based courses allowing for longitudinal exposure to course directors and faculty. Exposure to enhanced surgical teaching outside of the curriculum is associated with greater interest in pursuing a surgical residency, there is potential for longitudinal exposure of students to surgeons through their role as pre-clinical faculty. We aimed to evaluate the level of pre-clinical surgical faculty involvement at three institutions and compare that with the percentage of students matching into surgical fields.

Methods:
A list of pre-clinical faculty with their respective specialties at three institutions was acquired and categorized as preclinical or longitudinal faculty. Faculty were categorized as either surgical, nonsurgical, or nonclinical.

Results:
At each of the three institutions the majority of preclinical course content was delivered by non surgical faculty (between 0% and 14%). Reviewing specialty match data from each institution demonstrated 25% to 30% of students matched into a surgical field, correlating with a 25% national rate of students matching into surgical fields.

Conclusion:
When compared to the rate of students matching into surgical specialties, surgical faculty are significantly underrepresented in preclinical faculty. This is a trend across multiple institutions. More surgical faculty should be involved in the preclinical curriculum to provide interested students with earlier exposure to surgical mentors.

96. Adenosine: A Key Regulator of Human Pancreatic Islet Insulin Content and a Shield Against Hypoxia Injury

Quentin Perrier, PharmD, PhD Amish Asthana, PhD

Quentin Perrier[1,2], Lori Byers[1], Wonwoo Jeong[1], Rita Bottino[3], Christopher A. Fraker[4], Alice Tomei[4], Giuseppe Orlando[1], Amish Asthana[1]
[1]Wake Forest School of Medicine, Winston-Salem, NC, USA
[2]Univ. Grenoble Alpes, Department of Pharmacy, Grenoble Alpes University Hospital, Grenoble, France
[3]Imagine Islet Center, Imagine Pharma, Pittsburgh, PA, USA

[4]Diabetes Research Institute, University of Miami Miller School of Medicine, Miami, USA
Surgery-Transplant
Basic Science- Fellow

Introduction
Islet transplantation is an effective cell therapy for treating type 1 diabetes. However, a high therapeutic dose is required to achieve optimal glycaemic control, as a significant proportion of islets is destroyed shortly post-transplantation due to oxidative and biochemical stresses. Adenosine (AD) has been shown to decrease the metabolism of rat islets and, also to provide protection against ischemia-reperfusion and hypoxia injury in other cell/tissue types. Therefore, the primary objective of this study was to investigate the effect of adenosine on human islets. The secondary object was to assess the impact of adenosine in preventing hypoxia-associated adverse effects on human islets viability and function.

Materials & Methods
Human pancreatic islets were obtained from Imagine Pharma and cultured in PIM(S) medium. First, the potential toxicity of Adenosine was tested by incubating islets with 1 mM AD for 24h, and then analyzing islet viability and function at different time points (immediately (D0), D2 and D4). Thereafter, AD-treated islets (1 mM AD for 24h), were subjected to 48h of hypoxia (1% O2), followed by 2h of reperfusion (culturing in full oxygenated medium, 21% O_2), and then directly analyzed for viability and function. Islet viability was assessed by confocal microscopy after staining with Syto13 (live cells, green) and propidium iodide (dead cells, red). Functional evaluation was conducted by glucose-stimulated insulin secretion (GSIS) index (an index > 2 suggested functional islets), and total insulin content was measured after incubation in an acid-ethanol solution.

Results
AD (1 mM) did not have any adverse effects on human islet viability at any time point tested. Following AD exposure (24 h; D0), total insulin content of AD-treated islets decreased compared to the control (203 ± 99 ng/mL vs. 409 ± 120 ng/mL, $p < 0.01$), as did the GSIS index (3.09 ± 1.22 vs. 5.34 ± 1.27, $p < 0.01$). At D2 and D4 post-exposure, islet function demonstrated recovery, with the total insulin content being comparable to the respective controls as well as from D0 (D2: 361 ± 98 ng/mL, D4: 393 ± 115 ng/mL). Similarly, no significant difference was found in the GSIS index (D2: 4.16 ± 1.26, D4: 5.56 ± 1.20). Preconditioning of human islets with AD (24 h) was able to prevent the deleterious effects of hypoxia. Hypoxia reduced islet viability compared to non-hypoxic control (72.7 ± 6.8% vs. 91.4 ± 0.3%, $p < 0.01$), but adenosine treatment prevented the reduction in viability (81.5 ± 5.3%, $p < 0.01$ vs. hypoxia). Hypoxia also decreased the GSIS index compared to the control (0.68 ± 0.42 vs. 4.80 ± 1.98, $p < 0.01$), and adenosine prevented this reduction in the GSIS index (3.41 ± 0.80, $p < 0.01$ vs. hypoxia).

Conclusion
Adenosine treatment can temporarily decrease the insulin content of human islets, without any significant effect on their viability (probably linked to the downregulation of islet metabolic activity). The treated islets are able to fully recover their function and insulin content after 48h. Moreover, adenosine preconditioning can protect human islets from the impact of severe hypoxia (1% 02) on their viability and function. These findings provide a strong support for incorporating adenosine preconditioning in bioengineered islet grafts for cell therapy in diabetes, to protect islets from necrosis that often occurs early during the engraftment period due to insufficient oxygen supply.

97. Short-Term Pain Relief Following Hip Abductor Repair: A Pilot Study

Caitlyn Perrone, MD Student John B. Hubbard, MD

Caleb Puckett, Brandon Garcia Fuentes, John Hubbard
Surgery-Orthopedics
Clinical Science- Student

BACKGROUND: Greater trochanteric pain syndrome is very common and associated with tears of the gluteus medius or minimus tendons. Few studies have investigated the short-term pain relief provided by endoscopic repair of the hip abductor tendons.

METHODS: This is a retrospective review of patients at least 18 years of age who underwent endoscopic repair of hip abductor tendons between 2014 and 2024. Electronic health records were reviewed to capture age, sex, surgical technique, tendon involvement, MRI results, intra-operative findings, pre-operative pain, seven to fourteen-day post-operative pain, and operation time. Pain scores on a 10-point scale of: 1-3, 4-7, and 8-10 were considered mild, moderate, and severe,

respectively. The patient group was also stratified into groups with either gluteus medius or minimus tears and those with both gluteus medius and minimus tears. Descriptive statistics, student t-test, and $\chi 2$ were used to evaluate continuous and categorical variables.

RESULTS: 105 patients met the inclusion criteria. 59 patients with gluteus medius tears, 10 with gluteus minimus tears, and 36 with concomitant gluteus medius and minimus tears. The average age was 64.24, 95% CI [61.90, 66.58]. There were 84 (80%) female and 21 (20%) male patients. The average operating time for the procedure was 71.22, 95% CI [66.96, 75.49] minutes. 103 (98.10%) and 98 (93.33%) of patients had quantifiable pre-operative and post-operative pain scores respectively. Pre-operatively, 15 (14.56%), 66 (64.08%), and 22 (21.36%) of patients rated their pain as mild, moderate, or severe, respectively. Seven to fourteen days post-operatively, 54 (55.10%), 40 (40.82%), and 4 (4.08%) patients rated their pain as mild, moderate or severe, respectively. This demonstrated a statistically significant improvement in pain seven to fourteen days post-operatively ($p < 0.001$). There was no statistically significant difference in sex between those with single tendon tears compared to those with concomitant tendon tears ($p = 0.090$). Those with concomitant tendon tears were significantly older than those with single tendon tears with average ages of 67.50 and 62.54, respectively ($p = 0.043$). Stratified by those with single tendon and those with concomitant tendon injuries, both groups achieved significant pain relief post-operatively ($p < 0.001$). There was no significant difference between the groups in pre-operative pain, but the group with concomitant tendon tears had significantly lower post-operative pain scores ($p < 0.001$).

CONCLUSIONS: Endoscopic repair of gluteus medius and minimus is shown to provide pain relief seven to fourteen days post-operatively, and those with concomitant tendon tears may experience greater pain relief. Those with concomitant tendon tears are more likely to be older in age than those with single tendon involvement. Future studies are warranted to investigate longer term functional outcome scores following this procedure.

98. Replacing creatinine with glomerular filtration rate in MELD 3.0 score might result into an equitable ranking system for allocating liver grafts

Katheryn Peterson, BS Dionisios Vrochides, MD PhD

Katheryn Peterson, William Archie, Peter Drossopoulos, Vincent Casingal, Roger Denny, Lon Eskind, David Levi, Jose Soto, Natasha Adlakha, Andrew deLemos, Mark Russo, Paul Schmeltzer, Steven Zacks, Philippe Zamor, Dionisios Vrochides
Surgery-Transplant
Clinical Science- Student

Introduction: Liver graft allocation systems in the United States have progressed from Child-Turcotte-Pugh to MELD, then MELD-Na, and now MELD 3.0. MELD 3.0 included variables to estimate short-term survival likelihood for liver transplant candidates, specifically aimed to correct misclassification errors and therefore improve accuracy and equity when compared to MELD-Na. Creatinine remained as an important parameter of MELD 3.0. In the context of the MELD score for liver transplantation prioritization and considering the well described limitations of creatinine to accurately reflect renal function, such as its dependence on factors like age, muscle mass, and diet, the hypothesis was made whether Glomerular Filtration Rate (GFR) should be used instead. The aim of this study was to explore the impact of replacing creatinine with GFR in the liver transplant list ranking.

Methods: A retrospective review (IRB00097121) was undertaken of those patients listed on the liver transplant wait list at Atrium Health - Carolina's Medical Center on a randomly selected specific date (December 7, 2023) after adoption of the MELD 3.0 system. Eighteen eligible patients were identified after the exclusion of those undergoing chronic dialysis and those listed as a status 7 (non-active). Enlistment MELD 3.0 scores and their position on the list were verified. Blood type grouping was applied. Based on their enlistment creatinine, GFR values were generated for each patient using the Cockcroft-Gault equation. New rankings within the waiting list based on the GFR values (and not the creatinine ones) were then generated.

Results: Seven blood-group A, three blood-group B, and eight blood-group O patients were identified. In the blood-group A patients, two (28.6%) had altered ranking, with one patient being listed one position higher on the waitlist, and the other being listed one position lower. In the blood-group B patients the ranking was not affected when replacing creatinine with GFR. In the blood-group O patients six (75%) patient rankings were impacted. Each of these six patients either moved up or down the waitlist by one position. For all blood-groups, the first position, top of the waitlist, remained unchanged.

Conclusion: MELD 3.0 scores calculated with GFR instead of creatinine resulted in altered transplant list ranking. The potential implications for the prioritization of patients awaiting liver transplantation are obvious. To validate whether GFR is indeed superior to creatinine in the MELD score, additional comprehensive studies on survival-on-the-list are needed.

These studies will provide critical insights whether further refinement of the MELD 3.0 score is necessary, for a more equitable clinical decision-making in liver graft allocation.

99. INEQUITIES IN CARE OF PEDIATRIC PATIENTS UNDERGOING MEDIAL PATELLOFEMORAL LIGAMENT RECONSTRUCTION

Caleb Puckett, BS Alejandro J. Marquez-Lara, MD, PhD

Jonathan D. Groothoff, Alejandro J. Marquez-Lara
Surgery-Orthopedics
Clinical Science- Student

BACKGROUND: Patient outcomes following orthopaedic surgeries have been shown to be negatively impacted by health disparities. However, there is limited research investigating the relationship between socioeconomic status as measured by Child Opportunity Index (COI) and pediatric patient outcomes following medial patellofemoral ligament (MPFL) reconstruction.

HYPOTHESIS: Lower COI scores will be associated with less access to physical therapy (PT) when compared to higher COI scores, impacting functional outcomes.

METHODS: All charts for patients under the age of 16 who underwent MPFL reconstruction between 2012 and 2022 at a single academic center were reviewed. Patients were excluded if they received multi-ligament reconstruction or had bilateral MPFL injuries prior to full release to activity. Groups were classified by socioeconomic status based on COI quintiles (Low and Very Low vs. High and Very High). Differences in time to first PT appointment after surgery, post-operative functional measures, and length of follow up were analyzed.

RESULTS: 60 patients met the inclusion criteria: 40 from low or very low COI areas and 20 from high or very high COI areas. The mean age was 13.1±1.6 years. There were 35 male patients and 25 female patients. No differences were observed between groups for age or sex. The mean time from surgery to first physical therapy appointment was 10.0±11.3 days for the lower COI group and 11.4±11.1 days for the higher COI group (p=0.336). Over 6 months, patients with lower COI scores attended a mean of 18±11 physical therapy appointments compared to 23±16 from higher COI areas (p=0.142). At 3 months post-op, mean total range of motion was 122.9±18.8 degrees for the lower COI group and 131.2±16.0 degrees for the higher COI group (p=0.059). At 6 months, it was 128.5±18.1 degrees and 137.8±9.5 degrees, respectively (p=0.021). 40.0% of patients in the lower COI group were lost to follow-up, compared to 20.0% of patients in the higher COI group (p=0.121).

CONCLUSIONS: This study identified associations between socioeconomic status and health disparities following MPFL surgery. Lower COI scores were associated with less range of motion at 6 months post-op. Though not statistically significant, patients with lower COI scores were more frequently lost to follow up and attended fewer physical therapy appointments overall. Future studies are warranted to better characterize the impact of socioeconomic disparities in pediatric patients with patellar instability.

100. Baseplate Coverage in Reverse Total Shoulder Arthroplasty: A Systematic Review

Caleb Puckett, BS Brian R. Waterman, MD

Matthew Gwilt
Surgery-Orthopedics
Clinical Science- Student

BACKGROUND: There has yet to be a decisive consensus on the minimum amount of contact surface area between the reverse total shoulder arthroplasty (rTSA) glenoid baseplate and the glenoid bone required for stable fixation. The aim of this systematic review is to produce a qualitative review of the current literature describing the biomechanical and clinical implications of baseplate coverage.

