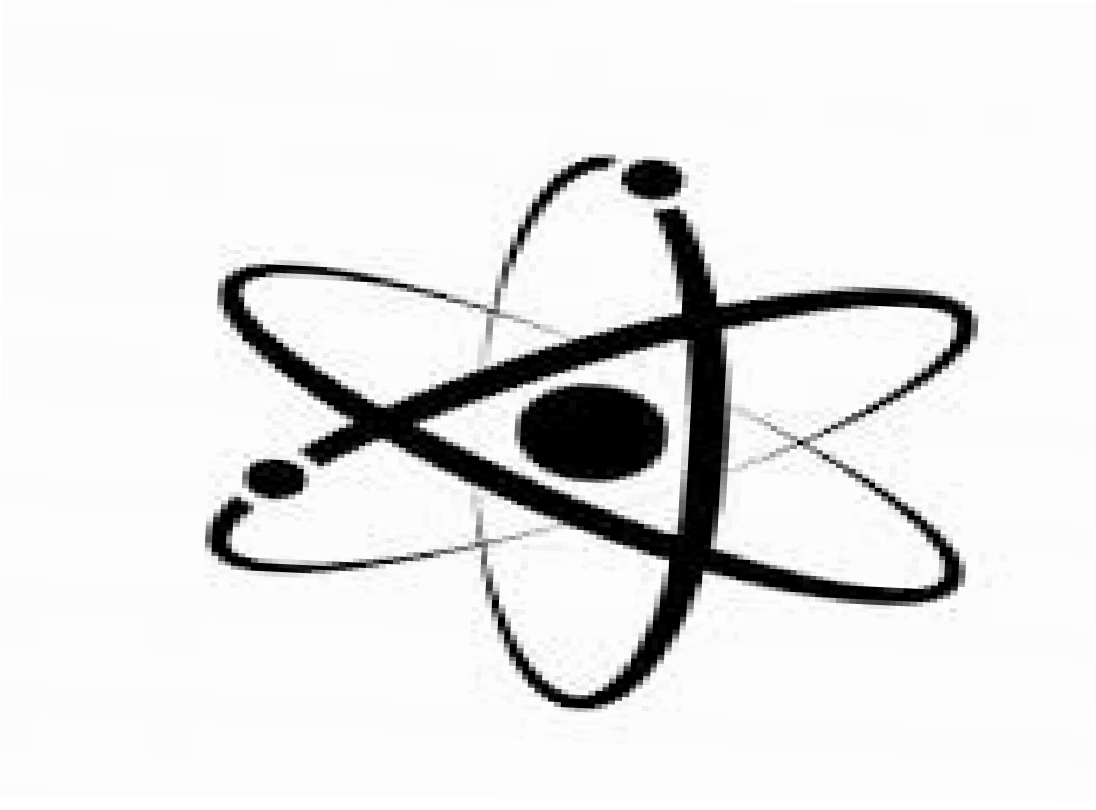
Surgical Sciences

Thirty-Third Annual Residents' and Fellows'

RESEARCH DAY

WAKE FOREST UNIVERSITY SCHOOL OF MEDICINE



NOVEMBER 13, 2025

Research Day Chairperson
Garrett S. Bullock, PhD, DPT

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 33rd 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 Accordingly, you acknowledge and agree that by participating in the event, you will receive and maintain any unpublished information or materials in confidence until such time as the information or materials are published or otherwise made publicly available by the originating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 Chuck Thigpen, PhD, PT, ATC “From Bedside to Bench to Boardroom: Twenty Years of Learning How to Create Value in Orthopaedic Care” *Biotech Place Auditorium*
2:00 pm – 4:00 pm…….	Presentation and Judging of Posters *Biotech Place Atrium*
6:00 pm – 7:00 pm…….	Social Hour *Bridger Field House*
7:00 pm…….....	Awards Presentation Recognition and Reception *Bridger Field House*

KEYNOTE SPEAKER

Chuck Thigpen, PhD, PT, ATC

Chief Clinical and Strategy Officer
ATI Physical Therapy

Dr. Chuck Thigpen serves as the Chief Clinical and Strategy Officer at ATI Physical Therapy, where he oversees clinical excellence, enterprise strategy, and strategic partnerships. He has been instrumental in developing ATI's care model and implementing best practices across the organization. Since 2019, Dr. Thigpen has led ATI's participation in the CMS Quality Payment Program, earning recognition as a MIPS Exceptional Provider across the entire platform. He has also driven the expansion of service lines and the national rollout of innovative care models, including the integration of virtual therapy solutions into a hybrid care model designed to enhance access to high-quality care.

A recognized leader in musculoskeletal health, Dr. Thigpen has published and presented extensively on shoulder injuries and value-based care. He is a member of the East Tennessee State University Rehabilitation Sciences Alumni Hall of Fame and the American Academy of Sports Physical Therapy Hall of Fame. He holds adjunct faculty roles at Duke University, the University of South Carolina, and Clemson University, and earned his PhD and MS from UNC-Chapel Hill and BS from East Tennessee State University.

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

Gabriela Velazquez, M.D. .....Department of Vascular and Endovascular Surgery

RESEARCH DAY 2025
PLANNING COMMITTEE

HOST DEPARTMENT:
ORTHOPAEDIC SURGERY

Garrett S. Bullock, PhD, DPT.....Chair, Department of Orthopaedic Surgery
Hooman Sadri, MD, PhD.....Co-Chairperson, Department of Urology

Committee Members

Lydia Durr.....Hypertension & Vascular Research

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

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

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

Jennifer Sloan, CPA.....Hypertension & Vascular Research

KEYNOTE SPEAKERS (PAST 5 YEARS)

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
2024	Bruce J. Tromberg, MD National Institute of Biomedical Imaging and Bioengineering

AWARD RECIPIENTS (PAST 5 YEARS)

CLINICAL RESEARCH

	Gold Medal	Silver Medal
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	Maria Masciello, MD, MS Surgery-Otolaryngology (Dentistry) Resident	Donald Browne, MD Plastic and Reconstructive Surgery Resident
	Griffin Bins, MD Plastic and Reconstructive Surgery Fellow	Mary Duet, BS Plastic and Reconstructive Surgery Fellow
	Ahmad Shamulzai, BS Neurosurgery Student	Greg Aiello, BS Ophthalmology Student

CLINICAL RESEARCH continued

	Gold	Silver	Bronze
2023	Jessica Rauh, MD Surgery-Pediatrics Resident	Kunhan Patel Surgery - Otolaryngology (Dentistry) Resident	Elizabeth Laikhter, MD Surgery - Plastic & Reconstructive Resident
	Cecilia Schaaf, DVM Surgery - Oncology Fellow	Naresh Mahajan, PhD Regenerative Medicine Fellow	
	Lauren Hostettler, MS Surgery- General Student	Amelia Davidson, BS Surgery- Plastic & Reconstructive Student	Darnell Campbell Surgery- Plastic & Reconstructive Student
2024	Madeline Snipes, MD Surgery-Urology Resident	Mary Duet, MD Surgery- Plastic & Reconstructive Resident	Elizabeth Laikhter, MD Surgery- Plastic & Reconstructive Resident
	Jigishkumar Vyas, MD Surgery-Transplant Fellow	Carma Goldstein, MD Surgery- Trauma Fellow	
	Antonella Henson-Vendrell Surgery-Orthopaedics Student	Madison Hinson Surgery-Plastic & Reconstructive Student	Damian Hutchins, MS Surgery-Oncology Student

BASIC RESEARCH

	Gold Medal	Silver Medal
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
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

BASIC RESEARCH continued

	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
2024	Elizabeth Wood, MD Surgery-Vascular & Endovascular Resident		
	Won Woo Jeong Regenerative Medicine Fellow	Erika Billman Regenerative Medicine Fellow	Mohamed Gaber, PhD Cancer Biology Fellow
	Hannah Lee Cancer Biology Student	Yu-Ting Tsai Cancer Biology Student	Kenysha Clear Cancer Biology Student

EDUCATIONAL RESEARCH

	Gold Medal	Silver Medal
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	
2024	Michael Boyajian, MD Surgery- Plastic & Reconstructive Resident Logan Bearfield, MS3 Surgery- Ophthalmology Student	

Abstracts

1. THE SURGICAL DIVIDE: IDENTIFYING DIFFERENCES IN CLINICAL CHARACTERISTICS BASED ON MANAGEMENT OF INTERSTITIAL CYSTITIS/BLADDER PAIN SYNDROME

Eboni Acoff, MD Stephen J Walker, PhD

Nicos Prokopiou, Madeline Snipes, Stephen Tranchina, Kaylee Ferrara, Robert Evans, Stephen J Walker
Clinical Science
Resident
Surgery-Urology

Introduction: Interstitial cystitis/bladder pain syndrome (IC/BPS) is a heterogeneous condition characterized by chronic pelvic and bladder pain. The etiology remains unclear, so management is multimodal and patient specific. A subset of patients will fail conservative therapy, requiring more invasive treatment options such as intravesical instillations or cystectomy with urinary diversion. This study aimed to identify clinical characteristics associated with treatment-refractory IC/BPS requiring cystectomy.

Methods: Patients were identified and selected from our large IRB-approved IC/BPS patient registry. Those aged 18-80 with an IC/BPS diagnosis who underwent cystectomy with urinary diversion at our institution were compared to age-matched IC/BPS controls, all of whom had at least one therapeutic hydrodistension (HOD). Patient-reported outcomes (PROs) were assessed via multiple questionnaires, including Pelvic Pain and Urgency/ Frequency (PUF) and the O'Leary-Sant Score (IC Symptom Index (ICSI) and the IC Problem Index (ICPI)). Clinical data included Hunner lesion (HL) status.

Results: Of the 650 patients in our IC/BPS registry, 51 (43 female, 8 male) underwent cystectomy and were compared to 106 (97 female, 9 male) age-matched controls. There was a significantly higher proportion of patients with HL in the cystectomy cohort ($z= 4.58$, $p<0.0002$), and a significantly higher proportion of patients with a smoking history, fibromyalgia, migraines, panic disorder, and depression in the control cohort. On multivariate logistical regression, HL were significantly associated with cystectomy (OR 5.635, CI 2.13 - 15.93). PUF total scores were significantly higher in the cystectomy cohort (25.7 ±6.9 vs 23.1 ±5.6; $p=0.041$). Similarly, both ICSI (16.0 (±4.2) vs. 12.9 (±4.2), $p<0.0001$) and ICPI (14.4 (±3.1) vs. 12.1 (±3.1), $p=0.0001$) were greater in the cystectomy cohort.

Conclusion: In our large patient cohort, the most important characteristics that define IC/BPS patients who went on to have a cystectomy are pain, severe urinary symptoms and bother scores, and a history of Hunner lesions. These findings further help to distinguish bladder-centric patients from the non-bladder-centric, systemic pain disorder phenotype.

2. Liver Transplantation for Maple Syrup Urine Disease: Outcomes Analysis of 245 Liver Transplant Recipients from the United Network for Organ Sharing Registry

Wiliam Archie, MD Dionisios Vrochides, MD PhD MBA FACS FRCSC

Namratha Mylarapu, Katheryn Peterson, Dionisios Vrochides, Lon Eskind, David Levi, Kyle Soltys, Kevin Strauss, George Mazariegos
Clinical Science
Resident
Surgery-Transplant

Introduction: Maple Syrup Urine Disease (MSUD) is a metabolic disorder that poses significant neurological and metabolic risks. In 2004, liver transplantation (LT) emerged as a long-term option to stabilize branched-chain amino acid metabolism. LT for MSUD has expanded since, now performed at transplant centers across the United States. This national expansion has provided a broader dataset for evaluating the long-term outcomes of these transplants.