METHODS: A comprehensive systematic review of the existing literature was conducted. PubMed, EMBASE, and Cochrane library databases were accessed in June 2024, using relevant keywords. All biomechanical and clinical studies

investigating varying amounts of rTSA baseplate coverage were included, as well as clinical studies which discuss a decision on surgical technique based on the amount of baseplate backside contact. Abstracts, poster presentations, and manuscripts not written in English were excluded. The titles and abstracts of the search results were then reviewed independently by two investigators. The full manuscripts of articles meeting the inclusion criteria and those undecided by the investigators were downloaded. The full manuscripts were then reviewed against the inclusion criteria.

RESULTS: A total of 8 studies were found to meet the inclusion criteria, of which 6 were biomechanical studies and 2 were clinical studies. Additionally, 21 studies were noted to include a statement on the impact of rTSA baseplate coverage on surgical management. The biomechanical studies found various results with 25%, 50%, 50%, 60%, < 67%, and 54% of width and 70% of height found to be points at which statistically significant baseplate instability was seen, when defined by micromotion or displacement. One clinical study found no association between native bone support and American Shoulder and Elbow Surgeons score in the setting of rTSA with glenoid bone graft augmentation. Additionally, 50% baseplate coverage was found to be the most frequently cited minimum contact surface area at which surgeons decided to further address glenoid defects with eccentric reaming, bone grafting or augmented baseplates.

CONCLUSIONS: A firmly defined minimum baseplate coverage has yet to be established, however, greater than 67% baseplate coverage allows for adequate fixation. Additionally, the general consensus tends to agree that achieving maximal baseplate coverage is optimal. Differing results from biomechanical studies may be attributable to the varying baseplate implant designs used. Future studies investigating the association between clinical outcomes and baseplate coverage following rTSA are warranted.

101. Epidemiology and Clinical Manifestations of Posterior Segment Ocular Syphilis

James Rhead, BS David Browning, MD

Ian Seddon, Alicia Chen, David Browning
Surgery-Ophthalmology
Clinical Science Student

Background:
Syphilis has seen a resurgence in the United States since its nadir in 2000. In 2022, rates of syphilis reached a peak with 207,255 cases, the highest since 1950. Untreated, this infection can disseminate to various structures of the eye (ocular syphilis), leading to redness, light sensitivity, pain, decreased vision, and loss of vision. Given the increasing prevalence of syphilis over time, it is possible that the clinical presentation of ocular syphilis has changed. Understanding the risk factors and manifestations of posterior segment ocular syphilis will help ophthalmologists avoid diagnostic inaccuracies and delays in care for affected patients.
Objectives:
To identify the patient demographics and presenting clinical features of eyes diagnosed with posterior segment ocular syphilis since 2000. These results are compared to pre-2000 trends by utilizing data obtained from a previous case series.
Methods:
A retrospective cohort study was performed using data from the Wake Forest University Medical School and affiliated hospitals through a search of EPIC records. This study includes 46 patients of all ages. Outcome measures include demographic descriptors such as race, sex, age, marital status, and socioeconomic indicators, including insurance coverage. Additionally, the study evaluated treatment modalities, and management setting (inpatient or outpatient). The assessment included other organ system involvements (dermatologic, cardiac) and co-infections with HIV and other sexually transmitted diseases (STDs).
Results:
In this cohort of ocular syphilis cases, most patients were White (63.0%) compared to 2022 CDC syphilis rates of 33.9%. 7.5% of cases were Hispanic or Latino, differing from CDC-reported rates of 20.0%. This could reflect the population in Winston-Salem which is 51.0% White, 33.2% Black, and 4.8% Hispanic. The HIV positivity rate (34.1%) was lower than previously reported in ocular syphilis cases (~50%), but the median CD4 count at presentation was 260, reflecting immunocompromised states. 48.8% presented in the inpatient setting, highlighting the need for ED providers to maintain a high index of suspicion. 28.3% had skin signs, emphasizing the need for awareness of multi-organ involvement. Public health was informed in only 39.1% of cases, indicating room for improved coordination between ophthalmology and infectious disease teams. Compared to a North Carolina series from 2000, the distribution of cases across race has changed with White cases increasing and Black cases decreasing. While HIV positive rates stayed close to the same in these cases, ocular syphilis as the sentinel event leading to HIV discovery decreased from 60% in the 2000 study to 15.4% in 2024.
Conclusion:
This study highlights the need for systemic evaluation in ocular syphilis cases. The discrepancy between local and na-

tional syphilis demographics may reflect regional population differences. All patients with ocular syphilis require screening for HIV, as undiagnosed cases persist 24 years after the last North Carolina case series. The proportion of HIV-positive patients with lower-than-expected CD4 counts, indicative of poorly controlled disease, further emphasizes the importance of early diagnosis and routine screening of these patients. Interdisciplinary management is crucial as nearly 50% of cases presented in the ED, requiring an ophthalmology consult to make the diagnosis. The low rates of public health notification also indicate a need for enhanced collaboration between ophthalmology and infectious disease specialists as well to improve patient outcomes.

102. Impact of metabolic conditions on patient reported outcome measures after Total Shoulder Arthroplasty

James Rhead, BS Nicholas Trasolini, MD

Noah DiNapoli, Alan Reynolds, Ani Fares, Edward Beck, Brian Waterman, Nicholas Trasolini
Surgery-Orthopedics
Clinical Science-Student

Background: Previous studies on the effect of metabolic conditions on outcomes of total shoulder surgery (TSA) have shown varying results. While some studies on hip and knee arthroplasty have found metabolic comorbidities to be risk factors for worse outcomes, the same correlation has not been found for TSA in the currently available literature. Hypothesis: Metabolic comorbidities will not correlate with post-operative patient reported outcome measurements (PROMs) and range of motion (ROM) for patients undergoing TSA.
Methods: A retrospective review was performed to gather metabolic factors including LDL, HDL, cholesterol, triglycerides, A1C, Albumin, Vitamin D, BMI, and diagnosis of Lipid disorders, hyperthyroidism, diabetes, osteoporosis/osteopenia, and hypertension in 217 patients undergoing total shoulder arthroplasty (TSA). PROMs were collected including American Shoulder and Elbow Surgeon (ASES), Single Assessment Numeric Evaluation (SANE), and Visual Analog Scale (VAS). Post-operative External rotation (ER), internal rotation (IR), and forward flexion (FF) range of motion (ROM) measurements were also recorded.
Results: Of the 217 patients included in the study, 61% (132/217) underwent reverse total shoulder arthroplasty (RTSA), while 39% (85/217) underwent total shoulder arthroplasty (TSA). The cohort was 51% male (110/217) and 49% female (107/217), with a mean age at surgery of 70 years (± 8.8). The average follow-up length was 2.8 years (± 1.6). Pearson and Spearman correlation analysis did not reveal any statistically significant correlations between metabolic factors and post-operative PROMs, with the following non-statistically significant findings between ASES score and metabolic factors: LDL ($r = 0.047$), DM ($r = 0.035$), Triglycerides ($r = -0.021$), Lipid presence ($r = -0.021$), Vitamin D ($r = -0.195$), Osteopenia/porosis ($r = -0.166$). In addition, there were also no statistically significant differences in ASES ($p=0.247$), VAS ($p=0.150$), or SANE scores ($p=0.059$) between categorical BMI cut-offs (<30, 30-40, and >40) or between ASES ($p=0.215$), VAS ($p=0.397$), or SANE ($p=0.492$) scores between patients with A1c categories (A1c ≤7, A1c >7).
Conclusions: This study found no statistically significant correlations between numerous metabolic factors and post-operative PROMs, including categorical cut-offs for BMI and hemoglobin A1C which have historically been used for arthroplasty patients. These results corroborate previous studies which have not found metabolic factors to be a risk for poor outcomes after TSA in the same ways that have been found for hip and knee arthroplasty.

103. Outcomes of Operative Fixation of Distal Femur Fractures

Abrianna Robles, MD Jason Halvorson, MD

James A. Rhead, J. Benjamin Gordon, Jeffery St. Jeor, Jason Halvorson, Molly Hartzler
Surgery-Orthopedics
Clinical Science-Resident

Background: The management of distal femur fractures is extremely challenging. The incidence of these fractures is 37 per 100,000 persons per year. They are generally caused by high-energy mechanisms in younger males and lower energy mechanisms in older females. Operative fixation of these fractures is required to achieve the best patient outcomes. However, the optimal implant for this type of fracture has not been elucidated. Furthermore, the reported outcomes after operative fixation with these implants have varied widely.

Objectives: The purpose of this study is to retrospectively review our institution's experience with distal femur fractures,

both primary and peri-prosthetic, and to report on outcomes. Furthermore, we will attempt to elucidate any outcome differences between treatment modalities including distal femur replacement (DFR) and open reduction internal fixation (ORIF).

Methods: Patient outcomes after DFR and ORIF performed at a tertiary medical center were reviewed. The study focused on a total of 329 patients, including 36 distal femur replacement patients and 293 patients who underwent open reduction and internal fixation (ORIF). Data points collected included the following: date of birth (DOB), gender, race, height, weight at the time of surgery, and body mass index (BMI) at the time of surgery. Additionally, we documented complications such as infection, reoperation, and hardware failure, as well as comorbidities, defined as any treatable condition excluding general fatigue. Specific note was made of patients who had received previous knee or hip replacement prior to surgery. Important follow-up data were also recorded, including date of death (if applicable) and date of last follow-up. Comparisons were made between the outcomes of the distal femur replacement group with those of the ORIF group.

Results: One-year mortality was 16.7% (6/36) for distal femur replacement (DFR) and 12.6% (37/293) for open reduction internal fixation (ORIF). Total complications were 13.9% (5/36) for DFR and 9.9% (29/293) for ORIF. No infections were reported in the DFR group, while 4.4% (13/293) of ORIF patients had infections. Hardware complications requiring revision were 11.1% (4/36) for DFR and 4.8% (14/293) for ORIF. Complete hardware failure occurred in 5.6% (2/36) of DFR cases compared to 4.1% (12/293) in ORIF. There were no cases of painful hardware in DFR, whereas ORIF had 0.3% (1/293). Prolonged intubation was required in 5.6% (2/36) of DFR patients and 0.3% (1/293) of ORIF patients. No amputations occurred in DFR patients, but 0.3% (1/293) of ORIF patients required amputation.

Conclusions: The study revealed no statistically significant differences in one-year mortality, infection rates, hardware failure, or total complications between distal femur replacement (DFR) and open reduction internal fixation (ORIF). Specifically, one-year mortality was 16.7% for DFR and 12.6% for ORIF, with total complications at 16.7% and 9.9%, respectively. However, there was a statistically significant difference in the number of patients requiring prolonged intubation, with 5.6% (2/36) of DFR patients compared to only 0.3% (1/293) of ORIF patients (p-value > 0.0001). It also showed a higher rate of revision for DFR, while other studies indicated a higher rate for ORIF. Overall, these findings emphasize the need for further research to delineate the long-term outcomes and complications associated with each procedure.

104. Foveal Crack Sign and Macular Pattern Dystrophy

Rainer Rodriguez, BS MS-3 David Browning MD, PhD

Surgery-Ophthalmology
Clinical Science- Student

Background: Foveal Crack Sign (FCS) is a recently described optical coherence tomography (OCT) finding that is characterized as a thin vertical and linear hyperreflectivitty of the foveola from the internal limiting membrane to the ellipsoid zone. There is also research that describes similar novel findings on OCT using different nomenclature, such as hyperreflective stress lines (HSL), intraretinal hyperreflective lines (IHL) and hyperreflective foveal spots (HFS). Authors theorize pathophysiologic mechanisms for the sign that concern two cell types: 1) traction on or dehiscence of Muller cells in the fovea (altering their orientation and causing hyperreflection), as well as 2) migration of retinal pigment epithelium in macular pattern dystrophies and acquired vitelliform lesions. Little work has been done to further explore the relationship between hyperreflective OCT findings such as FCS and MPD. In this study, we report on findings of patients diagnosed with macular pattern dystrophy whose OCT was found to have FCS. We also conducted a chart review of MPD patients to determine if macular pattern dystrophy and FCS are associated, and if FCS in these patients progressed to macular holes.

Methods: A retrospective chart review of eyes with macular pattern dystrophy from 1/1/2000 to 5/1/2024 was conducted in the Atrium Wake Forest Baptist Health medical system. Exclusion of eyes was made if they did not have an OCT available in our Topcon system and a follow-up OCT of at least 6 months after the diagnosis of macular pattern dystrophy. Data collected from charts included population descriptors such as age, sex, race, and eye laterality. Other data included past ocular history and intraocular surgical history, presence/type of MPD or macular hole, best corrected visual acuity (BCVA) recorded as LogMAR score, follow-up length in days from diagnosis to final visit, and minimum macular thickness in microns. All OCT's were obtained as spectral domain OCT's (Heidelberg Spectralis).

Results: 151 eyes were initially identified. Of these, 56 were MPD eyes. 8 MPD eyes from 6 patients were FCS-positive. One eye developed a full-thickness stage 4 macular hole during the follow-up period. There was no significant difference ($p = .491$) between eyes with and without MPD with regards to development of FCS. There was no significant difference in macular hole development between MPD eyes with and without FCS ($p = .1429$).

Discussion: This study further analyzes FCS in patients with macular pattern dystrophies and asks if the novel diagnostic

sign has utility in MPD and augurs macular hole generation. Ultimately, the data did not show a significant difference in macular hole generation between eyes with and without FCS, which runs contrary to the current literature around FCS. Further work is needed to better characterize FCS and determine if it has utility as a novel diagnostic tool or is better served as a subtype of existing OCT patterns.

105. Quantifying Introspective Self-Reported Pediatric Orofacial Cleft Outcomes Via Report Card

Marina Sawires, MS Christopher Runyan, MD, PhD

Daniel Sedarous, Elaine Lin, Victoria Yi, Alexander Allori, Suzanne Santomieri,
Leah Chapman, Christopher Runyan
Surgery-Plastic & Reconstructive
Educational Science- Student

Introduction: 'CLEFT Q' is a database composed of postoperative patient surveys, completed by pediatric orofacial cleft patients. These Patient Reported Outcomes (PROs) provide patient-centered insight into metrics related to the social, academic, emotional and psychological well-being of pediatric cleft lip and palate patients. Three age groups (7-10, 11-14, 15-18) were analyzed, with three umbrella categories in mind: Scaring/Aesthetics, Psychosocial and Functionality (Scaring/Aesthetics: Lips, Nostrils, Scar, Psychosocial: School, Social Life, Speech, Feelings Functionality: Face Breathing, Eating/Drinking). PROTEUS (Patient-Reported Outcomes Tools: Engaging Users & Stakeholders) is a consortium that focuses on implementing PROs into clinical practice. It provides resources and guidance to clinicians, researchers, and patients to incorporate PROs into clinical care and research settings. Using PROTEUS-guided techniques, we have created python-coded data visualizations communicating CLEFT Q PROs to people of all levels of medical literacy. We have established a methodology here at the North Carolina Cleft and Craniofacial Center composed of efficient data collection, structured PRO reporting, clear communication with researchers, clinicians and patients alike; working to ease PRO burden from patients while simultaneously collecting high quality data to promote equitable and individualized patient care and communication. It is hypothesized that clear and intuitive data visualizations and specific clinic-centered methodology techniques based in PROTEUS guidelines can improve medical literacy and increase delivery of equitable and individualized patient care techniques among the cleft lip and palate population.

Methods: Our 9 surveys of interest were distributed to all eligible patients during Cleft Clinic when patients are evaluated by all the clinicians on their multidisciplinary care team. Patients filled out surveys at their first appointment and submitted them at their final appointment of the day with Dr. Runyan. Researchers on the team inputted the data collected at the end of the day and emailed patients if certain surveys were not inputted. Using PROTEUS recommendations, this data was then transformed within the framework of python-based code and displayed in multiple data visualization techniques.

Results: We have created python-based code for histograms, traffic light strip plots and box plots stratified by both age and cleft lip and palate phenotype (Cleft Lip Only, Cleft Palate Only, Cleft Lip and Alveolus, Cleft Lip and Palate with Intact Alveolus, Cleft Lip, Alveolus and Palate) for all 9 of our surveys of interest. This code will be shared across multiple institutions to build a robust data framework for cleft lip and palate patients to visualize their data as it compares to other patients, and for clinicians to use it to understand and inform treatment methods and surgical interventions. Upon observations on Cleft Clinic days, we further refined our data collection and research methodology such that we distributed materials in a way that increased both PRO return and quality.

Conclusion: Using highly efficient research methodology, data distribution, collection and visualization techniques, these effective and effective workflows can be applied to similar Cleft and Craniofacial centers across the nation to build robust individualized patient data sets driving patient care and clinician-guided interventions.

106. Direct Evidence for Attenuated Levels of the Vasopressor Ang II in Post-Cardiotomy Associated Vasoplegia

Benjamin Schachner, MD Bart R. Imielski, MD

Spencer D. Tingey, Jake W. DuPlooy, Jorge S. Seoane, Ashish K. Khanna,
Mark C. Chappel, and Bart R. Imielski
Surgery-Cardiothoracic

Clinical Science-Resident

OBJECTIVE: Postoperative vasoplegia affects up to 20% of patients who undergo operations requiring cardiopulmonary bypass (CPB). In this study we evaluated the response of the Renin-Angiotensin-Aldosterone System (RAAS) in patients with vasoplegic shock compared to those without vasoplegia following CPB.
METHODS: Patient blood was collected immediately into an inhibitor cocktail, including the renin inhibitor aliskerin, for Ang II measurements and for serum prior to CPB, at separation from bypass and protamine administration; and then at 24 and 48 hrs post-operatively. Patient samples were analyzed for the vasopressor hormone Ang II, the precursor angiotensinogen, and the RAAS enzymes renin, ACE, ACE2, and DPP3. Patients were grouped into vasoplegic vs. non-vasoplegic cohorts based on vasopressor support and cardiac index measurements post-operatively.
RESULTS: A total of 27 patients were analyzed and 7 patients identified with vasoplegia based on increased vasopressor need and adequate cardiac index following CPB. All patients following CPB exhibited reduced angiotensinogen compared to baseline ($p<0.0001$) but recovered by 24h. ACE was reduced amongst all patients following CPB ($p<0.001$) and failed to recover by 48h. Both ACE2 and DPP3 did not differ among patients prior to and following CPB. Renin levels were higher in all patients following CPB ($p<0.03$) and at 24h ($p<0.003$); however, renin tended to be lower in those patients with vasoplegia as compared to the non-vasoplegia group at all time periods. Moreover, Ang II levels were lower in patients with vasoplegia following CPB ($p<0.01$) and this trend continued for 48hr post CPM.
CONCLUSIONS: Renin concentration is lower at all time points and Ang II levels are lower in vasoplegic patients compared to control patients. ACE levels decrease after CPB and do not recover for up to 72 hours regardless of vasoplegia. Angiotensinogen levels drop across all patients following CPB and recover progressively. This data suggests that therapies targeting a disrupted RAAS, specifically early and point-of-care monitoring of active renin concentration and possible exogenous replacement with Ang II, may have a role in ameliorating post-CPB vasoplegic shock.

107. Surgical Management & Outcomes of Aortic Valve Infective Endocarditis AVR vs ROOT

Jorge Seoane, MD Bartlomiej Imielski, MD

Jake DuPlooy, Elizabeth C. Wood, James E. Jordan, Timothy E. Craven, Adrian L. Lata, Edward H. Kincaid, Neal D. Kon, Bartlomiej R. Imielski
Surgery-Cardiothoracic
Clinical Science-Student

Objective:
This study evaluates the surgical management of both native (NVIE) and prosthetic (PVIE) aortic valve infective endocarditis (IE). We hope to address the paucity of data regarding intervention strategy and their respective post-operative complications (POC).

Methods:
This is a retrospective study, of 146 patients treated surgically for IE, between Jan ’12 - Jan ‘24. Patients with concomitant surgery (CS) were included and those who underwent AV repair (3) were excluded. Patient demographics, medical history, hospital course, and POC’s were obtained from the EMR. Patients were split by NVIE vs PVIE, and by intervention: aortic valve replacement (AVR) (mechanical or bioprosthetic) vs aortic root replacement (ARR) (stentless porcine xenograft or mechanical valve conduit). Primary outcome assessed was mortality, along with re-operation rates and Major Adverse Cardiac Events (MACE) (i.e myocardial infarction, acute renal injury, arrhythmias, and cerebrovascular accidents (CVA)/ septic emboli (SE)). Descriptive statistics were used for continuous variables, and chi-square tests for proportional hazards models.

Results:
We reviewed 146 patients, mean age 54 years, of which 31 (21%) were female. 44 (31%) confirmed history of recreational drug use, and 34 (24%) had intravenous drug use (IVDU). Furthermore, 27 (19%) presented with CVA or SE. 44 (30%) had a bicuspid AV. 30 (%) had Staph, 29 (%) Strep, and 21 (%) Enterococcus Faecalis organisms for NVIE; whereas 8 (%) Staph. 10 (%) Strep. 7 (%), Enterococcus Faecalis for PVIE. Of the 102 patients with NVIE 23 received AVR alone (24 AVR + CS), and 32 ARR alone (23 ARR + CS). Out of 44 patients with PVIE, 3 had redo-AVR alone (5 redo-AVR + CS), and 12 had ARR alone (24 ARR + CS). For the entire NVIE cohort, there was no difference in survival between AVR and ARR (p-value =0.33). In the PVIE group, there was a significant difference in survival for patients that underwent ARR vs redo-AVR (p-value =0.001). Regardless of NVIE or PVIE, the hazard ratio for ARR over AVR was HR =2.47 (1.22, 5.0), p-value =0.012).

Conclusions:
This study seeks to highlight the surgical outcomes following AVR or ARR for NVIE and PVIE. We demonstrate equipoise between AVR and ARR irrespective of concomitant surgeries performed for NVIE. Additionally, ARR appears to portend improved survival over redo AVR for PVIE. Additionally, PVIE rendered an increased risk of pacemaker placement compared to NVIE.

108. Efficacy, Injectate, and Technique in Ultrasound-Guided Hydrodissection for Carpal Tunnel Syndrome: A Scoping Review

Sujeeth Shanmugam, BS Kiran Mullur, MD

Lauren Neal, Amy Sisson, Kiran Mullur
Family Medicine
Clinical Science-Student

Introduction: Carpal Tunnel Syndrome (CTS) is the most common entrapment mononeuropathy. Management strategies vary based on disease severity. Hydrodissection, a relatively novel intervention, involves separating anatomical structures within the carpal tunnel using various injectable fluids. These may include normal saline, dextrose in water, platelet-rich plasma, insulin, hyaluronidase, and ozone. This technique is generally associated with a low complication rate. However, despite its growing popularity, significant gaps in the literature remain. This review aims to synthesize the current evidence and identify key areas for future research. Methods: A comprehensive search strategy was developed in MEDLINE (Ovid) with the assistance of a medical librarian and subsequently adapted for Embase, Web of Science, and Cochrane, including ClinicalTrials.gov. The search results were uploaded into Covidence for independent screening by two team members. Studies were included if they focused on hydrodissection in the carpal tunnel and were published in English. Exclusion criteria encompassed systematic reviews, cadaveric studies, and investigations of non-idiopathic carpal tunnel syndrome. Data extraction was performed using a predefined template. The full list of references and the detailed search strategy are available upon request. Results: A total of 117 studies were screened, of which 25 met the inclusion criteria. Common outcome measures included the Boston Carpal Tunnel Questionnaire, Visual Analog Pain Scale, electrodiagnostic results, and ultrasound findings. The average follow-up period was 34 weeks. Evidence suggests that increased hydrodissection volume may correlate with greater short-term improvements. Dextrose, midazolam, hyaluronic acid, and platelet-rich plasma were frequently found to be more effective than normal saline. However, the relative effectiveness of hydrodissection, with or without corticosteroid, compared to corticosteroid injection alone remains uncertain. The short-axis ulnar in-plane approach was the most utilized hydrodissection technique. When reported, long-axis approaches-either proximal-to-distal or distal-to-proximal-also demonstrated success. Adverse effects were infrequent across all techniques. Notably, only one study examined the combination of physical therapy and hydrodissection. Discussion: More long-term studies on the efficacy of various injectate compounds, potential differences in long- and short-axis approaches, and combining hydrodissection with conservative therapies, such as physical therapy, are needed. Few studies evaluated the effectiveness of hydrodissection in severe cases; more research is needed on efficacy in severe cases and adjustments that may need to be made to improve efficacy. Prior carpal tunnel release was often an exclusion criterion; the role of hydrodissection in recurrent Carpal Tunnel Syndrome following release should be explored.

109. Neuroma Development Following Surgical Finger Amputation with Underlying Traumatic and Vascular Etiologies

Sujeeth Krishna Shanmugam, BS Zhongyu Li MD, PhD

Sarah Martin , Andy Mendoza, Zhongyu Li
Surgery-Orthopedics
Clinical Science-Student

Introduction: Finger amputations due to trauma, infection, or chronic ischemia are one of the most common surgical procedures conducted by orthopedic hand surgeons. Traumatic amputations are heavily studied in contrast to digital amputations due to chronic ischemia. While rare, one concerning unfortunate outcome is the development of a painful amputation

stump neuroma following surgery. The purpose of this study is to examine the incidence of complications with special focus on nerve stump painful neuroma formation after hand digital amputation associated with acute trauma vs chronic digital ischemia.

Methods: Exclusion criteria include 1) age younger than 18, 2) finger/thumb amputation due to cancer or infection, 3) amputation due to congenital conditions such as polydactyly, macrodactyly or syndactyly. Demographics, including age, gender, race, and ethnicity were collected. Post-operative complications were analyzed.

Results: There were 917 (79.7%) patients and 1211 digital amputations due to acute trauma and 233 (20.3%) patients 284 digital amputations associated with chronic ischemia. The mean age for trauma and ischemia patients was 47 ± 16.4 And 57 ± 15.7, respectively. There were 867 males in the traumatic group (94.5%) and 144 males in the ischemia group (61.8%). 51% of traumatic patients and 69% of ischemia patients were smokers. Among the traumatic amputations, index finger is the most common injury (329), followed by middle (325), ring (239), small (168) and thumb (150) with saw injuries most common. Among the digital ischemia patients, index is also the most common injury (85) followed by middle (64), ring (63), small (41) and thumb (31). Complications, including residual pain, phantom limn sensation, stiffness, sensitivity and infections, did arise among 89 patients (8%) with 75 patients after traumatic amputation (84%) and 14 due to vascular causes (16). Among the 59 workers compensation patients, 11 had complications (1%). Painful amputation stump neuroma development occurred in 42 cases (3.6%) involving a total of 63 fingers, 38 after traumatic amputations (4%) involving 55 fingers and 4 after amputations for chronic ischemia (1.7%) involving 8 fingers. There was no statistical difference between the 2 groups (p= 0.078).

Conclusions: Evidence suggests that while finger amputations are common procedures, the incidence of finger amputation stump neuroma remains low. Painful finger amputation stump neuroma occurs more frequently after traumatic causes than after chronic ischemia.

110. CLINICAL CHARACTERISTICS OF IC/BPS PATIENTS FROM A LARGE PATIENT REGISTRY WHO HAVE UNDERGONE CYSTECTOMY

Madeline Snipes, MD Stephen J Walker, PhD

Stephen Tranchina, Robert Evans, Gopal Badlani, Stephen J Walker
Surgery-Urology
Clinical Science-Resident

Introduction: Due to significant symptom heterogeneity, interstitial cystitis/bladder pain syndrome (IC/BPS) continues to be difficult to treat, and although several treatment options are available, none are broadly effective. Per AUA guidelines, an IC/BPS patient refractory to standard treatment approaches may elect to undergo cystectomy. Prior published reports have suggested that most patients, especially those with Hunner lesions (HL) and/or significant lower urinary tract symptoms, achieve dramatic symptom relief following surgery. The objective of this study is to describe the demographic and clinical features of end-stage IC/BPS patients who choose to undergo cystectomy.