Methods: Retrospective review of all MSUD LT patients in participating in UNOS sites from July 2010 to July 2024 was performed. 245 LT were performed at 43 centers. Recipients' age, gender, transplant location, transplant year, graft type, donor type, graft survival, and survival data were collected. Recipients were placed into two cohorts; the early experience (EE) cohort between July 2010 - June 2019 and the late experience (LE) cohort between July 2019 - July 2024.

Results: EE and LE cohorts included 146 and 99 recipients, respectively. Pediatric recipients accounted for 82% (n=201)

of all MSUD LT. This ratio was similar between EE and LE cohorts. The percentage of female recipients increased in the LE cohort (36% vs 59%; p=0.002). There were no differences in graft or patient survival. UPMC, Georgetown and Stanford accounted for 50% of cases (n=123). When compared with the remaining 40 centers, the volume performed at low volume centers increased significantly in the LE cohort, (43% vs 60%; p=0.017). The 30-day graft loss rates trended higher at low vs. high volume centers, 9.8% vs. 4.1%, respectively (p=0.0629). This trend improved but persisted across EE (12.7% vs. 3.6%) and LE cohorts (6.8% vs. 5%).

Conclusion: LT for MSUD has expanded beyond a few high-volume centers to a growing number of institutions across the United States while maintaining stable graft survival rates. Pediatric recipients continue to represent the majority of cases, with a more equitable shift in gender distribution in recent years. Long-term outcomes remain comparable between the EE and LE cohorts, reinforcing the effectiveness of LT for MSUD. Overall, these findings support the continued utilization of LT across diverse transplant centers to ensure access, but the inverse correlation between volume of cases and early graft loss calls for an adoption of a minimum number of LT per center per year to achieve optimal outcomes.

3. Optimizing liver utilization for adult and pediatric transplantation with deceased donor partial grafts undergoing normothermic machine perfusion: Proposed standardization of logistic options

Wiliam Archie, MD Dionisios Vrochides, MD PhD MBA FACS FRCSC

Namratha Mylarapu, Maria Baimas-George, Kyle Soltys, Jose R. Soto, David Levi, Lon Eskind, Vincent Casingal, Roger Denny, George Mazariegos, Dionisios Vrochides
Clinical Science
Resident
Surgery-Transplant

Background: Liver transplantation is the only curative, life-saving option for children and adults with end-stage liver disease. Due to the well-known shortage and heterogeneity of grafts, split liver transplantation (SLT) is an attractive strategy to expand the donor pool and reduce waitlist times. Given increased risk of cold ischemia time (CIT) with SLT, machine perfusion represents a promising option to reduce CIT and optimize transplant logistics and outcomes.

Methods: The present communication describes various possible combinations of procurement steps to perform SLT facilitated by placing one or both grafts on a normothermic machine perfusion (NMP) closed circuit device. This is further exemplified by the described case of a standard left lateral section (LLS) pediatric liver transplantation and a right trisectional split graft that was optimized on NMP prior to implantation in an adult recipient.

Results: A 19-month-old female with biliary atresia after failed Kasai portoenterostomy and a 42-year-old woman with unresectable intrahepatic cholangiocarcinoma were selected as recipients for a SLT from a 17-year-old male donor. The SLT generated an LLS and a right trisectional graft of appropriate volume for both recipients. After a mixed in-situ and ex-situ split, to improve logistics, the right trisectional graft was placed on a closed circuit NMP device, following an appropriate vascular reconstruction. Both grafts were implanted with excellent short-term outcomes.

Discussion: Use of NMP with SLT for preservation prior to implantation allows not only for graft optimization but also for significant improvement of transplant logistics. We propose various models and standardization of logistic options for combining SLT with NMP to optimize graft availability and outcomes.

4. Interactions Between Endocrine-Targeting Therapies and Short-Chain Fatty Acids in Reducing ER+ Breast Cancer

Alana Arnone, PhD Katherine Cook, PhD

Adam S. Wilson, Valerie S. Payne, Katherine Ansley, and Katherine L. Cook
Basic Science
Fellow
Cancer Biology

Emerging evidence highlights the gut microbiome as a key player in estrogen receptor-positive (ER+) breast cancer development and recurrence, with breast cancer patients often exhibiting altered gut microbial profiles. Although oral endocrine-

targeting therapies have proven effective in treating and preventing ER+ breast cancer recurrence, the risk of therapeutic resistance and tumor recurrence remains decades post-diagnosis. Whether these endocrine targeting therapies interact to shift the gut microbiome and whether modifying diet-microbe-metabolite interactions could enhance the efficacy of these therapies remains largely unexplored. Preliminary data indicate that supplementing bacterial-derived metabolites, particularly short-chain fatty acids (SCFAs), may impact ER+ breast cancer by influencing tumor initiation, progression, and response to treatment. In both chemical-carcinogen-induced and spontaneous genetic MMTV-PyMT murine models of mammary tumorigenesis, exogenous SCFA supplementation increased tumor-free survival and reduced tumor multiplicity in the context of a high-fat diet. Additionally, in a 4T1.2ER+ syngeneic murine breast cancer model, exogenous administration of SCFA butyrate alone reduced tumorigenesis by modulating apoptosis (cleaved caspase 3) and immune infiltrate (F4/80 macrophages and infiltrating CD8+ T-cells). Further, exogenous administration of all three SCFA (butyrate, acetate, propionate) in mice on high-fat, low-fiber diet significantly reduced tumor growth and enhanced tamoxifen anti-tumor efficacy. SCFA interventions modulated tumor proliferation (Ki67), tumor apoptosis, and enhanced anti-tumor immunity (infiltrating CD8+ T-cells). Plasma butyrate levels were negatively correlated with breast cancer patient BMI, suggesting obesity interactions regulate gut microbial metabolite generation. To explore direct drug-microbe interactions we used an ex vivo colonic bioreactor and human donor fecal samples, we show that the aromatase inhibitor (AI) letrozole increased the proportional abundance of several SCFA-producing microbes. Moreover, metagenomic sequencing of DNA isolated from fecal samples obtained from postmenopausal breast cancer patients before and 3 months after AI treatment (NCT05030038) further revealed shifts in gut microbial populations, including increases in the proportional abundance of SCFA-producing species. These changes were associated with decreased circulating inflammatory cytokines. These findings suggest that SCFAs may suppress breast carcinogenesis, promote endocrine-targeting therapy responsiveness, and AI may directly modify SCFA-producing microbiota in breast cancer patients. SCFA may represent a promising adjunctive strategy to improve the outcomes of endocrine-targeting therapies for ER+ breast cancer patients.

5. Unseen Airborne Threats: Structural and Functional Lung Alterations Following Microplastic Inhalation

Charles Bardawil, MD Rajeev Dhupar, MD

Jarrett Dobbins, Shannon Lankford, Gayathriy Balamayooran, Cedric Schaack
Basic Science
Fellow
Surgery-Cardiothoracic

Introduction: Microplastics (MPs) are human made environmental contaminants that pose a growing concern for our health, particularly through airborne exposures. Although human autopsy studies confirm that MPs are retained in lung tissue, our understanding of their short and long term effects on the pulmonary system is limited. We sought to investigate the potential functional and histopathological changes that may be induced by MPs post exposure
Methods: MPs were generated in-house from polypropylene and nylon fibers using a cryostat and subsequently stained with Rhodamine 6G. C57BL/6 mice were divided into three groups (n=10 per group): nylon MP, polypropylene MP, and control. Each mouse in the exposure groups received 5 mg of microplastics via intratracheal infusion. Pulmonary function was assessed terminally using the flexiVent system 1 week later. Mice were then sacrificed, lungs were extracted, sectioned, and subjected to histopathological evaluation by a board-certified veterinary pathologist. All animal procedures were approved by the Institutional Animal Care and Use Committee under protocol #A24-146.
Results: Both MP exposure groups exhibited statistically significant changes in pulmonary function compared to controls, including increased airway resistance, reduced $FEV_{0.05}$, and elevated tissue damping. The nylon MP group showed more pronounced effects, with a significant reduction in FEV/FVC ratio. Histopathological analysis revealed MP accumulation within lung tissue, accompanied by inflammatory changes and marked neutrophil recruitment.
Conclusion: These findings demonstrate that inhaled MPs can induce both structural and functional impairments in the lung within a short timeframe. The observed alterations in pulmonary mechanics, along with histological evidence of inflammation and particle accumulation, highlight the potential for MPs to contribute to respiratory pathology and underscore the need for further investigation into their long-term health effects.

6. Impact of Donor Age on Retinal Progenitor Cell Differentiation from Urine-Derived iPSCs

Daniella Beiner, BS Yuanyuan Zhang, MD PhD

Carol Bosholm, Anthony Atala and Jay Ma, Yuanyuan Zhang
Basic Science

Fellow
Wake Forest Institute Regenerative Medicine (WFIRM)

Purpose: Age-related macular degeneration (AMD) is a progressive eye disease that can lead to significant vision loss. Induced pluripotent stem cells (iPSCs) can be differentiated into retinal pigment epithelium (RPE) cells and photoreceptor cells, which are critical for vision. Urine-derived iPSCs (u-iPSCs) provide a non-invasive and accessible source of cells for regenerative medicine. However, the effect of donor age on the efficiency of u-iPSC generation and subsequent differentiation into retinal progenitor cells (RPCs) remains largely unexplored. In this study, we investigated the influence of donor age on the generation and differentiation of u-iPSCs into RPCs.

Methods: Urine samples were collected from young (n=3, 20-30 years old) and elderly (n=3, 60-70 years old) healthy donors. Urine-derived stem cells were isolated from the urine samples and reprogrammed into iPSCs using a defined reprogramming factor cocktail. The pluripotency of the generated iPSCs was assessed by morphology, expression of pluripotency markers by immunocytochemistry. iPSCs were differentiated into RPCs using an embryoid body-based differentiation protocol. The resulting RPCs were characterized by their expression of retinal progenitor markers (Pax6, Otx2 and Chx10) and their ability to differentiate into different retinal cell types.

Results: There are significant differences in the efficiency of iPSC generation between young and older donors. Young donors showed a higher reprogramming efficiency, with a higher number of iPSC colonies and a shorter time to colony formation. However, both young and senior donor-derived iPSCs exhibited similar pluripotency markers and differentiation potential. RPC differentiation: Both young and senior donor-derived iPSCs differentiated into RPCs with similar efficiency, as assessed by the expression of retinal progenitor markers. However, further analysis of the functional properties of these RPCs, such as their ability to form mature retinal cell types and their response to specific stimuli, is required to fully understand the impact of donor age on RPC differentiation.

Conclusions: Donor age significantly impacts the efficiency of iPSC generation from urine-derived cells, with younger donors exhibiting higher reprogramming efficiency. However, once iPSCs are generated, their differentiation potential into RPCs appears to be less influenced by donor age.

7. Beyond the Mucin Myth: Clinical Determinants of Organoid Success in 223 Appendiceal Cancer Specimens

Helen Bernardi Rathgeb, BS Eleftherios A. Makris, MD PhD

Julia Henault, Caleb Strickler, Sara Muhiczukic, Steven D. Forsythe, Richard A. Erali, Sydney Smith, Damian Chance Hutchins, Tiefu Liu, Nadeem Wajih, Cecilia Schaaf, Perry Shen, Edward A. Levine, Ralph D'Agostino Jr., Adam Hall, Lance Miller, Shay Soker, Konstantinos I. Votanopoulos, Eleftherios A. Makris
Clinical Science
Student
Surgery-Oncology

Introduction: Patient-derived tumor organoids (PTOs) represent a transformative tool for precision oncology, yet their application to rare malignancies like appendiceal cancers remain limited due to perceived biological challenges. Appendiceal tumors, characterized by abundant extracellular mucin and low cellular content, have been widely regarded as unsuitable for organoid establishment, with mucin content traditionally viewed as a major barrier to successful culture. This study systematically evaluated factors influencing organoid generation success in the largest cohort of appendiceal tumor specimens analyzed to date, challenging established assumptions about mucin-related obstacles.

Methods: We retrospectively analyzed 223 tumor specimens collected over the past 10 years from 78 patients with appendiceal cancers undergoing cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (HIPEC) at Wake Forest Organoid Research Center. Specimens underwent standardized processing including enzymatic digestion optimized for mucin-rich tissues, followed by organoid culture in thiol-modified hyaluronan/heparin and methacrylated collagen hydrogel systems. Over 30 clinical, pathological, and processing variables were analyzed using univariate and multivariate regression to identify predictors of successful organoid generation.

Results: Prior surgical intervention emerged as the strongest independent predictor of reduced organoid viability (OR=0.258, p=0.0019), demonstrating a 74% reduction in odds of achieving high viability, likely due to stromal fibrosis and cellular exhaustion. Multi-site sampling significantly enhanced organoid viability (mean difference=+0.649, p=0.0088),

supporting spatial heterogeneity sampling strategies that capture viable, non-fibrotic clones. Post-processing tissue mass <1g independently predicted poor viability outcomes (p=0.0053), establishing concrete procurement thresholds for adequate cellular diversity. Neoadjuvant therapy significantly decreased organoid performance (mean difference=-0.4814, p=0.0393), consistent with enrichment of therapy-resistant, less proliferative cell populations. Same-day processing more than doubled the odds of achieving high viable cell density (OR=2.332, p=0.0926), highlighting the importance of minimizing ischemic time. Importantly, mucin presence did not significantly impair organoid generation, providing reassurance that mucinous tumors should not be excluded from organoid attempts.

Conclusions: Successful organoid generation from appendiceal cancers is significantly influenced by modifiable clinical and technical factors. Key actionable predictors include avoiding previously operated tissue sites, implementing multisite sampling strategies, ensuring adequate tissue mass (>1g), prioritizing same-day processing, and recognizing that neoadjuvant therapy may reduce organoid viability. Crucially, mucin content should not be considered a barrier to successful organoid formation, challenging longstanding assumptions in the field. These findings provide an evidence-based framework for optimizing organoid protocols in mucin-rich, low-cellularity tumors and establish a foundation for integrating appendiceal cancer organoids into functional precision oncology platforms and clinical decision-making.

8. The use of tissue-specific decellularized extracellular matrix (dECM) in GelMA-based organoid models to create physiologically improved cancer models

Randall Bissette, MD Shay Soker, PhD

Zachary Congress, Shay Soker
Basic Science
Resident
Wake Forest Institute Regenerative Medicine (WFIRM)

Introduction: The addition of dECM to GelMA based organoids enhances the 3-dimensional and biochemical environment for cells. This is thought to be related to the physical attributes which can serve as a scaffold or signal for cells, in addition to the organic components native to the ECM, such as collagen and glycosaminoglycans (GAGs) which may better recapitulate the native tissue architecture and associated biological cues. We sought to examine ideal digestion conditions for dECM and assess how organoids made with dECM improve cellular interactions and organoid architecture compared to those lacking dECM (GelMA only).

Methods: Human small intestinal tissue was decellularized via a osmotic shock combined with a detergent method (SDS) to create dECM. This dECM was then digested under various conditions by varying either the solubilization solution or the enzyme used (hydrochloric acid, acetic acid, papain). Addition factors studies included digestant concentration (0.5% vs 1%), time (acetic acid and HCl: 1 day, 2 day, or 3 days; papain: 4-24 hrs), and temperature (acetic acid and HCl: room temperature or 4°C; papain: 37° C). Final dECM samples were analyzed for collagen and GAG content using sircol collagen assay and blyscan sulfated GAG assay. Using the ideal digestion conditions from this experiment, organoids were made using UV cross-linking in a UV-box and consisted of HCT-116 colon cancer cells and/or LX-2 hepatic stellate fibroblast cells. Organoids were made with one or both cell lines, with or without dECM. Alamar blue viability assays were run at days 1, 4, and 7 after organoid printing. Rheology was analyzed at days 1 and 7.

Results: Compared to acetic acid and HCl, papain solubilization was found to have half the collagen content, but 20 times more GAG content. Papain digestion conditions of 250µg/mL papain, 16 hours of digestion, and 37° C were found to yield the highest GAG content. Organoids constructed using HCT 116 and/or LX-2 cells with versus without dECM had slightly higher viability at days 1, 4, and 7, but this requires more studies to confirm. Rheology showed lower stiffness in the dECM group.

Conclusions: Digestion of human colon cancer dECM with papain leads to notably higher GAG content compared to acetic acid or HCl, with a lower collagen content though to a much smaller degree. Organoids constructed with HCT 116 colon cancer cells and LX-2 hepatic stellate cells have a slightly higher viability along with lower stiffness when dECM is added to gelMA solution prior to UV photo box printing. These results lay groundwork for continued future work in unveiling the opportunity to improve organoids via addition of dECM to gelMA solutions.

9. Comparison of Two Retinal Pigment Epithelial Progenitor (RPEP) Differentiation Methods for Urine-Derived iPSCs

Carol Bosholm Yuanyuan Zhang, MD, PhD

Hainan Zhu, Xinyue Zhang, Anthony Atala, Jay Ma, Yuanyuan Zhang
Basic Science
Fellow
Wake Forest Institute Regenerative Medicine (WFIRM)

Introduction: Age-related macular degeneration (AMD) is a leading cause of vision loss in older adults. Cell replacement therapy using retinal pigment epithelial (RPE) cells derived from induced pluripotent stem cells (iPSCs) offers a promising therapeutic approach. Urine-derived iPSCs (u-iPSCs) provide a non-invasive and accessible source of cells for regenerative medicine.
Methods and Materials: To optimize RPE cell generation from u-iPSCs, we compared two commonly used differentiation methods: Embryoid Body (EB) Differentiation and Triphasic RPE Differentiation. Both methods were evaluated for their efficiency, purity, and functional properties of the resulting RPE cells.
Results: Both methods successfully generated RPEP cells from u-iPSCs. EB Differentiation: iPSCs were aggregated into 3D spheroids-like. EBs were cultured in specific media containing growth factors and signaling molecules to induce RPEP differentiation. Triphasic RPE Differentiation: u-iPSCs were induced to differentiate into neuroectodermal cells, neuroretinal progenitor cells and subsequently RPEP cells. However, the EB method demonstrated higher efficiency in terms of cell yield and RPEP cell purity.
Conclusion: By comparing these two methods, we aim to identify the most effective approach for generating functional RPE cells from u-iPSCs. This information will be crucial for developing advanced cell-based therapies for AMD and other retinal diseases.

10. A Novel 3D Printed Simulator to Teach Metacarpal Fixation with Kirschner Wires

Michael Boyajian, MD Kyle Edward Robinson, MD

Eric Zeng, Michael F. Reynolds, Kyle E. Robinson
Educational Science
Resident
Surgery-Plastic & Reconstructive

Purpose:
The purpose of this project was to create a novel simulator to teach metacarpal fixation with Kirschner wires. Using this simulator, we held workshops for junior residents and validated the curriculum via objective pre- and post-workshop assessments on a cadaver model.
Methods:
A novel hand simulator was created using 3D printing and silicone casting. Cost of materials was $25. The beginner model has a transparent silicone skin envelope, and the more advanced model is opaque. A two-hour simulation workshop was held for PGY1 and PGY2 plastic surgery residents (n=5). Survey data was collected.
For objective validation, the participants underwent pre- and post-workshop assessments on cadaveric hands. Their task was to drive K-wires through intact cadaver metacarpals 2-5. X-rays were taken of each attempt, and success or failure was judged on ability to drive K-wires through the entire length of the bone. They got 3 attempts per metacarpal, for a total of 12 attempts. Two fellowship-trained Hand Surgery attendings served as the control group.
Results:
Survey data indicated that participant confidence significantly improved, and simulator feedback was resoundingly positive. Additionally, the participants' objective skill significantly improved. Comparing objective pre- and post-assessments on cadavers, the participants' successful K-wire placement rate improved from 11.7% to 71.7% ($p < 0.001$), compared to the attending control group's 87.5%.
Conclusions:
Exposure to this novel training tool significantly improved junior resident confidence and objective metacarpal fixation skills. Because it can be mass produced and shared, the device potentially has wide applicability within hand surgery training.

11. Adult Dual Kidney Transplantation Following Dual Renal Endarterectomy: A Case Series

Arianna Cabrales, MD Robert Stratta, MD

Jigish Vyas, Rana Kumar, Guiseppe Orlando, Christopher Webb, Alan Farney, Robert Stratta
Clinical Science
Fellow
Surgery-Transplant

Introduction: Dual kidney transplantation (DKT) represents a method of expanding the donor pool and minimizing kidney nonutilization for kidneys with limited functional capacity or marginal characteristics. For kidneys with severe renal artery atherosclerosis, back-bench eversion endarterectomy (EE) may be performed as a salvage procedure to further promote kidney utilization.
Methods: Single center retrospective chart review of all adult deceased donor DKTs performed at our center from 10/1/2001 to 3/1/2025. Recipient selection included primary transplant, low BMI, low immunologic risk, adequate vasculature and bladder capacity, and informed consent. All patients received antibody induction with FK/MPA/prednisone maintenance therapy.
Results: During the study period, we performed 99 DKTs and identified five cases in which both kidneys underwent EE prior to implantation. Two cases in which single EE was performed were excluded. Mean donor age was 60.2±5.5 years, mean KDPI 84±15%, and mean terminal serum creatinine 0.88±0.3 mg/dl. There were 3 expanded criteria and 3 donations after circulatory death donors. Four cases were from donors with a KDPI ≥80%. Nine of the 10 kidneys were managed with hypothermic machine preservation (5 with suboptimal pump parameters) and 2 cases were imported. Percent glomerulosclerosis on biopsy ranged from 7-30% and cold ischemia times from 19.2-33.5 hours. Mean recipient age was 63.0±6.5 years, mean EPTS 65±30%, and mean dialysis duration 19±10.3 months. All recipients were chosen based on out-of-sequence allocation (median match run sequence #1480). Operating times ranged from 4-7 hours; three cases were performed as unilateral and two bilateral extraperitoneal transplants. Three patients experienced delayed graft function; initial length of hospital stay ranged from 3-7 days. At 6 months follow-up, mean serum creatinine was 1.6±0.3 mg/dl and mean GFR 46±17 ml/min/1.73m2. One patient died at 43 months from malignancy after experiencing graft loss at 41 months, but the remaining 4 patients are doing well at a mean follow-up of 29 months. There were no vascular, technical, or surgical complications.
Conclusion: Based on this preliminary experience, we believe that acceptable outcomes can be achieved with DKT in appropriately selected cases, even in the setting of severe donor renal artery atherosclerosis requiring dual endarterectomy.