Methods: This retrospective analysis of a large cohort of IC/BPS patients examined demographic and clinical data collected from the electronic medical record that included anesthetic bladder capacity (BC), HL status, results for validated IC/BPS symptom questionnaires (O'Leary Sant Interstitial Cystitis Symptom Index and Interstitial Cystitis Problem Index (ICSI/ICPI) and the Pelvic Pain and Urgency/Frequency (PUF) scale), and comorbid non-urologic associated conditions.

Results: Patients in our large IC/BPS registry who had undergone cystectomy (47/600; 39F:8M) had an average age at surgery of 54.33 (±15.5). Average time between diagnosis and cystectomy was 5.04 years (±4.72). Average anesthetic BC was 380 mL (±227.98), with 78.7% of patients having low BC (≤500 mL) and 17/47 (36.2%) patients with a history of HL. 20% of patients reported chronic pelvic pain, 12.5% reported fibromyalgia, 14.9% reported migraines, 61.7% reported allergies, 17% reported asthma, 19.1% reported panic disorder, and 19.1% reported depression. 23% of patients had a smoking history. Average PUF total score was 25.8 (±7.2), with average symptom score 16.7 (±4.7), average bother score 9.14 (±2.7). Average ICSI and ICPI were 15.9 (±4.3) and 15.8 (±3.2), respectively.

Conclusion: Hunner lesion is a hallmark of bladder-centric IC/BPS, yet only about 1/3 of patients in our registry who had undergone cystectomy were HL positive. This indicates that, though HL status may be predictive of post-operative patient satisfaction, it may not be predictive of end-stage IC/BPS and ultimately cystectomy. Additionally, >60% of patients that underwent cystectomy reported comorbid allergies, which aligns with evidence that mast cells are implicated in IC/BPS pathophysiology.

111. Congenital Neonatal Craniofacial/ Upper Airway Anomalies; A Case Series Analysis

Anna Soloshenko, BS, MS2 Daniel Kirse, MD

Soloshenko A (MS2), Margheim J (MS2), Runyan C, Keill E, Zeller K, Grotegut C, Kirse D, Porcelli P.
Wake Forest University School of Medicine, and WFUSOM/ Atrium Departments of Plastic Surgery, Otolaryngology, Pediatric Surgery, Maternal Fetal Medicine, and Pediatrics
Pediatrics
Clinical Science- Student

Introduction: Congenital anomalies of the naso/oro-pharynx and upper airway represent a spectrum of disorders related to tissues and organs associated with neonatal respiration and oral feeding. Pierre- Robin sequence (PRS) with a cleft palate is the most recognized condition; however, a range of micrognathia, retrognathia, and glossoptosis (MRG) can be seen. Unfortunately, congenital upper airway anomalies can be unknown at delivery and become life-threatening within minutes of birth. Anomalies involving MRG occur during early fetal life, at 7-12 weeks of gestation with criteria to distinguish fetuses at risk for oropharyngeal anomalies. With an observed increase of PRS/ MRG cases at WFUBMC, a case series of PRS/ MRG patients was initiated. A case series is apt for a relatively rare but serious occurrence or disease such as PRS/ MRG, using a focused data set to identify characteristics of the population. It requires domain expertise but does not require a control group. For reference, a case series was created for the early description of then unknown Covid19 in China and was used to describe cases of benign neonatal sleep myoclonus mistakenly diagnosed as seizures.
The purpose of this study is to analyze clinical information of patients diagnosed with PRS or MRG to improve care and management. Specific aims include: 1) creating a maternal and neonatal PRS/ MRG patient dataset, 2) describing patient demographics and management practices, and 3) identifying practice improvement opportunities.
Methods: All patients received care at Brenner Children's Hospital, Winston-Salem, NC. PRS-MRG patients were identified, and a dataset was created using the Children's Hospital's Neonatal Consortium, WFU Perinatal High-Risk clinic, WakeOne Epic EMR, and WFU Plastic Surgery clinic. The data variables included maternal and infant demographics, delivery location, time of PRS/ MRG diagnosis, Mandibular Distraction Osteogenesis (MDO) and gastric feeding tube surgery, genetic testing, and survival and length of stay. The research protocol was approved by WFU/Atrium eIRB; data was stored and collated on a secure server using WFUBMC OneDrive.
Results: From 10/2020 - 10/2023, 21 infants were admitted to BCH for either PRS (9) or MRG (12). Most infants were term 15/21 at >37 weeks with a median gestation age of 38w-4d. 13 infants were male with 16 White and 3 African American. Seven infants were outborn, 4 were SGA, 2 were LGA, and 2 infants died before DC. All 9 infants with PRS received MDO therapy and had gastric feeding tube placement coincident with MDO surgery. Three infants had a tracheostomy placed.
Genetic findings were described in 16 of 20 infants tested including titinopathy, trisomy 7q22, 16p11 deletion and RAF1/ possible Noonan Syndrome. However, none of the PRS patients had a SOX9 anomaly. Length of stay (LOS) ranged from 10 – 190 days (median 54 days) for infants discharged (DC) alive; the titinopathy patient died at 14 days of age. One family was instructed and continued distractor turnings and g-tube feedings at home. Almost all infants (18/19) had g-tube placement before DC, with a wide range of delay, up to 7 weeks, between completing distraction and/or transitioning to room air and eventual g-tube placement.
Conclusions: This case series describes PRS- MRG as a relatively rare condition with 21 cases over a 3-year period, mostly in term infants. Given the potential airway issues at delivery, and that 1/3 of cases were out-born, suggests that prenatal ultrasound screening for PRS- MRG could be improved. Improving criteria to identify infants who will require a g-tube whether they are diagnosed with PRS or MRG may
promote earlier placement and shorten LOS. Also, a program for home distractor management may be an option for motivated parents. Since most infants had genetic findings, it would be prudent to send genetic studies early after the diagnosis of PRS-MRG as these results may guide clinical management discussions with the parents. Also, further evaluation should involve selecting the most informative genetic test(s), such as microarray or whole genome sequencing. Lastly, developing standards to evaluate airway status before DC may improve clinical outcomes and patient care. Future directions include: 1) continue to expand and complete the dataset, 2) work with NICU safety leaders to improve management of PRS/ MRG infants and, 3) facilitate communication between maternal and neonatal clinical providers.

112. Surgical Video Auto-segmentation by a Commercially Available Platform is Not Inferior to Manually Edited Operative Recordings When Utilized for Expert Review and Training

Blake Stephens, MD Dionisios Vrochides, MD, PhD

William Archie, Blake Stephens, Damien Huckleberry, Lon Eskind, David Levi, Jose R. Soto, Dionisios Vrochides
Surgery-Transplant
Clinical Science-Resident

Background: The incorporation of artificial intelligence (AI) into the surgical field has the potential to revolutionize assessment of operative techniques through video capture, auto-segmentation and auto-analysis. The aim of this study was to utilize recordings of back table liver graft preparations to test the ability of commercially available AI software to auto-segment operative footage in a clinically meaningful way and an instantly reviewable final edit.

Methods: A total of 25 critical steps in the liver graft back table preparations for connection to the TransMedics normothermic machine perfusion pump were determined. Five operative videos were captured. Videos were manually edited. In addition, using the AI-based GoPro auto-edit feature, recordings were auto-segmented for separate analysis and comparison against the manually edited footage. Each manually and auto-segmented video was assessed for: a) inclusion of each one of the 25 steps, b) technical performance and completion. The assessment was conducted by an independent experienced transplant surgeon using a Likert scale (0 - not captured, 1 - poor, 2 - average, 3 - excellent).

Results: The average raw video length was 80 minutes. The average manually edited video length was 7.5 minutes. For every 10 min of raw video, 60 minutes of editing time was required, i.e., every minute of manually edited video required 64 minutes of work. On the other hand, the average AI auto-segmented video length was 5 minutes. Reviewing and rating AI auto-segmented videos was 16 times faster when compared to raw videos and 96 times faster when compared to manually edited recordings. The average number of steps fully captured across all five raw videos and the manually edited videos was 22.5. The average number of steps fully captured across the AI auto-segmented videos was 19.5 (87%). The average technical performance grade for the raw and the manually edited videos was 2.69, were as for the AI auto segmented videos it was 2.4, denoting a rating veracity of 89%.

Discussion: AI-based auto-segmentation of operative videos is a very appealing tool for assessment of surgical performance, since it significantly speeds up the reviewing and rating process by subject matter experts. The price that has to be paid for this unparallel facilitation of the video rating process is a small reduction in the assessment veracity. To elucidate to which extent this reduction distorts the technical evaluation process, it will need larger studies. In addition, correlation of AI facilitated dexterity assessment with intraoperative and postoperative patient outcomes is also warranted. Finally, developing an AI model for not just auto-segmentation, but also for auto-evaluation and auto-rating should become the ultimate goal of audio-visual translational research.

113. Normothermic Machine Perfusion of DCD Liver Grafts is Associated with Increased 90-day Acute Cellular Rejection Rates and Continues in a Time Dependent Manner

Blake Stephens, MD Dionisios Vrochides, MD, PhD

William Archie, Rohit Mantha, Blake Stephens, Katheryn Peterson, Carly Janusek, Vincent Casingal, Roger Denny, Lon Eskind, David Levi, Jose R. Soto, Allyson Cochran, Dionisios Vrochides
Surgery-Transplant
Clinical Science-Resident

Background: Normothermic machine perfusion (NMP) technology has revolutionized liver transplantation (LT). Use of marginal and extended criteria liver grafts, including those from donation after circulatory death (DCD), is achievable due to the ability of NMP to resuscitate them prior to transplant. On the other hand, other advancements in organ preservation, such as hypothermic machine perfusion and normothermic regional perfusion, have shown protective effects against acute cellular rejection (ACR), mainly in DCD graft transplantation. In this study we investigate the impact of NMP on early ACR rates when compared to ischemic cold storage (ICS).

Methods: A total of 55 LT recipients who received a DCD graft preserved with NMP pump over a two-year period were matched against recipients of all organs preserved with ICS in the five years prior to adoption of the machine perfusion. Propensity match (2:1) was utilized for Native MELD, indication for transplant, BMI, major comorbidities, age, and gender. Retrospective review of biopsy confirmed acute cellular rejection within 90 days of LT was performed.

Results: In the DCD NMP cohort (n=55), 10 (18.2%) were diagnosed with early ACR. In the ICS cohort (n=68), 7 (10.3%) were diagnosed with ACR. The OR was 2.11 (0.71-6.3; p-value 0.180). Of note, for the DCD NMP cohort, the rate of ACR was 0% when NMP duration was less than 8 hours, 22.2% when between 8 and 16 hours, and 30% when perfused longer than 16 hours.

Discussion: Previous studies have shown hypothermic machine perfusion and normothermic regional perfusion to have protective effects from ACR. Our study, although it lacks statistical significance, detects a strong signal towards increased early ACR rates. In fact, the incidence of ACR in the DCD NMP cohort is almost double. Based on previous basic research studies, this might reflect the fact that in NMP, despite the reduction of the incidence and the amelioration of the severity of ischemic reperfusion injury, the continued circulation of perfusate at normothermic conditions creates a general inflammatory response that results in a subsequent upregulation and priming of T cells within the liver graft, thus, increasing the risk of ACR. This is further corroborated by the fact that the incidence of early ACR is dependent on duration of NMP. The absence of statistical significance in our study may be explained by the small size of cohorts. Further analysis with a larger and longer followed DCD NMP population is warranted.

114. Exploring the Effects of Automated Endovascular Occlusion on Renal Perfusion in a 24-Hour Hemorrhagic Shock Swine Model

Thomas Sullivan, BS Lucas P. Neff, MD

Elizabeth C. Wood, Micaela K. Gomez, Magan Lane, Juhi Saxena, Austin Johnson, Jason Y. Adams, Lucas P. Neff, Timothy K. Williams
Surgery-Vascular & Endovascular
Basic Science- Student

Background: Resuscitative endovascular balloon occlusion of the aorta (REBOA) is an established method to fully occlude the aorta for temporary control of noncompressible truncal hemorrhage yet is limited by subsequent ischemia-reperfusion injury (IRI), including acute kidney injury (AKI). Endovascular Perfusion Augmentation for Critical Care (EPACC) is a resuscitative adjunct that involves precision volume adjustments of an aortic balloon catheter to provide hemodynamic support during shock states following prolonged REBOA. When implemented with an automated, standardized critical care fluid and drug delivery system, termed Precision Automated Critical Care Management (PACC-MAN), previous work showed a significant increase in renal perfusion when compared to PACC-MAN alone (PM), with no differences in histologic or biologic injury markers 4.5 hours after initial insult. In this study, we seek to understand how EPACC, in conjunction with PACC-MAN (E+PM), influences acute renal outcomes over a 24-hour period.

Hypothesis: We hypothesized that E+PM would improve renal outcomes in a 24-hour swine hemorrhage with IRI model compared to PM-only.

Methods: 12 Yorkshire swine underwent a 30% controlled hemorrhage and 45 minutes of full Zone 1 aortic occlusion to create a severe IRI and vasoplegic state, followed by a 15-minute balloon wean period. Animals were then transfused with whole blood to euvolemia, randomized to PM-only (n=6) or E+PM (n=6), then 24 hours of critical care ensued. Upon randomization, the balloon was removed from PM animals, and E+PM animals received an additional 180 minutes of endo-aortic hemodynamic support with the automated balloon. Outcomes of interest included renal flow, urine output, peak creatinine, inflammatory biomarkers (TNF-alpha, IL-10, IL-18), and histological evidence of renal tissue ischemia.

Results: Normalized median renal blood flow over a 24-hour period was higher in E+PM than PM, though not statistically significant (3.8 vs 3.2 mL/kg, p=0.58). Total urine output was slightly lower in E+PM (30.29 vs 47.84 mL/kg, p=0.30). Median peak creatinine levels were lower in E+PM (3.05 vs 3.75 mg/dL, p=0.148). All biomarkers of interest trended lower in E+PM but did not reach statistical significance. Histological scores slightly increased average tissue damage in the PM group (1.17 vs 1.96, p=0.151).