12. The Use of Pediatric Donors in Pancreas Transplantation

Arianna Cabrales, MD Robert Stratta, MD

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

Introduction: The use of pediatric donors in simultaneous pancreas-kidney transplantation (SPKT) and solitary pancreas transplantation (PTx) is not universally accepted because of concerns regarding an increased risk of surgical complications leading to early technical pancreas graft failure and decreased pancreas graft longevity (related to reduced islet cell mass).
Methods: Single center retrospective review of 310 consecutive SPKTs performed from 11/1/01 - 1/1/25 including 254 with portal- and 58 with systemic-enteric drainage. We also performed 50 solitary PTxs (39 sequential pancreas after kidney [PAK], 11 PTxs alone [PTA]) during the study period. All patients received depleting antibody induction with FK/MPA/prednisone maintenance therapy. Pediatric donors were defined as age <18 years.
Results: In the SPKT group, 72 patients (23.2%) received organs from donors <18 years (mean 13.9 years), 215 from donors 18-40 years (mean 26.4 years), and 23 from donors >40 years of age (mean 47.4 years). Rates of early PTx thrombosis were 5.6%, 6.5%, and 4.3% (p>0.05), according to increasing donor age category. One-year patient survival rates were 98.6%, 98.6%, and 91.3% (p=0.066). One-year death-censored PTx survival rates (GSRs) were 93.0%, 92.0%, and 90.5%; one-year death-censored kidney GSRs were 98.6%, 99.1%, and 95.5% (both p>0.05). Rates of early relaparotomy were 34.7%, 31.2%, and 39.1% (p=0.49). Four-year death-censored pancreas GSRs were 82.3%, 78.7%, and 90.5% (p=0.38). In the pediatric donor group, there were 11 donors ≤40 kg body weight (smallest 28 kg). One-year patient, pancreas, and kidney GSRs were 100% and four-year patient and pancreas GSRs were both 100% and the kidney GSR

was 90%. There were no technical pancreas or kidney graft losses in the ≤40 kg donor group, and PTx survival beyond 18 years follow-up has occurred. In 10 patients receiving solitary PTxs (7 PAK, 3 PTA) from pediatric donors, there were no cases of early thrombosis.
Conclusions: Despite concerns related to small caliber vessels and donor/recipient size mismatch, pediatric donors are associated with excellent mid-term outcomes in SPKT recipients and do not represent a contraindication to pancreas utilization in solitary PTxs.

13. Development and implementation in vitro of an antimicrobial hydrogel for second degree burn wounds

Darnell Campbell, PhD Nicole Levi, PhD

Clinical Science
Student
Surgery-Plastic & Reconstructive

A burn injury occurs when the skin, the body's largest organ, loses its role as a barrier due to thermal or mechanical trauma. Second-degree burns are the most common injury worldwide. The leading cause of complications and mortality in burn wounds are bacterial infections, driven by the formation of biofilms, which are structured communities of bacteria that adhere to surfaces and produce a protective extracellular matrix, making them highly resistant to antibiotics and host defenses. Through the release of signaling molecules, these bacteria coordinate their behavior, multiply rapidly, and undergo genetic changes that enable them to act collectively to release tissue-damaging toxins. Staphylococcus aureus (S. aureus), a common bacterium naturally present on healthy skin, can exploit this process to colonize burn wounds within hours.
Standard treatment for second-degree burns includes wound irrigation to cool the injury, debridement of damaged tissue, and the application of topical antimicrobials such as 1% silver sulfadiazine, or hydrogels to reduce S. aureus colonization. Despite these measures, most commercial hydrogels and silver-based topicals fail to prevent biofilm formation, leading to chronic infections and impaired wound healing. Moreover, repeated dressing changes can cause pain and disrupt new tissue growth, reducing patient compliance.
From a biomedical engineering perspective, the ideal wound dressing should not only deliver antiseptic agents to prevent biofilm development but also support tissue regeneration and minimize pain during dressing changes to improve patient compliance to treatment.
In this study, we present a hydrogel composed of antimicrobial bacterial peptides extracted from probiotic Escherichia coli Nissle 1917 (EcN). The hydrogel is capable of being used as standalone treatment in the prevention of biofilm formation, or as a delivery matrix to enhance the effectiveness of silver sulfadiazine. Our synthesis process involves growing EcN bacterial cultures under proprietary conditions followed by vacuum filtration to remove bacteria and collect material of interest followed by gelation and sterilization of the material.
The hydrogel was characterized for its, viscosity, absorbance capacity, hydrodynamic diameter, and zeta potential. Antimicrobial effectiveness was evaluated against Staphylococcus aureus (S. aureus) Xen 40. Viable colony forming unit (CFU) assays quantified live bacteria remaining after treatment, while crystal violet staining assessed the hydrogel's ability to inhibit biofilm formation. Cytotoxicity was evaluated using a methane-thiosulfonate (MTS) viability assay on healthy 3T3 mouse fibroblasts and primary human dermal fibroblasts, with cellular morphology confirmed by microscopy. The antimicrobial performance of the hydrogel was compared to the commercial burn wound hydrogel, Plurogel, in addition to Plurogel supplemented with silver.
Pre-gelation the viscosity range was found to be in between 6 - 200 cp indicative of a low viscosity solution. Post-gelation, the hydrogel demonstrates good colloidal stability with a consistent zeta potential of -24 mV. The dry hydrogel exhibits a fluid absorbance capacity of 113%. The hydrogel achieved a greater than 80% reduction in S. aureus biofilm formation; however, there was no significant reduction in biofilm formation after silver sulfadiazine was added. The hydrogel alone could not reduce CFU bacteria, yet when combined with silver sulfadiazine this combination resulted in a 91% reduction in CFUs. Notably, the hydrogel at a concentration of 100mg/mL enhanced fibroblast viability, with metabolic activity increasing up to 91% compared to untreated cells. The inherent efficacy to inhibit S. aureus biofilm, synergistic effect with silver and skin cell support make our EcN hydrogel a good candidate for streamlining the treatment of second degree burn wounds.

14. Comparative Outcomes of Split-Thickness Versus Full-Thickness Skin Grafts in Adult-Acquired Buried Penis Reconstruction: A Retrospective Cohort Analysis

Brandon Casas, MD Calder Bennett White, MD

Rezko, David. Chaves, Bruna. Dilley, Kate. Calder, Bennett White

Clinical Science
Resident
Surgery-Plastic & Reconstructive

Background: Adult-acquired buried penis (AABP) is a debilitating condition characterized by phallic entrapment within surrounding soft tissue, most commonly secondary to obesity, lichen sclerosus, or prior urologic surgery. Surgical repair typically involves a combination of penile degloving, escutcheonectomy or panniculectomy, and dermal anchoring to restore penile exposure and function. When local tissue is insufficient for coverage, resurfacing with skin grafts becomes necessary, most often using split-thickness skin grafts (STSG) or full-thickness skin grafts (FTSG). STSG remains the most widely employed technique, offering high graft take rates (>90%), low rates of major complications, and durable functional improvement, including restoration of urinary and sexual function. FTSG, though less commonly used, has also demonstrated excellent graft integration and minimal wound morbidity in select reports. Despite these encouraging outcomes, direct comparative data between STSG and FTSG in adult buried penis reconstruction remain limited. This study aims to evaluate postoperative outcomes, complication profiles, and functional success across grafting techniques in a single-institution cohort.
Methods: A retrospective review was conducted of 27 adult patients undergoing AABP reconstruction at a tertiary academic center between 2015 and 2025. Demographic and clinical variables were extracted from operative and follow-up notes, including age, BMI, comorbidities, smoking status, procedure type, graft use and type, estimated blood loss (EBL), tissue rearrangement size, and intraoperative penile length. Postoperative outcomes assessed included graft take, wound complications, wound severity (graded as none, mild, minor,
moderate, or major), readmission/reoperation, urinary and skin-related issues, and subjective surgical success. Patients were stratified by graft type, STSG, FTSG, or Other/None, and descriptive statistics compared rates of wound complications and overall surgical success between groups.
Results: The mean age was 53.6 ± 12.7 years, and mean BMI was 41.0 ± 10.1 kg/m². Grafts were utilized in 64.7% of cases (n=17), including STSG (n=15) and FTSG (n=2). Across the cohort, the overall complication rate was 55.6%, predominantly minor (33.3%) or moderate (25.9%), with major complications in 7.4% of patients. Functional improvement was documented in 100% of patients with available follow-up, while subjective surgical success was achieved in 79.2%. When stratified by graft type, the STSG group (n=15) demonstrated a 73.3% complication rate, primarily superficial wound issues or partial graft loss, and a 78.6% success rate. The FTSG group (n=2) had 0% complications and 100% success, with all grafts fully integrated and durable coverage maintained at follow-up. While the other/None group (n=10) experienced 40.0% complications and 75.0% success, with minor wound issues resolving with local care. Graft-related complications occurred exclusively in STSG recipients, commonly due to superficial dehiscence or localized infection.
Conclusions: This single-center experience highlights that while skin grafting remains essential for buried penis reconstruction, graft type may influence postoperative outcomes. STSG, although widely used due to ease of harvest and large coverage potential, exhibited higher wound morbidity likely reflecting both greater disease severity and thinner graft resilience in regions prone to moisture and shearing. FTSGs, though less common, demonstrated excellent durability and graft take without major complications in this limited series. Despite these differences, overall functional and cosmetic outcomes were highly favorable across all groups. These findings underscore the need for larger, prospective studies to evaluate long-term graft viability, patient satisfaction, and cost implications between STSG and FTSG techniques in AABP repair.

15. Development of a Chorioallantoic Membrane (CAM)-Based Angiogenesis Platform for Enhancing Neovascularization in Renal Organoid Constructs

Roopa Chalasani, MBBS James Yoo, MD, PhD

Ingrid Johanna Garzon Bello, Young Min Ju, Ji Hyun Kim, John D. Jackson, Anthony Atala, James J. Yoo
Basic Science
Fellow
Wake Forest Institute Regenerative Medicine (WFIRM)

Introduction: Achieving robust vascularization is essential for the survival, growth, and functional integration of organoids in regenerative medicine. Human renal organoids, derived from renal progenitor or pluripotent stem cells, can self-organize into nephron-like structures and demonstrate aspects of kidney development in vitro. However, the absence of functional vasculature restricts their maturation and longevity.
The chorioallantoic membrane (CAM) assay of the developing chick embryo provides a highly vascularized, immunodeficient, and biologically relevant in vivo platform. This platform supports direct host-construct interaction, real-time visualization of angiogenesis, and rapid vascular remodeling without immune rejection.
The CAM model, which is cost-effective, ethically favorable, and compliant with the 3Rs principles (Replacement, Reduc-

tion, Refinement), makes it an ideal intermediate between in vitro culture and mammalian preclinical models. Leveraging these advantages, this study investigated a novel approach to promoting vascularization of human renal organoids using the CAM model. We hypothesized that supplementation with vascular endothelial growth factor (VEGF) and co-culture with endothelial cells (ECs) would enhance angiogenesis, vessel infiltration, and organoid structural preservation compared to the organoid-only group.

Methods:

Human renal organoids were embedded within fibrin scaffolds (250 µL) prepared from a stock solution containing 40 mg/mL fibrinogen, 3 U/mL thrombin, and 40 µg/mL aprotinin. Each scaffold in the VEGF-treated groups was supplemented with 100 ng of VEGF. Scaffolds were implanted on the chorioallantoic membrane (CAM) of chick embryos on embryonic stage day 6, precisely positioned at the intersection of mature blood vessels to maximize host vascular interaction. Three experimental groups were established: (1) organoids-only, (2) organoids with VEGF, and (3) organoids with VEGF plus endothelial cells (5M cells, HUVEC or MS1). Constructs were harvested on day 10 post-implantation and analyzed using gross imaging, histology (H&E), and immunofluorescence staining (CD31, AQP-1, VWF, LTL, HLA) to evaluate vascular infiltration, organoid structure, and host-implant interactions. Vessel and branch counts were quantified, and organoid size dynamics were compared. Statistical significance was determined using the Kruskal-Wallis test.

Results:

We demonstrated that the VEGF supplementation significantly enhanced angiogenesis, endothelial recruitment, and vessel branching compared to the organoid-only group. The VEGF + MS1 group demonstrated the most favorable outcomes, characterized by larger organoid size, enhanced structural integrity, and robust integration with CAM vasculature. In contrast, the VEGF + HUVEC group showed reduced organoid size and delayed CAM vessel infiltration, likely due to their limited adaptation to the CAM's microvascular environment. Organoid-only scaffolds remained smaller and exhibited poor survival despite hypoxia-induced angiogenesis. Statistical analysis revealed significant differences among groups ($p= 0.016$) and significant temporal changes in vitro ($p=0.00044$). Immunofluorescence staining confirmed the presence of endothelial, stromal activation, and preservation of organoid-specific markers.

Conclusion

The CAM assay, which is a powerful, ethically favorable, and cost-effective in vivo platform, offered vascularization and integration of human renal organoids. VEGF plays a crucial role in stimulating angiogenesis and maintaining organoid structure, while the choice of endothelial cell type significantly influences vascular outcomes. Notably, MS1 cells facilitated superior vessel-organoid integration and organoid survival compared to HUVECs. These findings suggest that fibrin scaffolds supplemented with VEGF and endothelial cells provide a promising strategy for generating pre-vascularized renal constructs, advancing their potential applications in regenerative medicine.

16. Development of a Novel Microfluidic Electrochemical Biosensor Platform for Longitudinal Monitoring of Organoid Immune Systems

Joshua Cheng Anthony Atala, MD

Kyung Eun You, Seth Kinoshita, Sang Jin Lee, Adam Hall, Sean Murphy, James J. Yoo, Anthony Atala, Shay Soker
Basic Science
Student
Biomedical Engineering

Monitoring biological markers is essential for understanding dynamic immune responses in research and clinical settings. Microphysiologic systems, including organ-on-a-chip platforms, enable sophisticated modeling of human tissues and immune function, but current detection methods limit their full potential. Immunoglobulins (IgG, IgA, IgM) are critical indicators of immune activity, but gold-standard enzyme-linked immunosorbent assays (ELISA) require time-consuming, manual procedures which only allow measurements at occasional timepoints. To address this limitation, we developed a microfluidic electrochemical biosensor platform capable of real-time, multiplexed detection of human immunoglobulins with performance matching or exceeding ELISA. The sensors use a standard antibody-based capture approach but incorporate two key innovations: electrode surfaces enhanced with carbon nanotubes to improve signal sensitivity, and integration into a microfluidic chip that enables continuous flow measurements. These design features work together to dramatically improve sensor performance compared to conventional static detection methods. The platform achieved detection limits of 1 ng/mL with linear ranges exceeding 400 ng/mL and demonstrated high specificity with no cross-reactivity to non-target proteins. We validated the system by monitoring immunoglobulin secretion from cultured immune cells, with results confirmed by ELISA. This technology offers significant advantages for both research and clinical applications, enabling automated, continuous monitoring of multiple biomarkers simultaneously. The modular design integrates easily with existing microphysiologic systems and can be adapted to detect diverse protein targets beyond immunoglobulins, providing a versatile platform for biomarker detection.

17. The Peritoneal Thromboinflammatory Environment is Associated with Epithelial Glycocalyx Loss During Abdominal Adhesions Formation

Reid Christemsen, BS Samuel P. Carmichael II, MD PhD

David M. Kline, Hannah C. Ainsworth, Kevin A. Jankowski, Christopher A. Marks, Ryan M. Kelly, Alexei V. Mikhailov, Nathan L. Fearby, Kristina Stumpf, Lysette A. Mutkus, Hadi Pourhadi, Jingyun Lee, Cristina M. Furdui, Frank C. Marini, Jessica C. Cardenas, John B. Holcomb, Anthony Atala, Samuel P. Carmichael II
Basic Science
Student
Wake Forest Institute Regenerative Medicine (WFIRM)

Introduction:
Adhesions are scar tissue networks that develop in the abdomen after 90% of operations. The innate immune system, coagulation system, and peritoneal mesothelial cells (PMC) work in concert to create a post-surgical thromboinflammatory environment (TIE) whereby coagulation drives inflammation. PMCs normally prevent the TIE by expressing an anti-friction epithelial glycocalyx (EpGL) and regulators of coagulation. Therefore, we propose that loss of the EpGL following surgical injury leads to TIE induction.
Methods:
We employed a rat model of abdominal adhesions to study tissue and peritoneal fluid at baseline, 24hrs, 72hrs, and 14d after laparotomy. Transmission electron microscopy (TEM) allowed quantification of EpGL height on PMCs. Immunofluorescent staining with confocal microscopy measured changes in PMC markers of adhesion formation and EpGL biomarkers (MSLN, αSMA, Muc16, Syndecan-1). Proteomic analysis was conducted by LC-MS/MS of the peritoneal fluid.
Results:
EpGL height decreased after injury, with interval regrowth. PMCs underwent a mesothelial-to-mesenchymal (MMT) fibroproliferative transformation. Immunofluorescence demonstrated an increase in αSMA and decrease in Syndecan-1. MSLN was elevated at 24h, and Muc16 was elevated at 14d. Mass spectrometry showed 24h increases in coagulation factor-X, fibrinogen beta-chain and fibrinogen gamma-chain. Tissue-type plasminogen activator and plasminogen activator inhibitor-1 were detectable at 24h.
Conclusion:
The thromboinflammatory response to surgical injury is promoted by changes to cellular and acellular fractions of the peritoneal cavity. Destruction of the EpGL is associated with loss of native anti-thrombotic architecture, and regeneration suggests proliferation of pro-thrombotic features. EpGL loss in the post-surgical abdomen contributes to the peritoneal TIE and promotes adhesion formation.

18. Assessment of Geographical Limitations to Access to Otolaryngology Care in the Southeast US

Sarah Clark, MD Lyndsay L Madden, DO

Jim Ruckart, Lucas Klever, Mary Dover, Sabine Abukhadra, Alexa Lacy, Lyndsay L Madden
Clinical Science
Resident
Surgery-Otolaryngology (Dentistry)

Objectives: There is a substantial shortage of otolaryngologists across the United States (US), more pronounced in rural regions. This leaves geographical "deserts" that lack access to services, resulting in greater disparities. We investigate access to care in the Southeast stratified by drive times and by ratio of otolaryngologists relative to the population in each Designated Market Area (DMA).
Methods: Data were collected for Southeast US otolaryngologists via publicly accessible databases. We also identified level I trauma centers serving the Southeast as a proxy for access to the most comprehensive services. Results were analyzed through creating heat maps using the Smappen™ online location intelligence platform.
Results: Data were represented visually via heat mapping and included the percentage of each DMA's population that lives within 1 hour of a level I trauma center, both in-state and out-of-state. We also calculated the ratio of otolaryngologists per 100,000 people in each DMA. Data showed that drive time and geographic proximity were significantly variable within and between states; there was an overall shortage of otolaryngologists in the Southeast. Despite most people living within one hour of an otolaryngologist, many people live in a geographic desert relative to access to full-spectrum care.
Conclusions: This data adds to existing literature with novel analysis of time-based access to care, highlighting inequi-

ties of accessibility for rural populations in the Southeast US. Public health leaders, policy advocates, hospital systems, and physicians can gain insight into specific needs for improved geographic access to otolaryngology care in underserved areas.

19. Surgical staff perceptions of the environmental impact of operating rooms and potential sustainability interventions

Sarah Clark, MD Joshua Waltonen, MD

S. Carter Wright Jr., Elizabeth Presutto, Joshua Waltonen
Clinical Science
Resident
Surgery-Otolaryngology (Dentistry)

Introduction:
Researchers estimate that ~30% of worldwide health-related disease is surgical, and over four billion pounds of waste are produced by operating rooms per year in the US alone. This survey aimed to assess surgical staff's perceptions of operating room (OR) environmental impact to inform future sustainability efforts.
Methods:
This survey (March - June 2024) was sent to operating room stakeholders (e.g., attending surgeons, residents, scrub technicians, nurses) via RedCap. It included 34 Likert-style questions regarding attitudes and perspectives about various factors related to OR resource utilization as well as demographic information. Descriptive statistics were calculated.
Results:
A total of 197 OR staff members completed the survey. Attending surgeons and anesthesiologists represented 35% of participants, 21% were trainees, 19% APPs, 17% RNs, 4% scrub techs, 3% central processing staff, and 5% other roles. An example question was "Education about the environmental impacts of various OR practices should be part of training for all OR stakeholders" with 3% reporting strongly disagree or disagree, 10% reporting a neutral opinion, and 73% reporting agree or strongly agree. The remainder did not provide a response. Another example was "Healthcare systems should adopt practices and policies that improve sustainability of the operating room." Of the 178 participants who responded, <1% disagreed or strongly disagreed, 5% had a neutral opinion, and 84% agreed or strongly agreed.
Conclusions:
There was a belief that a lack of education and individual value placed on sustainability concerns are significant drivers of environmental impact; however, many respondents did not believe the individual can make a difference. Topics such as perceived safety and performance benefits of single-use items were thought to play a smaller role. Most participants believed regulatory bodies, healthcare systems, professional societies, and manufacturers should play a larger role in promoting sustainability efforts.

20. Early Outcomes Post Carotid Baroreceptor Stimulation Device Implantation for Advanced Heart Failure

Mark Cordell Jr. Bartlomiej Imielski, MD

M.B. Cordell, D.S. Raman, A. Howardgreen, S. Tingey, R. Garcia, G.A. Stanley, T. Craven, A. Villenthi, B.R. Imielski
Clinical Science
Student
Surgery-Cardiothoracic

Introduction: Heart failure is the leading cause of cardiac mortality in the United States. Advanced disease states with NYHA III/IV heart failure have limited therapeutic options after reversible causes have been corrected, including goal-directed medical therapy, ICD and CRT implantation, and evaluation for advanced therapies such as heart transplant and left ventricular assist devices. However, in patients who are not candidates for advanced therapies, with worsening symptoms despite GDMT, carotid baroreceptor stimulation offers a new therapeutic intervention to improve quality of life and possibly longevity.
Methods: We retrospectively reviewed heart failure (HF) patients implanted with the Barostim Neo2 carotid baroreceptor reflex activation therapy device, from 2024 to 2025, who underwent Barostim Neo2 implantation at Atrium Health Wake Forest Baptist and Atrium Health Carolinas Medical Center. The primary outcome included survival, and the secondary outcomes included major adverse events, hospital length of stay, and readmission. Statistical analyses were performed us-

ing R (v4.4.0). Pre-, intra-, and one-month post-operative characteristics were described using frequencies, percentages, medians (IQR), means, and standard deviations.
Results: Among 28 patients, the average age was 70, with 89% having NYHA Class II or III HF. Comorbidities included hypertension (93%), coronary artery disease (89%), and atrial fibrillation (89%). Prior cardiac procedures were common (96%), including PCI, ICD, catheterization, and angiography; 39% had prior cardiothoracic surgery (CABG: 8, AVR: 2, MVR: 3). Pre-op median NT-proBNP was 891. Pharmacotherapy included ARNI (85%), beta blockers (89%), diuretics (89%), mineralocorticoids (82%), and SGLT2 inhibitors (71%). At one month, there was 0% mortality and 3.8% HF-related hospitalization. Pain (15%) and numbness (27%) at the insertion site resolved by follow-up. Two patients improved from Class III to II (not statistically significant). However, ARNI prescription significantly decreased from 24 to 20 patients post-op (McNemar's test, $\chi^2 = 4.0$, $p = 0.0455$).
Conclusion: Barostim therapy was safe and well-tolerated, with minimal post-op symptoms. Many patients reported improved exercise tolerance and reduced medication burden at one month. Some showed NYHA class improvement. Future directions include routine post-op TTE, QOL assessments (Minnesota QOL, 6MWT), and follow-up lab markers.