Conclusions: Although we found no statistically significant differences, trends indicated an overall increase in renal flow and a subsequent decrease in renal injury markers in the E+PM group following a severe IRI. At the very least, our data

demonstrate that an automated balloon catheter in conjunction with automated fluid and drug delivery does not worsen renal perfusion, suggesting the feasibility of this approach to limit reliance on fluid and vasopressor support. Despite the small sample size and relatively short study period, the concept of automatic systems incorporating closed-loop delivery of vasopressors and fluids in conjunction with invasive aortic flow control devices may have merit and help move the field of automated critical care delivery forward.

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115. A Novel System of Evaluating Uncommon Atypical Wounds

Mason Sutherland, MD Kyle Robinson, MD

Abigail Heilenman, BS[1], Mason Sutherland, MD[2] , Hossein Hafezi, MD[3], Kyle Robinson, MD[2]
[1]Department of Plastic and Reconstructive Surgery, Wake Forest School of Medicine, Atrium Health Wake Forest Baptist Medical Center, Winston-Salem, NC
[2]Department of Plastic and Reconstructive Surgery, Atrium Health Wake Forest Baptist Medical Center, Winston-Salem, NC
[3]Department of Dermatology, Atrium Health Wake Forest Baptist Medical Center, Winston-Salem, NC
Surgery-Plastic & Reconstructive
Clinical Science-Resident

Introduction
Wound care is an essential component of medical practice, particularly for plastic surgeons and dermatologists who frequently encounter complex cases. While the management of typical wounds such as surgical incisions, abrasions, and lacerations is well-understood, atypical wounds present unique challenges that require specialized knowledge and expertise. Atypical wounds are those that deviate from the expected healing process, often due to underlying pathophysiological conditions, systemic diseases, or external factors. However, no standardized system of evaluating atypical wounds currently exists to help determine when surgical biopsy is warranted and how to manage atypical wounds, which may deviate significantly from typical regimens.

Methods
We present a novel system of analyzing and understanding atypical wounds in an effort to help clinicians determine when surgical biopsy is warranted and how to alter treatment regimens of atypical wounds by describing a framework which incorporates the following visual characteristics: raised lesion with ulceration, raised border of ulceration, unusual shape, unusual location, dermal vs. epidermal process, subcutaneous process, vascular process, and the presence of an attached black eschar. By clearly illustrating each feature through photographs of different pathologic conditions, we present an easy-to-understand system which allows early and prompt adaptation of wound evaluation by all clinicians.

Results
Our proposed framework for evaluating atypical wounds effectively elucidates how to evaluate atypical wounds and is widely applicable for use by plastic surgeons, dermatologists, primary care physicians, pediatricians, and other specialists. While additional research is being performed to create an objective score which defines the threshold for biopsy, this educational project provides clinicians with early guidance on how to examine and manage atypical wounds.

Conclusion
Our review has explored the complexities of atypical wounds, emphasizing their diverse etiologies and unique management challenges. In emphasizing the importance of a standardized diagnostic system of evaluating atypical wounds, this review advocates for improving prompt and accurate diagnosis of atypical wounds to allow for more expeditious and efficacious treatment. For wound care specialists, understanding both common conditions like diabetic foot ulcers and venous leg ulcers, as well as rarer ailments is crucial. Tailoring management strategies is essential to optimize patient outcomes and minimize complications. By addressing these areas, future advancements can significantly improve the management of atypical wounds, leading to better clinical outcomes and enhanced patient quality of life.

116. A Multi-Institutional Analysis of DIEP Flap Weight and Outcomes in Autologous Breast Reconstruction

Marion Tapp, MD Bennett Calder, MD

Joyce X. Cui Eric Zeng Mary Duet Courtney E. Stone Adam Katz Bennett Calder J. Michael Robinson
Surgery-Plastic & Reconstructive
Clinical Science-Resident

Introduction: The deep inferior epigastric perforator (DIEP) flap has emerged as the primary and preferred method for autologous breast reconstruction. However, post-operative complications vary widely with reported rates ranging from 15.5% to 47.4%. As the utilization of DIEP flaps continues to rise, there is growing interest to identify novel risk factors and variables that may predict complications, thereby enhancing clinical decision making. Flap weight is one variable in particular that may be associated with complications such as tissue necrosis and flap loss. This study investigates the relationship between DIEP flap weight and post-operative complications using a large, multi-institutional, DIEP-specific database.

Methods: A retrospective chart review of 757 patients (757 flaps) with a history of breast cancer who underwent DIEP flap reconstruction from November 2017 to May 2024 at two medical institutions was conducted. Demographics, medical history, operative course, and post-operative complications were analyzed.

Results: Mean age of included women was 51.11 years and mean follow-up length was 10 months. BMI was strongly correlated with flap weight ($r = 0.79$), and both BMI and flap weight were significant predictors of overall complication rates ($p < 0.001$, $p < 0.001$). Patients were grouped by BMI (< 25, 25-30, 30-35, and > 35) and subsequently into those with and without complications. In the BMI 30-35 group, there were significant differences in average DIEP flap weights for overall complications, wound dehiscence, fat necrosis, and seroma. Significant differences in flap weight were observed for skin necrosis in the BMI < 25 group and hematoma in the BMI 25-30 group. Logistic regression revealed that flap weight was a significant predictor for wound dehiscence, fat necrosis, and seroma in the BMI 30-35 group, and hematoma for the BMI 25-30 group. Threshold flap weight was 752.19 grams.

Conclusion: Flap weight is a significant predictor of post-operative complications. It is associated with wound dehiscence, fat necrosis, and seroma in patients with a BMI of 30-35, and hematoma in patients with a BMI of 25-30. DIEP flaps over 752.19 grams may increase complication risks. These findings underscore the need for further discussion and suggest the importance of considering flap weight during surgical planning to reduce complications.

117. Clinicians' Responses to Macular Drying with Minimal Visual Improvement After Anti-VEGF Injection in Central Retinal Vein Occlusion

Samuel Tarry, BS David Browning, MD, PhD

Renn Lovett
Surgery-Ophthalmology
Clinical Science- Student

Background: Retinal vein occlusion (RVO) is the second most common retinal vascular disease behind diabetic retinopathy and a regular cause of vision loss in older patients. Central retinal vein occlusion (CRVO), a subtype of RVO, is typically divided into two categories (ischemic and non-ischemic) based upon total area of post-occlusion capillary non-perfusion. Visual loss in CRVO is typically attributed to macular edema (ME) and degree of retinal ischemia. ME is defined as swelling of the retina due to accumulation of fluid by both vasogenic and cytotoxic mediated factors, primarily driven by vascular endothelial growth factor (VEGF). The current standard of care is based on anti-VEGF injections, which block the vasogenic effects typically induced by VEGF. These include Ranibizumab (Lucentis), Bevacizumab (Avastin), and Aflibercept (Eylea). Clinical practice patterns often vary when using anti-VEGF therapy for CRVO. Many providers continue treatment on a fixed interval in the setting of decreased central foveal thickness (CFT), disruption of retinal inner layers (DRIL), and absence of intraretinal and/or subretinal fluid (IRF/SRF). Such practice patterns may come at a significant cost burden with little to no clinical response in best corrected visual acuity (BCVA).

Design: Retrospective chart review from a tertiary referral center.

Methods: In this retrospective study, we collected information on patients who received a diagnosis of CRVO during an initial consult visit with a Wake Forest ophthalmologist between May 6, 2010 and August 13, 2024. Patients were excluded from the study if they did not receive anti-VEGF injections for their CRVO, if they had a visual acuity better than 20/100 following their CRVO, a previous diagnosis of neovascular glaucoma, or if they did not receive Optical Coherence Tomography (OCT) imaging at initial presentation. Patient information, relevant past medical history, CRVO initial presentation information, and subsequent injection visits and outcomes were collected. Injection information included initial anti-VEGF drug, any switch of anti-VEGF drug, number of injections, as well as the injection date at which ME was "resolved" based upon physician notes. ME was determined by CFT as measured by OCT and corrected visual acuity (CVA) was measured by Snellen chart visual acuity.

Results: 91 patients with a diagnosis of CRVO fitting the inclusion criteria were investigated. A correlation coefficient (r) for change in CFT compared to change in visual acuity (based upon EDTRS letters read) following anti-VEGF therapy was found to be 0.198. Of the 91 patients, 27 (29.7%) had improvement of their ME (defined as a greater than 11% reduction in CFT between initial presentation and their most recent documented CFT), and visual acuity (VA) improvement (defined as at least a two-line decrease on the Snellen VA chart). 38 (41.8%) patients saw improvement of their ME, without a corresponding improvement in VA. The average number of anti-VEGF injections in patients who saw improvement in ME, but no improvement in VA was 11.1, which cost, on average, $10,413. 19 (20.9%) patients saw no improvement in either ME or VA. The average number of anti-VEGF injections in patients who saw no improvement in either ME or VA was 5.8, which cost, on average, $5,757.

Conclusions: The correlation coefficient (r) for change in CFT compared to change in visual acuity following anti-VEGF therapy was found to be 0.198, demonstrating that visual acuity and macular thickness changes are not surrogates for each other. 57 (62.64%) patients saw no improvement in VA, despite the use of anti-VEGF injections. To decrease the significant cost burden of anti-VEGF injections, physicians should consider earlier discontinuation of anti-VEGF injections following CRVO, should they notice little visual improvement.

118. LONGITUDINAL REDUCTION IN BLADDER CAPACITY IS A KEY CHARATERISTIC OF INTERSTITIAL CYSTITIS/BLADDER PAIN SYNDROME PATIENTS WHO PROCEED TO CYSTECTOMY

Stephen Tranchina, MD Stephen J Walker, PhD

Madeline Snipes, Robert Evans, Gopal Badlani, Stephen J Walker
Surgery-Urology
Clinical Science-Resident

Introduction and Objectives: Interstitial cystitis/bladder pain syndrome (IC/BPS) is a condition of chronic pain perceived to originate from the bladder associated with lower urinary tract symptoms. In cases refractory to conservative management, patients may undergo cystectomy. The goal of this study was to determine if there are objective characteristics that can be used to predict which IC/BPS patients will likely progress to end-stage bladder disease and undergo cystectomy.

Methods: A retrospective chart review was conducted to identify patients in our large IC/BPS registry (N=680) who underwent cystectomy. Review of the electronic medical record was used to determine which patients had undergone therapeutic hydrodistension (HOD) at any time prior to cystectomy, total number of HOD, bladder capacity at each HOD, time between first HOD and cystectomy, and Hunner lesion (HL) status.

Results: Of the 47 patients in our IC registry that underwent cystectomy, 25 (53.2%) had ≥ 2 HOD (average = 3.92 ±2.41); their data were used for further analyses. The average time between first HOD and cystectomy was 3.42 (±2.77) years. Among the 22/25 patients for which complete longitudinal HOD data were available, 15 (68.2%) had a decrease in BC of >50cc between first and last HOD. Additionally, 9/22 (40.9%) patients were classified as lowBC (i.e., BC ≤ 500cc) at first HOD with an additional 10 patients progressing from a non-lowBC (> 500cc) to a lowBC between first and final HOD. This progression occurred over an average of 2.54 (±0.96) years. At final HOD 19 (86.4%) of patients were classified as lowBC. Patients who underwent multiple HOD prior to cystectomy had an average reduction in BC of 125cc (±128.41). Nearly half (7/15; 46.7%) of the patients who experienced a decrease in bladder capacity were HL+ whereas 4/7 (57.1%) of the patients who had no change or an increase in their BC, were also HL+.

Conclusion: We provide preliminary evidence to suggest that the progression to end-stage bladder disease resulting in

cystectomy in IC/BPS patients is associated with a reduction in bladder capacity over time, occurs within a relatively short timeframe (between 1.5-3.5 years), and is not dependent on a finding of Hunner lesions.

119. SIRPα intracellular signaling mediated mitochondrial fission in triple-negative breast cancer cell is associated with brain metastasis

Yu-Ting Tsai, PhD Student David R. Soto-Pantoja, PhD

Adam Wilson, Jessica D. Mackert, Mitra Kooshki, Elizabeth R. Stirling, Brian Westwood, Lance D. Miller, Katherine L. Cook, Dawen Zhao, Linda Metheny-Barlow, Glenn J. Lesser, David R. Soto-Pantoja
Cancer Biology
Basic Science- Student

Introduction: Triple-negative breast cancer (TNBC), the most aggressive breast cancer subtype, often leads to brain metastasis (35%). Current need for standard treatment requires the development of new therapies. The CD47/SIRPα interaction drives immune escape. However, SIRPα's expression and role in cancer cells remain poorly understood.

Methods: Open-access human breast cancer single-cell RNA-seq profiles were used to examine the expression of SIRPα within different cell types and breast cancer subtypes. TNBC brain-tropic cells were injected into the mouse mammary fat pad to form the orthotopic tumor model and intracardiac-injected for brain metastasis models. Both models were given IgG or SIRPα antibodies. After the treatment, the orthotopic tumors were taken out for bulk RNA sequencing and gene clustering. SIRPα stably overexpressed, and knockout TNBC cell lines were established to determine SIRPα intracellular signaling and its' mediated mitochondrial dynamics. Digital spatial profiling was utilized to investigate the orthotopic and brain metastasis tumor microenvironment that underwent IgG or anti-SIRPα treatment. Agilent ACEA xCELLigence RTCA Real-Time Cell Analyzer was used to measure cell migration and microglia-mediated cell killing in vitro. Mitochondria morphology were imaged by electric and confocal microscope.

Results: The expression of SIRPα is upregulated in TNBC, and a 3.5-fold increase is detected in the breast-to-brain metastatic lesions compare to primary tumors ($n=9$-19; $p<0.01$). Consistently, the protein expression of SIRPα TNBC 4T1 and EO771 brain-tropic cells (4T1Br3/EO771Br4) is significantly higher than the parental cells ($n=3$; $p<0.05$). Stably overexpressed SIRPα and knockout TNBC cell lines show that SIRPα regulates SHP2 phosphorylation in cancer cells, and SIRPα/SHP2 axis regulates TNBC cell migration. Further, anti-SIRPα treatment affects the genes related to mitochondrial fission and fusion dynamics. Our data shows a doubling in Drp1 (mitochondria fission) protein expression in TNBC brain-tropic cells compared to parental, whereas MFN2 (mitochondria fusion) has a 50% decrease in expression. Moreover, SIRPα knockout cell line also downregulates mitochondria fission with decreased Drp1 and increased MFN2 expression. Allosteric SHP2 inhibitor treatment on TNBC brain-tropic cells also shows a dose-dependent inhibition of Drp1 ($n=3$, $p<0.001$) and MFN2 enhancement ($n=3$, $p=0.0184$) with Erk signaling inhibition. SIRPα/SHP2/Erk axis shifts mitochondria fusion to fission, leading to cancer metastasis. SIRPα blockade by antibody reduced metastatic brain lesion formation in two in vivo models by approximately 90% ($n=4$-7; $p<0.05$). Spatial proteomics revealed changes in innate suppressive and inflammatory signaling that may be associated with the observed changes in SIRPα intracellular signaling. This was associated with shift in ECM proteins that may influence mitochondrial function to influence metastasis., thus providing a potential mechanism for how SIRPα promotes TNBC brain metastasis.