21. Manipulating the Microbiome to Alleviate Anti-cancer Treatment-induced Cardiovascular Toxicity

Zipporah Cornelius, MS Katherine L. Cook, PhD

Adam S. Wilson, Valerie Payne, Eleanor Cyrus, Kenysha YJ. Clear, David R. Soto-Pantoja, and Katherine L. Cook

Basic Science
Student
Surgery-Hypertension

Background: Pre/peri-menopausal women with hormone receptor + (HR+) breast cancer undergo near complete estrogen deprivation (NCED) that includes ovarian suppression and aromatase inhibitors (AIs) therapy, as standard-of-care to eliminate estrogen. Furthermore, women are treated with adjuvant AIs for as long as 5-10 years. Despite an efficacy rate of 40% reduction in HR+ breast cancer mortality, a subset of patients experience relapse. Metastatic HR+ breast cancer patients are treated with either AIs or fulvestrant (ICI), a selective estrogen receptor degrader (SERD), in combination with cyclin-dependent kinase 4/6 inhibitors (CDK4/6i). Both AIs alone and in combination with CDK4/6i have shown to improve breast cancer outcomes. However, follow-up studies demonstrate their association to cardiotoxic damage. Previous studies have shown Lactobacillus probiotics supplementation alters the microbiome, reduces breast tumorigenesis, and improves menopausal-induced cardiometabolic syndrome. Thus, the purpose of this study is to determine the impact of diet and probiotic supplementation on ameliorating HR+ breast cancer therapeutic responsiveness and counteracting therapy-induced cardiac damage. Our central hypothesize is that a healthy diet or Lactobacillus-based probiotic intervention will reduce tumor progression and improve cardiovascular disease outcomes in advance HR+/HER2- breast cancer mouse model.
Methods: Ten-week-old female BALB/c (n=70) mice were subjected to either ovariectomy (OVX) or sham. Mice placed on either on a healthy-control diet (21% kcal fat) or a high-fat diet (45% kcal fat), were treated with or without Letrozole (AIs) and injected with 1 X 106 4T1.2ER+ luciferase ER+BC cells in the mammary fat pad. Vevo cardiac ultrasound and Echo-MRI were performed. Tumors grew for 4 weeks before sample collection. Eight-week-old female BALB/c mice (n = 60) were started on a Western diet upon arrival. Mice were randomized into one of six treatment groups: untreated control, probiotics only (Probx; 2×10^8 CFU Lactobacillus spp.), Letrozole (AIs) + Ribociclib (CDK4/6i), ICI + CDK4/6i, Probx + AI + CDK4/6i, or Probx + ICI + CDK4/6i. Once acclimated, our syngeneic 4T1.2ER+ breast cancer cell line (1×10^6 cells) was transplanted into the left inguinal (L4/5) mammary fat pad. Tumors were allowed to reach 100 mm^3 before initiating treatment, which was administered for 21 days. Tumor volume and weight were measured three times weekly using calipers until the study endpoint.
Results: In our near complete estrogen deprivation (NCED) cardio-oncology animal model, OVX with AI reduced tumor volume in both diets suggesting NCED significantly reduces tumor volume despite diet intake. AI-treated mice fed a western developed elevated left ventricular pressure and reduced ventricular relaxation time indicating AI negatively regulate ventricular diastolic function. An increase in arterial stiffness was observed only in OVX+AI treated mice fed a western diet, indicating a relationship between NCED and high fat diets reducing vascular elasticity. Similarly, OVX+AI treated mice fed a western diet showed elevated levels of fibrotic deposition in both the interstitial space and perivascular space in the heart. To assess whether cardiac fibroblast activity, we determined cardiac vimentin immunohistochemistry levels. There were no significant difference of vimentin levels among treatment groups. However, a significant increase of cardiac resident macrophages in the OXV+AI-treated mice fed a western diet was observed. Overall, these finding suggest AI promoted metabolic co-morbidities, promoted fibrosis-induced diastolic dysfunction and cardiac resident macrophage population. In our advanced 4T1.2ER+ breast cancer animal model, the addition of probiotics supplemented with the combinational therapeutics (AIs or ICI with CDK4/6i), significantly reduces tumor volumes. Tumor weights attenuated significantly in ICI

treated groups compared to control and probiotics alone. Our cardiac data displayed both ICI and AI-treated groups alone significantly increased E'E and IVRT but reduced by in groups supplemented with Lactobacillus. We sought to assess the expression of pro-fibrotic TGF-β/Smad-dependent pathway. We found a trending reduction of expression in this pathway amongst probiotic groups compared to non-probiotic groups, suggesting Lactobacillus may be able to regulate the activation of f TGF-β/Smad-dependent pathway.
Conclusion: Our findings highlight a relationship of both NCED and combinational CDK4/6i with endocrine therapeutics in components driving cardiac fibrotic deposition resulting in diastolic dysfunction. Additionally, a high fat is shown disrupting metabolic function as well as cardiac function. However, a healthy diet or probiotic supplementation with Lactobacillus significantly improved treatment efficacy and ameliorated drug-induced cardiotoxicity. Our data provides a feasible and accessible approach to address drug toxicity in the cardio-oncology setting.

22. The Limits of Microsurgery: Proprioceptive-visual-motor accuracy and latency thresholds preclude supra-microsurgical applications

Joyce Cui, BA Ramon Llull, MD, PhD

Michael Boyajian, Thomas Steele, Bennett Calder, Ramon Llull
Basic Science
Student
Surgery-Plastic & Reconstructive

Introduction: Expanding the frontiers of microsurgery to resolve micrometric structures opens a clinically unbound horizon. Advances in operator-independent optical and robotic aids amplifying human micromotion fail to address intrinsic operator-dependent limitations such as
proprioception, a sixth human sense critical to microsurgical skills, compounded by visual inputs and motor outputs.
Methods: Calibrated video recordings of microneedle tip trajectories were analyzed for trainees (n=10) and experienced surgeons (n=3) . Path 2D coordinates were mapped using direct linear transformation . Each 3000 µm path was defined as: start and end offsets to target, vector direction, velocity, and correction latency. Means, SD, and range described precision and accuracy.
Results: Trainees exhibited wider starting positions and struggled with irregular directional and velocity control. Both groups showcased similar correction continual patterns (5-13 degrees every 300-600 ms), consistently missing the target. Trained surgeons achieved end offset precision of 96.5 ± 24.7 µm, range 256 µm, compared to trainees (288.70 ± 32.72 µm, range 479 µm).
Conclusion: Training leads to improved initial alignment, path uniformity, precision and accuracy. Arguably, expert hands fail to effectively interpose sutures amid a 500 µm gap. This limit appears associated to an operator inherent proprioceptive-visual-motor continual response, and support our aspiration to identify obstacles to microsurgery advancement, new training methods to overcome them, and guidelines to improve optical and robotic aids.

23. Comparing Outcomes in Obese Patients: Deep Inferior Epigastric Perforator Flap vs. Implant-Based Breast Reconstruction

Caitrin Curtis Thomas Steele, MD

Caitrin Curtis, MD; Eric Zeng, BS; Joyce Cui, BA; Anna Stipe, Abigail Heilenman, , Lilian Galarza Paez, BS; Mary L. Duet, MD; Adam Katz, MD1; Bennett Calder, MD Thomas Steele, MD
Clinical Science
Resident
Surgery-Plastic & Reconstructive

Introduction: Obesity increases the risk of complications in deep inferior epigastric perforator (DIEP) flap breast reconstruction, particularly infection rates and donor site morbidity. Efforts to define an appropriate BMI cutoff for DIEP flap candidacy remain controversial. Implant-based breast reconstruction (IBBR) is often considered an alternative, though it also carries higher complication rates with increasing BMI. This study compares complication and revision rates in obese patients undergoing DIEP flap versus IBBR.
Methods: A retrospective review was conducted of patients who underwent breast reconstruction at two institutions from 2017 - 2024. Patient demographics, operative details, post-operative complications, and revision surgeries were analyzed. Major complications were defined as those requiring unplanned surgical intervention. Patients were categorized into DIEP

flap and IBBR groups and further stratified by obesity status: non-obese (BMI <30), class 1 obesity (BMI 30-34.9), and class 2 obesity (BMI ≥35).
Results: A total of 1,308 patients were included, with 895 undergoing DIEP flap reconstruction and 413 undergoing IBBR. In patients with class 1 obesity, DIEP was associated with a higher rate of minor complications compared to IBBR (50% vs. 20%, p<0.0001), a trend that persisted in class 2 obesity (62.6% vs. 25%, p<0.0001). However, major complication rates did not differ significantly between groups. DIEP patients had significantly higher successful reconstruction completion rates than IBBR patients both in class 1 obesity (98.5% vs. 75%, p < 0.0001) and class 2 obesity (98.9% vs. 84.9%). Additionally, DIEP patients had higher revision rates, with class 1 patients requiring revision in 61.2% of cases vs. 36.7% for IBBR (p<0.0001) and class 2 patients requiring revision in 64.2% vs. 41.5% of cases (p<0.0001).
Conclusion: Despite higher rates of minor complications and revisions, DIEP flap reconstruction consistently demonstrated higher success rates across all BMI categories compared to IBBR. These findings suggest that while DIEP flap reconstruction may require more postoperative adjustments, it provides a more reliable reconstructive outcome for obese patients. Further research is needed to refine surgical decision-making and postoperative care strategies for this high-risk population.

24. Selective PKC-βII Inhibition Improves Skeletal Muscle Contractility and Gait Recovery Following Tourniquet-Induced Hindlimb Ischemia-Reperfusion Injury in Mice

Tameka Dean, MD Xue Ma, MD/PhD

Kaitlin Cruz, Christopher Franco, Deja Seibert, Donna-May Bernard, Xue Ma
Basic Science
Resident
Surgery-Orthopedics

Introduction: Prolonged tourniquet application for extremity trauma in prehospital settings can lead to significant skeletal muscle damagedue to ischemia-reperfusion (I/R) injury. Previous rodent studies suggest that I/R injury contributes to long-term deficits in muscle strength due to mitochondrial dysfunction and oxidative stress, resulting in inhibited satellite cell activation and delayed muscle fiber repair.1,2 In preliminary studies, we demonstrated that Ruboxistaurin (RBX), a selective inhibitor of PKCβII-mediated mitochondrial redox protein p66Shc activity, significantly decreases mitochondrial reactive oxygen species (ROS) in murine satellite cells in vitro.3 We hypothesized that RBX would attenuate ROS-mediated damage and restore muscle strength and function to pre-injury baseline following tourniquet-induced hindlimb I/R injury in mice.
Methods: All animal procedures were approved by the Institutional Animal Care and Use Committee (IACUC) of Wake Forest University Health Sciences. Hindlimb ischemia was induced using an orthodontic rubber band tourniquet applied to the left thigh of 6-month-old male (n=8) and female (n=8) C57BL/6J mice for 3h. Mice were randomly assigned to a 2-week or 9-week recovery cohort. RBX or saline was delivered via subcutaneously implanted osmotic pumps. Functional recovery of the ischemic hindlimb was assessed weekly using DigiGait software. Gait metrics were normalized to Day-0 baseline values to evaluate recovery trends (L/L baseline ratio). At study endpoint, electrodes were placed into the gastrocnemius (GC) and tibialis anterior (TA) muscles of both experimental (left) and control (right) limbs to measure muscle force (mN/g) and contraction amplitude. Nerve conduction studies on bilateral sciatic nerves were performed using electromyography. Muscle contractility was evaluated by averaging three consecutive compound muscle action potentials (CMAPs). Left limb force, CMAP, and nerve conduction velocity (NCV) were normalized (L/R ratio) to the contralateral limb to account for inter-animal variability. Independent and paired t-tests were performed using SPSS software.
Results: RBX-treated mice in the 9-week cohort demonstrated significantly increased muscle force (mN*g) compared with saline controls at 40 Hz (97 ± 7 vs 26 ± 12; p=0.01), 60 Hz (98 ± 15 vs 23 ± 8; p=0.01), and 80 Hz (111 ± 23 vs 20 ± 7; p=0.02). When normalized to the contralateral limb, RBX-treated mice in the 9-week cohort showed significant improvement in muscle force at 60 Hz (p=0.003), 80 Hz (p=0.047), and 100 Hz (p=0.007) compared with RBX-treated mice in the 2-week cohort. However, RBX mice were not statistically different from saline controls within each cohort. No significant increases in muscle force were observed between the 2-week and 9-week cohorts in saline-treated mice after normalization. EMG analysis demonstrated time-dependent recovery for both saline and RBX groups, with significant improvements in CMAP and NCV at 9 weeks compared with 2 weeks (p<0.05). However, when normalized to the contralateral limb, only RBX-treated mice retained significant increases in tibialis anterior and gastrocnemius contractility at 9 weeks. RBX-treated mice also exhibited earlier recovery of gait parameters between Days 21-42, characterized by increased stance and propulsion duration, higher stance-to-swing ratio, and improved gait symmetry (p<0.05).
Discussion: Tourniquet use is often essential for limb salvage in lower-extremity trauma but can induce significant I/R-mediated injury that poses a major barrier to full muscle recovery. This study suggests that pharmacologic inhibition of PKCβII with Ruboxistaurin promotes functional restoration of skeletal muscle following tourniquet-induced I/R injury in

mice. RBX-treated mice exhibited significantly greater muscle contractile force and compound muscle action potentials at later recovery stages, accompanied by earlier improvement in gait symmetry and stance parameters compared with saline controls. These findings suggest that RBX enhances both neuromuscular conduction and contractile function, possibly through attenuation of mitochondrial ROS and preservation of satellite cell regenerative capacity. In future studies, histologic analysis of the tibialis anterior and gastrocnemius muscles from 2- and 9-week cohorts will be conducted to further characterize preservation of neuromuscular junction integrity and acceleration of myofiber regeneration as potential mechanisms of recovery.

25. Exploring Hibernation Mechanisms through the Lens of Human Organoid Models

Jonathan Diaz, PhD Christopher D. Porada, PhD

Jonathan H. Diaz, James Rice, Caleb Heathershad, Sarah Wachtman, Frido Welker, Jorsua Bethencourt, Vijay Gorantla, Tom Shupe, Alan Jacobson, Xu Han, Philp Kramer, Paul F. Wilson, Joshua T. Maxwell, Anthony Atala, Graça Almeida-Porada, Christopher D. Porada
Basic Science
Student
Wake Forest Institute Regenerative Medicine (WFIRM)

Astronauts on long-duration deep space missions face extreme physiological and psychological stressors, requiring advanced life support strategies. Inducing a hypometabolic state in astronauts could mitigate these challenges by reducing the psychological impact and the physiological harm induced by exposure to space radiation, while conserving vital resources. Our research leverages human organoids and insights from the proteome and genome of an extinct line of hibernating hominins to investigate this concept and understand human hibernation capabilities. We developed organoids representing cardiac, trabecular bone, and liver tissues to study the effects of reduced glucose and temperature, mimicking a torpor-like state. These studies identified survival thresholds for the organoids under torpor-like conditions characterized by hypoglycemia and hypothermia. To advance this work, we introduced 5' AMP and cryopreservation media to evaluate their efficacy in maintaining torpor-like hypermetabolic states. Simultaneously, we exposed the organoids to deep-space-equivalent space radiation to assess whether simulating a torpor-like state could act as a protection. Preliminary results suggest that 5' AMP effectively sustains hypometabolic states in liver organoids, while cryopreservation media appears to pause activity in cardiac models, indicating a potential torpor state. We have also observed that radiation exposure impacts organoid function, paving the way for future investigations. These findings are pivotal for advancing long-duration space missions by potentially reducing metabolic needs and protecting human tissues from space-related radiation stressors. Beyond space exploration, this research could have significant implications in medical fields such as organ preservation and trauma care.

26. Infection Risk Reduced With AV Access vs Catheter in Hemodialysis Patients

Crystal Diaz, MD Matthew P Goldman, MD

A Kuzma, N Edwards, M Goldman, T Craven, M Murea, A Stutsrim, G Velazquez, J McClung
Clinical Science
Resident
Surgery-Vascular & Endovascular

Objectives:
Infection and access-related complications are a leading cause of morbidity and mortality among hemodialysis (HD) patients. Vascular access type is a critical determinant of this risk. Arteriovenous (AV) access is associated with lower infection risk; however, many patients begin HD with a central venous catheter (CVC). Transition to AV access is widely advocated, yet whether this benefit is consistent across patient subgroups is unclear. We evaluated whether conversion from CVC to AV access reduces infection-related hospitalizations in HD patients.
Methods:
We performed a retrospective cohort study of 2,159 patients who initiated chronic HD with a CVC between 2015-2022 at a large North Carolina healthcare system. Of these, 2,136 with complete hospitalization data were analyzed. Hospitalizations were extracted from electronic medical records, with infection-related admissions identified using ICD-10 codes; non-CVC infections were excluded. Time-varying covariates captured conversion to and abandonment of AV access, and access type over follow-up. Recurrent event analysis used shared frailty models with gamma frailty distribution and

counting process input. A second model included baseline covariates: age, sex, race, diabetes, amputation history, living situation, ambulation and transfer ability, need for daily activity assistance, and serum albumin, hemoglobin, and ferritin at dialysis onset.

Results:

Among 7,906 hospital admissions during follow-up, 503 (6.4%) were infection-related CVC admissions. Patients who converted at least once from CVC to AV access had a significantly reduced risk of infection-related hospitalization (HR 0.65; 95% CI 0.48-0.87; p=0.005). Use of AV access during follow-up was associated with a 49% lower instantaneous risk of infection-related hospitalization (HR 0.51; 95% CI 0.40-0.65; p< 0.0001). Patients with AV grafts had more than double the risk compared with those with fistulas (HR 2.09; 95% CI 1.51-2.89; p< 0.0001). Multivariable models adjusting for baseline covariates yielded similar estimates. Other factors linked to increased infection risk included older age, diabetes, and lower hemoglobin at HD initiation.

Conclusion:

Conversion from CVC to AV access is associated with a significant reduction in risk of infection-related hospitalizations. This result is strengthened by the consistency of AV access, assessed in a time-varying manner during follow-up dialysis. Prompt conversion to AV access from CVC may reduce infection-related morbidity and mortality. This study provides strong support for early conversion to AV access as a key strategy to improve patient outcomes.

27. IMPACT OF PRE-HEMODIALYSIS NEPHROLOGY CARE AND COMORBIDITY BURDEN ON TYPE OF VASCULAR ACCESS AT DIALYSIS INITIATION

Crystal Diaz, MD Gabriela Velazquez Ramirez, MD

N Edwards, G Velazquez, M Goldman, R Davis, M Murea, J Stafford, T Craven
Clinical Science
Resident
Surgery-Vascular & Endovascular

Objectives:

End-stage renal disease is prevalent in the US with variable pre-hemodialysis (HD) nephrology (preHDn) care. We aimed to determine if length of preHDn care and comorbidity burden impacted type of access created at time of HD initiation; hypothesizing that longer preHDn and lower comorbidity burden will be associated with higher rates of arteriovenous (AV) access with either fistula or graft (AVF or AVG) versus catheter (CVC).

Methods:

We conducted a single-institution, retrospective review from 2015-2019 on a cohort of 1,978 patients on HD. The outcome was type of AV access at HD initiation. The primary covariates were preHDn care (none, < 6 months, 6-12 months, and >12 months) and comorbidity burden (Low, Moderate, High). Logistic regression models evaluated progressive levels of preHDn, comorbidity burden, and their interaction, both with and without adjustment for age, sex, race, insurance status, and distressed community quintiles.

Results:

Among N=1978 patients [mean(SD) age: 64.3(14.2), 43% female, 56% non-Hispanic White], patients with < 6 months [OR(95%CI) 3.9 (2.4, 6.6), p< 0.0001] and 6 -12 months[OR(95%CI) 1.8 (1.1, 2.7), p=0.0096] of preHDn follow-up showed significantly higher odds of AV access creation compared to their respective preceding categories. No significant difference between 6 -12 months and >12 months was observed. Of 1,978 patients, 1,634 (83%) initiated HD with CVC and 344 (17%) with AVF/AVG. Patients with moderate comorbidity burden had significantly lower odds of AV access creation versus low burden [OR(95%CI) 0.7 (0.5, 0.9), p=0.0128]. The interaction term was non-significant. Results were consistent in adjusted models.

Conclusion:

Findings demonstrate both preHDn care and lower comorbidity burden are significantly associated with increased odds of AV access creation at the time of HD initiation, as opposed to catheter use. The advantage of preHDn care plateaus after 12 months. Higher comorbidity burden did not diminish the positive impact of nephrology care on AV access creation, underscoring the universal value of early intervention. These results highlight that patients who initiate HD without prior nephrology follow-up face delays in establishing permanent vascular access, reinforcing the critical role of timely preHDn care in optimizing dialysis readiness.

28. Perforator and Pedicled Flap Reconstruction for Hidradenitis Suppurativa: A Review of the Literature

Katherine Dilley Kyle Edward Robinson, MD

Samuel Kogan, Kyle Edward Robinson
Clinical Science
Student
Surgery-Plastic & Reconstructive

Background: Hidradenitis suppurativa (HS) is a chronic and debilitating disease, in which reconstructive approaches vary among surgeons. While secondary intention healing (SIH), primary closure, and skin grafting are commonly performed, perforator and pedicled flaps are an increasingly popular alternative reconstructive technique. Compared to traditional techniques, flaps offer the unique advantage of transferring vascularized healthy tissue free of disease, do not require extensive postoperative wound care, and offer robust coverage for complex defects.

Methods: A literature review was performed according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. PubMed was searched to identify all articles pertaining to reconstructive surgery for HS using perforator and pedicled flaps. Data collected included patient characteristics, operative techniques, complications, recurrences, and revision surgeries.

Results: A total of 129 articles were screened, and 29 studies (222 patients, 234 flaps) met inclusion criteria. Anatomic locations included axillary (81.6%), inguinal (5.6%), and perineal/perianal/gluteal (12.8%). Complications were reported in 46 cases (19.7%), including dehiscence, necrosis, venous congestion, hematoma, and infection. Rates of disease recurrence (3.2%) and revision surgery (5.4%) were found to be lower than those reported in published studies on SIH and skin grafting for HS reconstruction.

Conclusions: Perforator and pedicled flaps are a reliable and effective technique for the reconstruction of HS defects. They allow for complete resection of diseased tissue and enable reconstruction of large defects with decreased recurrence, reduced need for revisionary surgery,
and minimal postoperative morbidity compared to closure techniques classically used for this debilitating disease.

29. CT Prevention in Sagittal Craniosynostosis: The Clinical Utility of 3D-Photography as a Diagnostic Tool

Katherine Dilley Christopher M. Runyan, MD, PhD

Mario S. Blondin Griffin P. Bins Christopher M. Runyan
Clinical Science
Student
Surgery-Plastic & Reconstructive

Purpose: Computed tomography (CT) is the gold standard for diagnosing craniosynostosis. Despite the known risks of pediatric radiation exposure and possible sedation or general anesthesia, CT imaging is indicated for all cases of suspected craniosynostosis, regardless of clinical examination findings. The present study evaluates the potential reduction in CT scans that could be achieved by utilizing 3D-photography as a diagnostic tool for sagittal craniosynostosis (SC).
Methods: Surface-based indices describing cranial morphology were extracted from 3D-photographs of individuals ages 0 to 18 months who were suspected of SC and referred by craniofacial surgeons for CT between 2018 and 2025. To evaluate their utility as a primary screening tool and their ability to confirm a diagnosis, "rule-out" and "rule-in" index thresholds were created, respectively, and applied to the study population.
Results: 3D and CT imaging was obtained for identified patients suspected of SC (n = 115). A two-step diagnostic model was designed and applied to the study population to evaluate its utility in the clinical setting. Applying "rule-out" and "rule-in" index thresholds could have prevented 73.04% (84/115) of CTs (sensitivity = 100%; specificity = 99.52%). For patients who did not meet threshold criteria, SC diagnosis was excluded if the index percentile scores totaled 10 or less (sensitivity = 97.78%). Overall, this model could have prevented CTs in 77.39% (89/115) of patients.
Conclusions: 3D-photography offers an accurate and reliable point-of-care screening tool for SC that could relegate diagnostic CT imaging to only those who are most difficult to diagnose.