Conclusion: SIRPα intracellular signaling mediated mitochondrial fission in triple-negative breast cancer cells is associated with breast-to-brain metastasis.

120. Lymphadenectomy Approach Comparisons for Squamous Cell Carcinoma of the Penis in North Carolina

Gavin Underwood Alejandro Rodriguez, MD

Alejandro Rodriguez, Maxwell Sandberg, Heidi Bleyer, Emily Ye
Surgery-Urology
Clinical Science- Student

Introduction/Background: Squamous cell carcinoma (SCC) of the penis is a rare, devastating form of SCC. Management

and prognosis are based on TNM classification. Inguinal and pelvic lymph node involvement plays an important role in determining the course of action for each patient. Laparoscopic, open, and robotic approaches are all used.

Methods: We conducted an observational cohort study of patients ≥ 18 years old with a diagnosis of penile cancer who were evaluated at a large academic learning health system between 2013 and 2024. Patients were then stratified based on operative approach. The primary outcome was to determine if a robotic approach offered decreased complications, and a decreased hospital stay when compared to open or laparoscopic procedures. Means, interquartile ranges, and standard deviations were calculated using SAS 9.4.

Results: Among the 34 patients identified (Median age: 68.6, IQR 48.2-89), 7 were non-white. 24 (70.6%) had an open approach, 5 (14.7%) laparoscopic, 4 (11.8%) robotic, and 1 (2.9%) mixed. Complications were seen in 22 (73.5%) patients and across the different approaches, complication rates were similar. Readmission rates were 17.2% (5/29) within 30 days and 4.5% (10/29) within 30-90 days. Admission rates were worse with laparoscopic (20%) and robotic (25%) procedures within 30 days and varied among the different approaches between 30-90 days.

Conclusions:
Minimally invasive approaches (laparoscopic or robotic) did not appear to offer a significant reduction in complications when compared to open procedures for lymphadenectomies as a part of treatment for invasive squamous cell carcinoma of the penis. There is an apparent increase in 30-90-day hospital readmission rates for minimally invasive approaches, however, this was not statistically significant. This study was limited by the number of identified patients and the accessibility of patient records due to presentation at outside hospitals. Further studies are needed to further evaluate the effect of minimally invasive approaches for lymphadenectomies in the treatment of squamous cell carcinoma of the penis.

121. Contemporary Clinical Outcomes in Squamous Cell Carcinoma of the Penis in North Carolina

Gavin Underwood Alejandro Rodriguez, MD

Alejandro Rodriguez Maxwell Sandberg Heidi Bleyer Emily Ye
Surgery-Urology
Clinical Science-Student

Introduction/Background: Squamous cell carcinoma (SCC) of the penis is a rare, devastating form of SCC. Management and prognosis are based on TNM classification. Inguinal and pelvic lymph node involvement plays an important role in determining the course of action for each patient.

Methods: We conducted an observational cohort study of patients ≥ 18 years old with a diagnosis of penile cancer with TNM staging ≥ pT1 who were evaluated at a large academic learning health system between 2013 and 2024. The primary outcome was to determine overall survival, defined as survival at 5 and 10 years. Means, standard deviations, and a Kaplan-Meier survival curve were calculated using SAS 9.4.

Results: Among the 156 patients (Median age: 65.87; Range 32 - 96) identified, 36 were non-white. There were 73 (46.79%) pT1, 40 (25.64%) pT2, 40 (25.64%) pT3, and 3 (1.93%) pT4. Pathologic grade 2 was most identified with 73 (57.94%) patients. Of specimens tested for HPV status, 49.37% (39/79) tested positive. Lymphovascular invasion was identified in 34 (17.46%) specimens. Recurrence of disease was seen in 26 (16.67%) patients. Penectomies were performed in 129 (82.69%) patients, and inguinal/pelvic lymphadenectomies were performed in 37 (23.7%) patients. At a mean follow up of 27 months (Range: 0-201 months, standard deviation 32.66 months), 5-year survival was 31.82% (49), and of those alive at 5 years 28.57% (14) were still alive at 10 years. 62.34% (96) of patients had a disease course less than 10 years, with 45.45% (70) of patients also having a disease course less than 5 years.

Conclusions: Invasive squamous cell carcinoma of the penis presents across a variety of age groups with varying disease courses. It is rare and carries a worse prognosis when not detected early. A radical or total penectomy was performed on most patients within this study. Recurrence of disease was low, however, 5-year overall survival was notably low. Possible attributions for this are a delay in diagnosis, increased disease burden at presentation, a lack of follow up, or an increased age at diagnosis. Further studies are needed to evaluate these claims.

122. Advancing Skin Protection: Unveiling the UVB Protective Role of MAA In Vitro and In Vivo

Sofia Vanella, MD Anthony Atala, MD

Sofia Vanella[1], Naresh Mahajan[1], Anastasiya Gorkun[1], Kelsey Willson[2], Shay Soker[1,2], Anthony Atala1[2]
[1]Wake Forest Institute for Regenerative Medicine, Wake Forest University, Winston Salem, NC
[2]School of Biomedical Engineering and Sciences, Wake Forest University, and Virginia Tech
Wake Forest Institute Regenerative Medicine (WFIRM)
Basic Science- Fellow

Introduction: The skin, acting as the primary defense against pervasive UVB radiation, plays a critical role in protecting the body from various skin pathologies. Our research is dedicated to enhancing skin protection through a comprehensive approach. The first objective of our study involves the ectopic application of Mycosporine-like Amino Acids (MAA), derived from red algae, to explore their protective effects on mouse skin. Simultaneously, the second objective investigates the efficacy of MAA gene sequences cloned into lentivirus for fibroblast transfection. These genetically modified fibroblasts are subsequently used in the 3D bioprinting of skin, which is implanted onto a nude mouse model. Our main goals encompass obtaining targeted insights into the dynamics of skin damage through in vitro UVB dose optimization and assessing MAA's effectiveness in nude mice as an innovative strategy for UVB defense. Our hypothesis suggests that the genetic modification of fibroblasts with the MAA gene cluster, used for 3D skin bioprinting and implanted on the mouse model, enhances protection against UVB radiation by reducing reactive oxygen species (ROS) production, thereby preventing skin damage.
MAA Gene Cluster Cloning in Lentivirus and 3D Bioprinting: The MAA gene cluster was cloned into lentivirus for subsequent transfection of fibroblasts. After doing stable transfection, fibroblasts, both genetically modified with the MAA gene cluster and normal, were collected, mixed in hydrogel, and 3D bioprinted into constructs. The constructs were bioprinted with a diameter of 1cm or a 10mm biopsy punch size, comprising two layers of 0.5mm thickness each. For the control group, normal fibroblasts were used for 3D bioprinting. Following bioprinting, the skin constructs were crosslinked with thrombin for an hour and supplemented with media spiked with aprotinin. The constructs matured in cell culture for 7 days before transplantation onto 12 mice with genetically modified cells and 12 mice with normal fibroblasts. Two constructs were implanted per mouse and were bandaged every third day until 14 days of wound healing, followed by exposure to UVB radiation of 600mj/cm2 for three days (results awaited).
In vivo MAA Protective Effect by Ectopic Application and Modified Fibroblasts Injections: To investigate the protective effect of MAA in vivo, twelve mice were subjected to daily UVB radiation (600mj/cm²) for three days. Two designated spots were treated with 1mM MAA or intradermal injection of genetically modified fibroblasts (Treatment). Visual and histological examinations at 24, 48, 72 hours, and 7 days post-UVB exposure provide crucial insights into the impact of UVB radiation and the efficacy of MAA in preventing skin damage.
Conclusion: Our study marks a significant advancement in comprehending skin responses to UVB exposure with MAA application, laying the groundwork for innovative dermatological interventions. With a focus on in vivo MAA efficacy, our research stands as a crucial step toward the development of targeted strategies for effective skin protection against UVB damage in the field of dermatological research.

123. Benefits Of Preemptive Transplant In Older Patients with High KDPI Kidneys: Is Sooner Better Than Later?

Jigishkumar Vyas, MD Alan Farney, MD

Colleen Jay, Emily McCracken, Alan Farney, Giuseppe Orlando, Robert Stratta
Surgery-Transplant
Clinical Science-Fellow

INTRODUCTION: Perioperative risks and morbidity from immunosuppression elicit concerns regarding the benefit of preemptive (prior to dialysis) kidney transplant (preKT) in older patients. Accepting a "high" kidney donor profile index (KDPI>85%) kidney may improve access to preKT in older patients. However, less than 20% of patients receive preKT, and willingness to accept a KDPI>85% kidney is declining. Prior evidence has demonstrated a survival benefit with KDPI>85% KT in older patients (both preKT and non-preemptive) compared to remaining on the waitlist. We sought to examine the benefit of early versus late KDPI>85% preKT, defined according to residual native estimated glomerular filtra-

tion rate (eGFR).
METHODS: Using UNOS national data from 1994-2022 for deceased donor KDPI>85% KT alone in patients ≥50 years (n=15,854), we evaluated patient survival (PS) and death-censored graft (DCGS) survival for early preKT (eGFR 15-20), late preKT (eGFR<15), and non-preKT (on dialysis at transplant). For preKT, eGFR was calculated according to non-race adjusted CKD-EPI. Sensitivity analyses limited to patients ≥60 and ≥65 years were performed.
RESULTS: PreKT recipients were more often white, had less diabetes, and were less sensitized (white: 78% for early, 70% for late, and 49% for non-preKT, p<0.001; Diabetes: 26% for early, 23% for late, 32% for non-preKT, p<0.001; cPRA>80%: 7% for early, 8% for late, 13% for non-preKT, p<0.001). PS and DCGS were improved for both early and late KDPI>85% preKT compared to non-preKT (Figure 1, log rank: p<0.001 for both). DCGS was equivalent for early vs late preKT in the first 4 years post transplant (Figure 1B). For patients ≥50 years, 1 and 3-year PS were 96% and 84% for early preKT, 93% and 83% for late preKT, and 90% and 78% for non-preKT, respectively. Kidney DCGS at 1 and 3-years were 95% and 90% for early preKT, 95% and 91% for late preKT, and 90% and 83% for non-preKT. Survival comparisons were equivalent when limited to patients ≥60 and ≥65 years.
CONCLUSIONS: Both early and late KDPI>85% preKT are associated with significantly improved patient and graft survival compared with non-preKT. Early preKT was non-inferior to late preKT for patient and graft survival, and exhibited increased DCGS after 4 years suggesting a role for enhanced utilization of KDPI>85% kidney transplant even among older patients considered “early”. PreKT with KDPI>85% kidneys in older patients should be endorsed to improve utilization, optimize survival outcomes, shorten waiting times, and reduce waitlist mortality.

124. PURGING OF CANCER CELLS FROM PROPAGATED SPERMATOGONIAL STEM CELLS PRIOR TO AUTO TRANSPLANTATION TO RESTORE FERTILITY

Kimberly Waggener, MD Hooman Sadri, MD, PhD

Omar Abdelaal, Safwat E Abouhashem, Anthony Atala, Hooman Sadri-Ardekani
Surgery-Urology
Basic Science- Resident

Introduction: Treating childhood cancer has dramatically increased in success over the past few decades, thus emphasizing the need for a reliable method for fertility preservation for pediatric cancer patients undergoing gonadotoxic therapies. Spermatogonial stem cell (SSC) cryopreservation before initiating chemotherapy or radiation and re-transplantation later in their life has been proposed as a fertility restoring option in childhood cancer survivors. One concern is the possibility of malignant cell contamination in testicular tissue biopsies, and reintroduction of cancer following treatment. According to systematic review of over 900 manuscripts, only a limited number of studies have focused on this issue, using various techniques to detect and purge cancer cells prior to SSC transplantation; however, none of these methods were successful.

Methods: SSCs and MOLT4 acute lymphoblastic leukemia (ALL) cells were co-cultured in StemPro Complete medium using different concentrations of ALL cells (0.05%, 0.5%, 5%, and 50% MOLT4 cells). Samples were retrieved from patients with confirmed malignant infiltration of testicular tissue. Medium was discarded after each passage to remove unattached MOLT4 cells. Following the final passage, the MOLT4 contamination level was quantified using various methods (flow cytometry, in-vivo imaging system, dPCR). Malignant cells were purged from the culture using fluorescence-activated cell sorting (FACS) and selective culturing methods. The efficacy of both purifying techniques was confirmed using the same methods as before.

Results: Our preliminary results indicate that while MOLT4 cells propagated rapidly in StemPro medium, refreshing SSCs culture without centrifugation (spin-negative) does not significantly affect germ cell count, and thus is a reliable option for removing MOLT4 cells suspended in SSC culture, which are adherent to the culture dish. CD1a digital PCRs showed no-amplification in SSC alone but high-amplification in MOLT-4 alone and SSC/MOLT-4 co-culture and is therefore reliable and sensitive for detection of residual MOLT4 ALL cells in a sample. Our study showed co-culturing and sorting using either FACS or selective culturing were effective in purging residual malignant cells from the patient samples.

Conclusion: We could establish a reliable method of In Vitro propagation of human SSC and removing cancer cells prior to auto-transplantation to preserve fertility.

125. Comparison of manual and semi-automated optical coherence tomography devices for capture of optic nerve and retinal imaging

Ashley Wells Atalie Thompson MD, MPH

Alma Moreno-Dominguez, Atalie C. Thompson
Surgery-Ophthalmology
Clinical Science- Student

Background: Glaucoma is a progressive optic neuropathy and has remained the leading cause of irreversible blindness worldwide, affecting over 57.5 million people. Use of novel imaging technology for glaucoma screening, especially in non-ophthalmic settings, is needed to help identify older adults with early glaucoma before they suffer vision loss. Currently, spectral domain optical coherence tomography (OCT) is used to diagnose and monitor glaucoma, but its use in non-ophthalmic settings for screening has been limited by its high reliance on skilled operators to manually capture imaging and the high cost of the device. Newer OCT devices, such as the Topcon Maestro2, are more affordable and have been designed with semi-automated imaging, thus potentially decreasing the need for expert ophthalmic imagers to capture imaging. It is not known if OCT imaging using the newer semi-automated image capture technology is of similar quality or accuracy as traditional spectral domain-OCT. This would be important to know before considering if the device could be used in non-ophthalmic settings for screening.

Hypothesis: We hypothesized that measurements for the retinal nerve fiber layer and macular thickness captured on the semi-automated Maestro2 would be highly correlated with the gold standard Spectralis Heidelberg, and that they would perform similarly in older adults with and without glaucoma diagnoses.

Methods: This was a cross-sectional analysis of optical coherence tomography data captured on the semi-automated Maestro2 and Spectralis Heidelberg on the same day in a cohort of 221 adults (mean age 75.1 years, 20% non-white/non-Hispanic, 55% female; 40.4% glaucoma, 9.4% glaucoma suspect, 50.2% normals). The global and sectoral thickness of the retinal nerve fiber layer and the ETDRS macular thickness values were compared using a Pearson's correlation test. Stratification by disease (glaucoma or suspect vs. normal) was done to determine if the optic nerve measurements were similarly correlated in both glaucomatous and non-glaucomatous eyes. Analyses were conducted using StataMP (v.18.0).

Results: The two devices showed high and significant correlation for the global ($r=0.7136$), superior ($r=0.7045$), inferior ($r=0.8072$), superotemporal ($r=0.7387$), inferotemporal ($r=0.8393$), superonasal ($r=0.6968$), and inferonasal ($r=0.7118$) RNFL thickness values (all $p<0.05$). There was also moderate correlation for the nasal ($r=0.5579$) and temporal ($r=0.6581$) quadrants (all $p<0.05$). RNFL correlations were similar when stratified by glaucoma/suspect vs normal (all $p<0.05$). The total macular volume ($r=0.8320$), central macular thickness ($r=0.8674$), inner circle ($r=0.9185$), inner temporal ($r=0.7815$), inner superior ($r=0.8247$), inner nasal ($r=0.8721$), inner inferior ($r=0.8539$), outer temporal ($r=0.7518$), outer superior ($r=0.7650$), outer nasal ($r=0.8529$), and outer inferior ($r=0.8764$) ETDRS sections of the macula were highly correlated between devices (all $p<0.05$).

Conclusions: Both macular and optic nerve measurements captured on semi-automated OCT imaging were highly correlated with a traditional clinical device. Such data support potential use of semi- automated imaging for disease detection in non-ophthalmic settings.

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126. Use of ShotSpotter Gunshot Detection Technology: No Reduction in Mortality Rate in Single Center Study

Hope Werenski, MD Martin Avery, MD

Heidi Roeber, Nick Major, Aaron Gilani, Andrea Boyd-Tressler, Mary Alyce McCullough, Greg Stettler, Martin Avery
Surgery-Trauma
Clinical Science- Resident

Objectives:
Early identification and transportation of patients sustaining penetrating trauma improves survival. Acoustic gunshot detection (ShotSpotter) systems have reported improved police response times as well as EMS prehospital times. However, the use of acoustic detection systems has not consistently demonstrated an improvement in mortality. Community death rates have not been assessed with respect to the deployment of ShotSpotter. The purpose of this study was to determine if ShotSpotter improved community violent death rate as well as the impact on hospital resource utilization.

Methods:
Patients suffering penetrating trauma from gunshots who were admitted to our ACS-verified Level I trauma center between March 2019 and August 2023 were reviewed. Shot Spotter was deployed in August 2021. Demographics, geographic, blood product utilization, and mortality data were evaluated. For each blood component, the mean number of blood packets used per patient within each group (SS vs NSS) and time period (pre- vs post-ShotSpotter) was inferred using multivariate Poisson regression. The mean gunshot death rate per 100K people was inferred within each group and time period using a Bayesian multivariate Poisson model with a zip code group-specific term to account for the temporal dependence of the death rate from month to month.

Results:
There were 511 shootings within the city limits, with 312 in non-ShotSpotter (NSS) and 199 in the ShotSpotter (SS) area. There were 54 NSS and 82 SS patients who underwent mass transfusion protocol. There was no significant difference in the utilization of whole blood between the groups. There was a significant increase in the utilization of components, RBC, Plasma, Platelets, and Cryoprecipitate for the SS group (all $p< 0.05$). The mean monthly death rate in the community for the SS group did not significantly differ from the NSS group.

Conclusion:
The utilization of acoustic detection technology has improved the identification and prehospital transport times in many cities. This has not translated into an improvement in mortality. We aimed to assess community death rates during the deployment of ShotSpotter gunshot detection technology, as many community deaths are not accounted for in hospital mortality. Our data demonstrates no change in community death rates or hospital mortality with an increased use of blood product components. ShotSpotter does not appear to improve the care of victims of penetrating trauma.

127. Colorectal Resections in Emergency General Surgery: Implementation of Guidelines to Reduce Colostomy Creation

Hope Werenski, MD Preston Miller, MD

Elizabeth C. Wood, Mary A. McCullough, Nick Major, Heather Ots, Kristina Fiorreti, Bonnie Laingen, Thomas Sullivan, Matthew Painter, Preston Miller
Surgery-General
Clinical Science-Resident

Introduction:
Creation of a colostomy versus anastomosis remains a controversial topic in emergency general surgery (EGS) patients requiring emergent or urgent colon resection. In 2017, our institution standardized the indications for colostomy creation in EGS patients which included the presence of septic shock, poor tissue condition at the anastomotic site, and underlying medical conditions associated with poor wound healing. In the absence of these conditions, the guideline recommended anastomosis. The goal of this study is to examine rates of colostomy, anastomosis, and abdominal complications before (PRE) and after (POST) guideline implementation.

Methods:
This is a single-institution, retrospective review of EGS patients over a 10-year period who underwent urgent or emergent colon resection by the EGS service. Demographics, comorbidities, operations, pre- and post-operative courses were recorded and analyzed before and after implementation of colectomy management guidelines.

Results:
Between 1/1/2013 and 10/31/2022, 710 patients underwent segmental colon resection (283 PRE/427 POST). The PRE and POST groups were similar with respect to sex (F 48.1% vs. 51.8%, $p=0.43$), Charlson Comorbidity Index (3.7±2.8 vs. 3.8±2.8, $p=0.50$), and ASA score (3.5±8.6 vs. 3.4±8.8, $p=0.08$). Anastomosis was significantly more common in the POST group as compared to PRE (65.6% vs. 44.5%, $p<0.0001$). Intestinal leak, abscess, and wound dehiscence rates were

similar in the PRE and POST groups (4.7 vs. 5.2, p=0.51, 14.1 vs. 14.7, p=0.50, 5.5 vs. 2.4, p=0.10, respectively) despite fewer colostomies.

Conclusion:
Implementation of an EGS colon management guideline was associated with a significantly higher rate of anastomosis creation but no concomitant increase in leak or abdominal complication rate. This study supports the safety of anastomosis in over 60% of appropriately selected patients despite the urgent/emergent nature of their colon resections.

128. Cerebral venous pressures, sinus trans-stenosis gradients, and intracranial pressures are dramatically augmented by head position

Angelina Wiater, BA Kyle M. Fargen, MD, MPH

Kyle M. Fargen, Jackson P. Midtlien, Connor R. Margraf, Paul Marcet, Adnan Siddiqui, Ferdinand K. Hui
Surgery-Neurosurgery
Clinical Science-Student

Background: Cerebral venous pressures, sinus trans-stenosis gradients, and intracranial pressures are known to be influenced by head position. This study investigates the intracranial manifestations of these changes in patients with cerebral venous outflow disorders (CVD).

Methods: A retrospective chart review was conducted on 22 consecutive adult patients who underwent diagnostic cerebral venography with rotational internal jugular vein (IJV) venography and superior sagittal sinus (SSS) pressure measurements in multiple head positions. Data on venous sinus pressures, IJV pressures, and lumbar puncture (LP) opening pressures (OP) were collected and analyzed.

Results: The study found that 96% of patients experienced increases in SSS pressures with head rotation, with a mean increase of 25.4%. Intracranial trans-stenosis gradients showed significant variability with head position. Additionally, LP OP measurements increased by an average of 44.3% with head rotation. Dynamic IJV stenosis was observed in all patients during rotational testing.

Conclusion: Head position significantly affects cerebral venous pressures, trans-stenosis gradients, and intracranial pressures in patients with CVD or IIH. These findings highlight the need for dynamic venography in the diagnostic evaluation of these conditions to better understand their pathophysiology and improve treatment strategies.

129. One in six patients exhibit changes in repercussion on 10-minute repeat cerebral angiography during mechanical thrombectomy for stroke

Angelina Wiater, BA Kyle M. Fargen, MD, MPH

Jackson P. Midtlien, Omar Ashraf, Ferdinand Hui, Samuel Tsappidi, Yi Johnathan Zhang, Aren A. Forster, Emily Chang, Robert Starke, Ahmed Abdelsalam, Ansaar Rai, Abdul Tarabishy, Sohyun Boo, Phong Vu, Molly Ehrig, Carol Kittel, Patrick A. Brown, Stacey Q. Wolfe, Kyle M. Fargen
Surgery-Neurosurgery
Clinical Science- Student

Background: Post-recanalization target vessel re-occlusion (TVR) following endovascular thrombectomy (EVT) is a known complication of the procedure, and it is associated with worse long-term functional outcomes. The incidence and factors that contribute to TVR are not well understood, particularly within the immediate timeframe following EVT.

Methods: A prospective, multicenter study was performed across four comprehensive stroke centers on adult patients undergoing EVT for acute large vessel occlusion. TICI score was recorded at the end of the standard procedure, and another TICI score was recorded 10 minutes afterward to evaluate for TVR.

Results: 167 patients underwent EVT for a large vessel occlusion, 93.4% of which were in the anterior circulation. Twenty-seven patients (16.2%) had a change in their TICI score at 10 minutes following EVT, with 19 of these patients (70%) having a worsening in their score. Of the total sample, 13% had their post-procedure care altered by any intervention, and 8% underwent further endovascular interventions due to the change in reperfusion over the 10-minute time period. Functional independence (mRS 0-2) at 90 days was observed in 31% of the entire cohort and in 21% of the patients with a worse TICI score at 10 minutes.

Conclusions: This is the first study to prospectively assess for TVR in the immediate timeframe following EVT. One in six patients had a change in their TICI score, and one in eleven patients had additional intervention. Accordingly, neurointerventionalists should consider integrating angiographic evaluation at 10 minutes following EVT.

130. The Real Influencer: Do Pre-Operative Diagnosis Have A Stronger Impact on Operative Times Than BMI?

Kathleen Williams, BS Molly Hartzler, MD

Brandon Garcia Fuentes Caitlyn Perrone Emily McMurtrie Molly Hartzler
Surgery-Orthopedics
Basic Science- Student

Background: Over the past 40 years, the rise in obesity has led to an increase in joint degeneration and the need for joint arthroplasties. As the demand for total hip arthroplasties (THA) has grown, the direct anterior approach (DAA) has gained popularity due to its less invasive nature, shorter operating times, and faster recovery. However, the current literature is limited on the information around the impact a pre-operative diagnosis has on operative times, with most studies focusing primarily on the impact that the body mass index (BMI) has instead.

Hypothesis: The preoperative diagnoses of Primary OA, Avascular Necrosis, and “Other” does not impact operative times while performing total hip arthroplasty, regardless of approach used.

Methods: A retrospective analysis of patient data for those who underwent a THA using the direct anterior or posterior approach at Atrium Health institutions between January 1, 2017, and December 31, 2021, was performed. Patient data were included if patients were at least eighteen at the time of surgery and had at least 2 years of follow up completed within Atrium Health institutions. Data were excluded if additional procedures were performed along with the THA or if metastases were indicated as the pre-operative diagnosis. Baseline demographic data, pre-operative diagnosis, and length of procedure time and operative time were collected. Patients consented to enrollment in the registry prior to surgery.

Results: BMI: There was no statistically significant difference in the median operative times of THAs utilizing the DAA when comparing patients with BMIs greater than 30 to the total THA sample (p=0.05315) In contrast, there was a statistically significant difference in operative times for patients with BMIs greater than 30 who undergone a THA utilizing the posterolateral approach (PL) (p= 0.01757). Pre-Operative Diagnosis: There was no statistically significant difference in the median operative times of THAs utilizing the DAA when stratifying groups based on pre-operative diagnosis (p=0.3277). For the PL, there was a statistically significant difference in the median operative times for patients who had a pre-operative diagnosis of avascular necrosis (p=0.01315) and “other” (p=0.00701).

Conclusions: This study provides valuable insights into the impact of pre-operative diagnoses on operative times during THA. Our findings indicated no significant difference in operative time associated with any pre-operative diagnoses or a BMI greater than 30 when utilizing the direct anterior approach. However, for the PL, we observed increased operative times linked to a BMI greater than 30 and pre-operative diagnoses of avascular necrosis and “other” conditions (including tear of the acetabular labrum, osteoarthritis resulting from hip dysplasia, osteonecrosis, closed fractures of the hip, and aseptic necrosis). These results suggest that certain pre-operative diagnoses, along with BMIs greater than 30 may contribute to longer operative times for THAs performed via the PL, but neither are impactful for operative times in THAs performed via the DAA.

Source of mentor’s funding or other support that funded this research: N/A

131. Finally, a Use for Balloons: Automated Endovascular Support Enhances Closed-Loop Drug and Fluid Delivery in a Porcine Model of Shock

Elizabeth Wood, MD Timothy Williams, MD

Micaela K. Gomez, Magan Lane, Juhi Saxena, Austin Johnson, Jason Y. Adams,
Lucas P. Neff MD, Timothy K. Williams
Surgery-Vascular & Endovascular
Basic Science-Resident

INTRODUCTION: Endovascular Perfusion Augmentation for Critical Care (EPACC) is a method of dynamic aortic balloon catheter titration for precision hemodynamic support. EPACC has a potential role in augmenting hemodynamics in tandem with conventional resuscitation strategies. We have previously described that even short periods of EPACC in conjunction with an automated fluid and drug delivery system termed, Precision Automated Critical Care Management (PACC-MAN), can reduce resuscitation requirements over the first few hours after severe ischemia-reperfusion injury (IRI). We sought to understand if an initial 180 minutes of EPACC+PACC-MAN has sustained benefits over a 24-hr period compared to PACC-MAN alone in an established IRI model.
METHODS: Twelve large swine underwent 30% hemorrhage, followed by 45 minutes of complete zone 1 aortic occlusion to induce IRI and a vasoplegic state. Animals were then transfused to euvolemia and randomized to a standardized critical care (SCC) algorithm with the PACC-MAN system, or EPACC+PACC-MAN (180 min of dynamic partial aortic balloon pressure augmentation that autonomously adjusted based on the animal's physiology). Fully autonomous, closed-loop resuscitation lasted for a total of 24 hrs in both groups. Primary outcomes included duration of hypotension (HYPO) (MAP <60mmHg) and hypertension (HTN) (MAP >70mmHg), and total crystalloid/norepinephrine (NE) volumes.
RESULTS: Duration of HYPO for SCC vs EPACC [3.75% vs 3.10 % p=0.47) and HTN for SCC vs EPACC (5.58% vs 8.90% p=0.13) was equivalent. SCC required significantly more NE during the study period (1102.0 mcg/kg vs 210.77 mcg/kg p=0.045) than EPACC. Total volume trended higher for SCC vs EPACC (308.2 ml/kg vs 198.3 ml/kg p= 0.38).
CONCLUSION: Supporting hemodynamics with EPACC in the initial phases of resuscitation had a sustained effect on limiting overall vasopressor requirements in this 24-hour study without compromising physiologic or metabolic endpoints. Automation of endovascular devices may play an adjunctive role in the management of severe shock states and augment autonomous resuscitation system capabilities. Such systems may play an important role in resource-constrained care environments.

132. Partial Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) vs Intermittent REBOA in Non-Compressible Torso Hemorrhage with Concomitant Traumatic Brain Injury

Elizabeth Wood, MD Timothy Williams, MD

Micaela Gomez, Gloria Sanin, Gabriel Cambronero, James Patterson, Bonnie E. Laingen, Elizabeth A. Azar,
Garrett R. Reid, Magan Lane, Antonio Renaldo, Elaheh Rahbar, Austin Johnson, Lucas P. Neff, Timothy K. Williams
Surgery-Vascular & Endovascular
Basic Science-Resident

Introduction: REBOA is a method for temporizing non-compressible torso hemorrhage (NCTH), but its use is limited by ischemic effects. Two strategies, intermittent REBOA (iREBOA) and partial REBOA (pREBOA), aim to mitigate these effects. iREBOA alternates between distal flow restoration and total balloon occlusion, while pREBOA provides hemodynamic support with attenuated distal flow by dynamically adjusting balloon volume to limit full aortic occlusion. Moreover, these strategies have very different hemodynamic profiles above the balloon, with uncertain impact on concomitant proximal injuries like traumatic brain injury (TBI). We hypothesized that swine receiving pREBOA would have more consistent cerebral hemodynamics in a porcine model of massive hemorrhage and TBI.
Materials and Methods: Sixteen Yorkshire swine underwent standardized TBI via a computer-controlled cortical impactor and liver transection for uncontrolled hemorrhage, followed by 10 min of complete supraceliac aortic occlusion. At T10, randomized swine received 80 min of either iREBOA or pREBOA support on a completely automated 7 Fr REBOA system. Following damage control surgery, allogeneic whole blood was transfused and experimental animals underwent 90 min of automated critical care. All vasopressor titrations and crystalloid delivery were performed with a closed-loop, automated

platform for resuscitation. Hemodynamic parameters (pressure and flow), ICP, and ischemia-related laboratory values were recorded. Hypotension was defined as MAP <60 and hypertension as MAP>70.
Results: With the automated REBOA system there were no differences in time spent in hypotension and hypertension for iREBOA and pREBOA (45.26% vs 17.22%, p=0.27 and 38.31% vs 49.19%, p=0.56, respectively). However, iREBOA demonstrated more variability in proximal MAP with greater standard deviation at 10 min time intervals from 10-20, 20-30, and 30-40 min into critical care compared to pREBOA (p=0.0074, 0.0028, and 0.0371). Carotid flow fluctuated more in iREBOA vs pREBOA from 10-20, 20-30, and 40-50 min intervals (p=0.038, 0.036, 0.0011, and 0.046). CPP fluctuated more in iREBOA than pREBOA at time points 20-30 and 30-40 min (p=0.0007 and 0.048).
Conclusion: Partial REBOA produced more consistent CPP and carotid flow while maintaining MAP. Dynamic control systems for NCTH are possible and automation of pREBOA may balance the competing risks of distal ischemia and proximal homeostasis in the multi-injured casualty with TBI.

133. Pediatric Facial Trauma: Preoperative Variables Affecting the Clavien-Dindo Classification

Avery Wright, BS Christopher Runyan MD, PhD

Madison Hinson, Amelia Davidson, Christopher Runyan
Surgery-Plastic & Reconstructive
Clinical Science-Student

Background: The Clavien-Dindo classification is a rating system that reports surgical complications based on the intervention(s) required to treat the complication. The system has been found to be valid in many fields of surgery and is noted to have strong correlations with postsurgical quality of life, but few studies have evaluated correlations with preoperative variables. This study aims to identify the variable that most strongly correlates to surgical complications and the corresponding Clavien-Dindo classification.

Methods: This retrospective study uses a multi-center database to evaluate pediatric (<18 years old) facial trauma patients (N=1094) visiting Atrium Heath Wake Forest Baptist (AHWFB) hospital and Atrium Health Carolinas Medical Center (AHCMC) from 2020 to 2022. The Clavien-Dindo classification was compared to the mechanism of trauma, length of hospital stay, and number of injuries, surgeries, and consultations.

Results: 338 patients required surgical intervention and 19 patients suffered surgical complications. Mechanism of trauma (p=0.044) was the factor that most strongly correlated with Clavien-Dindo classification as high mechanism injury had a correlation of 0.467 (p=0.044) and low mechanism of injury had a correlation of -0.467 (0.044). The next strongest correlation was the number of specialty consultations required at 0.464 (p=0.045).

Conclusion: In two large North Carolina hospital systems, the mechanism of trauma was found to have the strongest correlation and therefore the greatest predictive potential for postoperative complications quantified by the Clavien-Dindo classification. In other words, the mechanism of trauma may inherently increase the risk of postoperative complications. Acknowledging the correlation between the mechanism of trauma and postoperative complications can help guide healthcare decisions, potentially prevent or mitigate complications, and better inform patients and their families of potential complications.

134. The Current State of Surgical Palliative Care Education: an APDS Survey from the Education Committee of the Surgical Palliative Care Society

Jennifer Wylie, MD Buddy Marterre, MD, MDIV

Kimberly Kopecky, Mackenzie Cook, Joshua Sommovilla, and Buddy Marterre
Surgery-General
Educational Science-Resident

Purpose: Formal primary surgical palliative care education in the United States is lacking. We aimed to assess curricula and surgical program directors' (PDs) attitudes toward instituting formal educational programs. Results will be able to guide future efforts to create and standardize educational materials to meet the needs of surgical training programs.

Methods: An anonymized 15-item survey was developed by the SPCS Education Committee and electronically distributed to PDs at 282 general surgery residency programs through the Association of Program Directors in Surgery (APDS) in

June 2023.

Results: Forty-three PDs completed the questionnaire (15% response rate). Sixty-seven percent reported providing dedicated instruction time for communication skills with seriously ill patients. Most (76%) reported using didactics format, while 48% utilized simulation-based instruction, 35% dedicated time to clinical instruction in the ICU and 14% of programs utilized routine rounding to offer opportunities to teach communication skills. Use of materials created by educators within the institution was most common (69%), followed by SCORE materials (45%) and other established communication tools (7%). 37 (86%) respondents supported the use of standardized education materials if they were to be provided, including resources regarding end-of-life care (65%), decision-making capacity and the care and role of surrogate decision-makers (56%), code status documentation (49%), and ethics of medicalized death (65%).

Conclusions: Surgical residencies provide variable levels of formal education and utilize different tools and resources to teach primary palliative care and advanced communication skills. While a national standardized formal curriculum does not currently exist, many surgical PDs display positive attitudes towards adopting such materials if made available.

135. Objective Triggers for Early Palliative Care in Trauma Patients

Jennifer Wylie, MD Craig Follette, DO

Preston Miller, Audrey Spencer, Isabella Cornea, Buddy Marterre, and Craig Follette
Surgery-Trauma
Clinical Science-Resident

Introduction: Early palliative care (PC) in severely injured patients is essential to avert both premature withdrawal of life support (W/D) and outcomes survivors may consider worse than death. Retrospective data show that trauma teams that do not employ quality primary PC principles or consult PC experts early in the clinical course of severely injured patients generate outcomes many survivors would find utterly unacceptable. ACS TQIP Best Practice Guidelines advise subjective triggers for PC discussion within 72 hours of admission for patients with a high risk of death, permanent disability, or uncertainty of either. However, objective measures are lacking, particularly in young people. We thus aimed to develop objective criteria for PC in patients at risk for death or possible value incongruent outcomes (pVIO), defined as discharge to SNF or LTACH, tracheostomy or gastrostomy (trach/PEG).

Methods: Injury/patient characteristics associated with death or pVIO were analyzed retrospectively in adults admitted to the Trauma ICU. Deaths in the first 24 hours were excluded. Multivariable logistic regression (MLR) analysis examining age, anticoagulation, comorbidities, dementia, and GCS on each post-injury day from 0-7 was conducted. ROC curve cut points were based on Youden's index. These were tested on data from a subsequent year. GCS on post-injury day 3 (GCS3) was chosen as it aligns with ACS TQIP Guidelines and is often the first pivotal clinical decision-making moment for which patient values and suffering thresholds are critical (the first trach/PEG was done on day 3).

Results: The predictive value of GCS increased with each subsequent day beyond admission. From 7/1/2017 to 6/30/2020, 843/2328 (36.3%) ICU patients died or had pVIO. MLR identified 2 patterns: In patients ≤50 years old, only GCS3 predicted death or pVIO. Age, GCS3, and comorbidities were predictors of death or pVIO in those aged >50. Areas under ROC curves in ages ≤50 and >50 were 0.88 (cutoff GCS3 ≤ 11) and 0.77 (cutoff 43% risk of pVIO per regression equation). Models were tested against 960 patients. In the age ≤50 group, sensitivity (SN) and specificity (SP) for pVIO with GCS3 ≤11 were 71.4 and 91.7. Positive and negative predictive values (PPV, NPV) and accuracy (AC) were 64.9, 93.0, and 87.6, respectively. In those aged >50, at 43% risk of pVIO cutoff, SN and SP were 62.8 and 65.6 with PPV, NPV, and AC at 59.4, 68.7, and 64.3.

Conclusion: GCS on day 3 is a better predictor of pVIO than GCS on the day of injury. GCS3 ≤11 in those ≤ 50 years old accurately identifies candidates for early PC discussion. The model for those >50 performs less well but is the best objective trigger developed to date. With these triggers, studies investigating the effectiveness of PC in averting both premature W/D and outcomes that survivors consider fates worse than death are feasible.

136. Impaired Regeneration Potential in Urinary Stem Cells Diagnosed from the Patients with Diabetic Nephropathy

Xinyue Zhang, MD Yuanyuan Zhang, MD, PhD

Geng Xiong, Antony Atala, Anthony J Bleyer, Michael E Bleyer, Joseph A Aloi,Cristina M Furdui, Yuanyuan Zhang
Wake Forest Institute Regenerative Medicine (WFIRM)
Basic Science-Fellow

Background: Stem cells present in urine possess regenerative capacity to repair kidney injury. However, the unique characteristics of urinary stem cells (USC) from patients with diabetic nephropathy (d-USC) are unknown. The goal of this study was to investigate stemness properties in cell phenotype and regenerative potential of d-USC, compared to USC from healthy individuals.

Methods: Thirty-six urine samples collected from patients (n=12, age range 60-75 years) with diabetic nephropathy (stages 3-4 stage chronic kidney disease [CKD]) were compared with 30 urine samples from healthy age-matched donors (n=10, age range 60-74 years).

Results: There were approximately six times as many cells in urine samples from patients with diabetic nephropathy, including twice as many USC clones as healthy donors. However, approximately 70% of d-USC had weaker regenerative capacity as assessed by cell proliferation, less secretion of paracrine factors, weaker telomerase activity, and lower renal tubular epithelial differentiation potential compared to healthy controls. In addition, the levels of inflammatory factors (IL-1β and Cx43) and apoptotic markers (Caspase-3, and TUNEL) were significantly increased in d-USC compared to USC ($p<0.01$). Protein levels of autophagy marker (LC3-II) and mTOR signaling molecules (p-mTOR/mTOR, p-Raptor/Raptor and p-S6K1) were significantly lower in patient with diabetic nephropathy ($p<0.01$). Nevertheless, up to 30% of d-USC possessed similar regenerative capacity as USC from healthy donors.

Conclusions: Regenerative performance of most d-USC was significantly lower than normal controls. Understanding the specific changes in d-USC regeneration capability will help elucidate the pathobiology of diabetic nephropathy and lead to prevent USC from diabetic insults, recover the stemness function and also identify novel biomarkers to predict progression of this chronic kidney disease.