30. In Vivo Tracking of Injected Microplastics Using Fluorescent Labeling

Jarrett Dobbins, BSE Rajeev Dhupar, MD, MBA

Charles Bardawil, Shannon Lankford, Rajeev Dhupar
Basic Science
Student
Surgery-Cardiothoracic

Introduction:
Microplastics (MPs) are prevalent and have been detected in food, water, and air. Studies have established that ingestion, inhalation, and dermal absorption are the primary routes of MP exposure, and that they enter the bloodstream and distribute systemically. However, it remains unclear where they accumulate in the body, which is essential for understanding the potential physiologic effects. This study aimed to address this gap by developing a method for investigating the in vivo biodistribution of MPs in mice using fluorescently labeled polystyrene beads.
Methods:
We conjugated amine-functionalized 1 micron polystyrene beads to the near-infrared dye IRDye-800CW. C57BL/6 mice were injected intravenously with 3e8 IRDye-labeled MP beads (n=6), free dye (n=2), or saline (n=2). Whole-body imaging using an in vivo imaging system (IVIS) was done post-injection and every 24 hours for 72 hours. Mice were then euthanized, organs were harvested, and ex vivo fluorescent imaging and histology assessed MP distribution. Tissue sections were visualized with confocal and brightfield microscopy.
Results:
Polystyrene MPs were successfully conjugated to IRDye, resulting in strong fluorescent signals with IVIS imaging and microscopy. IVIS showed consistently higher fluorescence in experimental mice compared to saline controls, and increased abdominal localization compared to free dye controls. Notably, abdominal accumulation in experimental mice was detected as early as 15 minutes post-injection with fluorescence remaining strong for the full 72-hour period. Ex vivo imaging of mouse organs revealed a 2.8-fold and 5-fold increase in liver ($p = 0.0006$) and spleen ($p = 0.0454$) fluorescence, respectively. Confocal microscopy revealed MP accumulation in the liver, spleen, and lungs.
Conclusion:
Our study demonstrates that intravenously administered MPs preferentially localize to the liver and spleen, as expected. However, MPs were also found in the lungs, and increased fluorescence suggests that they might also be in the kidneys and reproductive organs. By creating custom fluorescent MPs and utilizing IVIS imaging along with histological analysis, we present a novel, reproducible method for tracking MPs in real time using readily available and affordable resources. These findings provide valuable insights into the distribution of MPs and will guide future research focused on the toxicity and physiologic effects of MP exposure.

31. High BMI, Thin Abdominal Wall? An Adjunct Method of Determining DIEP Patient Eligibility

Mary Duet, MD Bennett Calder, MD

Joyce Cui Eric Zeng Marion Tapp Attilla Kuka Dos Santos Courtney Stone Adam Katz Bennett Calder Michael Robinson Ramon Llull
Clinical Science
Resident
Surgery-Plastic & Reconstructive

Introduction: BMI cutoffs ranging from 30.0 to 32.7 kg/m2 have been recommended to mitigate post-operative complications in autologous breast reconstruction. 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.
Materials and Methods:
A retrospective chart review of 793 patients (1310 flaps) who underwent DIEP reconstruction from November 2017 to May 2024 at two medical institutions was conducted. Demographics, history, operative course, and 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. All analyses were conducted in R (version 4.3.0). Descriptive statistics were computed for all variables. Pearson correlation was

used to evaluate the relationship between BMI and average AWT, with and without IQR-based outlier removal. Differences in average AWT across BMI categories were assessed using one-way ANOVA, followed by Tukey's HSD post-hoc test. The Shapiro-Wilk test was used to assess normality of average AWT distributions within groups. Because the distributions violated normality assumptions ($p < 0.001$), Mann-Whitney U tests were used instead of t-tests to compare average AWT between complication groups, both overall and within each BMI bin. Binary logistic regression was used to assess associations between average AWT, BMI, and the likelihood of overall and specific complications (e.g., hematoma, seroma, wound dehiscence). A multivariable model was used to assess the combined effect of BMI and average AWT, and ED50 values were calculated from model coefficients. Receiver operating characteristic (ROC) analysis and area under the curve (AUC) values were used to evaluate predictive accuracy. Lastly, Chi-square tests were used to compare categorical complication rates across BMI bins where applicable.

Results:

The mean age and BMI of included women was 50.54 years and 30.34 kg/m2 respectively. BMI was strongly correlated with abdominal wall thickness ($r = 0.68$, $p < 0.001$), and both variables were strong predictors of 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 group, 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. Patients with abdominal wall thickness >26.3 mm had a significantly higher complication rate compared to those with ≤26.3 mm (58.3% vs 36.1%, difference 22.2%, 95% CI 13.3-31.1%, $p < 0.001$).

Conclusions:

Abdominal wall thickness may serve as a valuable 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.

32. Alterations in Limb Muscle Transcriptome in Patients with PAD and Diabetes

Nancy Edwards, MD Joseph McClung, PhD

Zoë S. Terwilliger, Feifei Li, Thomas D. Green, Matthew P. Goldman, Kevin Z. Chang, Ashlee E. Stutsrim, Timothy K. Williams, Gabriela A. Velazquez, Matthew S. Edwards, Joseph M. McClung
Basic Science
Resident
Surgery-Vascular & Endovascular

Background:

A major confounder to significant advancement in peripheral artery disease (PAD) therapeutic design is the presence of serious co-morbidities such as diabetes, which present significant challenges to normal limb tissue biology on their own. Despite pre-clinical modeling, the full influence of diabetes on tissue biology in the PAD limb is poorly understood. This knowledge is integral for therapeutic design and a critical step for treatment of patients with these often-overlapping diseases. This study was designed to be an observational, cross-sectional comparison of gene expression in diabetic versus non-diabetic PAD patients.

Methods:

We prospectively collected gastrocnemius tissue from patients with PAD at large academic medical centers. We analyzed whole transcriptome sequencing data from 36 patients of mixed clinical PAD presentations (Avg ABI 0.5+0.29SD). We included 18 diabetic and 18 non-diabetic patients to evaluate for variances in transcriptome activity based upon diabetes status.

Results:

Diabetes significantly altered the muscle expression of 518 genes (FDR<0.05), predominantly driving mRNA increases (494 targets) while 24 decreased. Reactome analysis revealed significant ($p<0.05$) changes in several pathways, including "Extracellular matrix organization" (53/351 found), "Signaling by Interleukins" (67/646 found), and "Immune System" (175/2664 found).

The largest fold-change (FC) decreases were seen in GAS2L2 (growth arrest-specific 2 like 2; -4.14FC), CISH (cytokine inducible SH2-containing protein; -3.19FC), FKBP5 (FK506 binding protein 5; -1.98FC), GGT7 (gamma-glutamyltransferase 7; -1.85FC), and SLC25A33 (solute carrier family 25 (pyrimidine nucleotide carrier), member 33; -1.82FC).

The largest increases were SPP1 (secreted phosphoprotein 1; 26.47FC), PRG4 (proteoglycan 4; 9.88FC), ALPL (alkaline phosphatase, liver; 8.03FC), TNC (tenascin C; 7.55FC), and ANPEP (alanyl (membrane) aminopeptidase; 7.12FC).

A separate analysis of patients within defined criteria for less severe PAD (20 patients; ABI 0.65+0.21SD) revealed 12 unique targets (FDR < 0.05), including 5 downregulated (HMOX1-heme oxygenase 1, FKBP5- FK506 binding protein 5, LPL- lipoprotein lipase, TSC22D1- TSC22 domain family, member 1, and AGPAT5- 1-acylglycerol-3-phosphate O-acyltransferase 5) and 7 upregulated (HMGN1- high mobility group nucleosome binding domain 1, TUBB4B- tubulin, beta 4B class IVb, HSPA1L- heat shock 70kDa protein 1-like, LRRN1- leucine rich repeat neuronal 1, ZNF385A- zinc finger protein 385A, LAMB3- laminin, beta 3, and CA1- carbonic anhydrase I) as a result of diabetes.

Discussion:

Despite the complicated and severe impact of PAD on limb skeletal muscles, the muscle transcriptome is altered uniquely by diabetes in these patients. These changes included significant alterations to the gene expression profile related to local immune function and the extracellular matrix. This provides important insight into the pathogenic influence of diabetes on skeletal muscle gene expression in the ischemic limb. These changes represent potential targets for future therapeutics or interventions and give framework for future investigation.

33. Differences in Metabolomic Profile of Patients with Chronic Limb Threatening Ischemia

Nancy Edwards, MD Joseph McClung, PhD

Zoë S. Terwilliger, Feifei Li, Thomas D. Green, Matthew P. Goldman, Timothy K. Williams, Kevin Z. Chang, Ashlee E. Stutsrim, G. A. Velazquez, Matthew S. Edwards, and Joseph M. McClung

Basic Science

Resident

Surgery-Vascular & Endovascular

Background:

Chronic Limb threatening ischemia (CLTI) represents the end stage of peripheral artery disease. CLTI patients suffer high morbidity and mortality rates, which is compounded by our lack of understanding of the unique biological characteristics of these patients' tissues. This creates difficulties aligning work in the basic sciences with procedural innovation and clinical care. Cellular bioenergetic changes represent a biologic arm of CLTI with the potential to influence each of the other profile defining characteristics. The goal of this study was to compare the metabolomic profiles of lateral gastrocnemius muscles derived from healthy adult volunteers (HA) and CLTI patients from different racial backgrounds (black and white).

Methods:

We collected muscle tissue from 23 HA controls (n=14 white, n=9 black) and 22 CLTI patients (n=22 white, n=10 black) and identified approximately 1114 biochemicals via global metabolomic profiling using Ultrahigh Performance Liquid Chromatography-Tandem Mass Spectroscopy (UPLC-MS/MS).

Results:

Significant alterations in metabolites related to pain, inflammation, energy metabolism, oxidative stress, sphingolipid, and tissue remodeling were identified in the CLTI tissues. Of particular interest was the identification of "lipid super-pathways." Fatty Acid (FA) synthesis and metabolism categories were significantly altered in CLTI tissues. Analysis of sub-pathway species revealed substantial increases in CLTI FA species.

Short-Long Chain Saturated acylcarnitine species were largely decreased (8/17 significantly decreased, 1/17 significantly increased, 7/17 were unchanged) in CLTI tissues. Mono-unsaturated targets were increased in CLTI tissues (5/10 species increased). The largest biochemical change of the pathway was the Polyunsaturated C22:2 species, which increased almost 8-fold. Specific regulators of fatty acid transport (deoxycarnitine and carnitine) were decreased in CLTI tissues. Elevations in the monounsaturated, polyunsaturated, and dicarboxylate acylcarnitine species in the presence of reductions in carnitine and deoxycarnitine signal disruptions in FA oxidation.

Further breakdown of the tissue metabolomics revealed a distinct pattern by patient race. In CLTI patient tissues, white patients demonstrated an increase in 6/32 FA metabolites compared with HA. In stark contrast, black CLTI patient tissues increased 23/32 FA species compared with HA. The specific and uniform increase in Long-Chain FA in this population is unique and concerning when coupled with our previously published data demonstrating black patient limb muscle mitochondrial functional deficits compared to white CLTI counterparts. No differences were observed between black and white HA tissue FA.

Discussion:

Limb muscle metabolome of CLTI patients demonstrates a unique profile that is differentially altered by race. In fact, these characteristics are features of the most common FAO clinical diseases, which result in cardio- and skeletal myopathies, hypoglycemia, and recurrent rhabdomyolysis. These results guide our understanding of the biochemical and biologic processes that underlie the CLTI pathophysiology which can aid in developing effective therapies that drive tissue outcomes.

34. PLACENTAL STEM CELL EXTRACELLULAR VESICLES DRIVE EPITHELAL AND INFLAMMATORY REPAIR IN NEC DAMAGE

Maryssa Ellison, MD Victoria Wies, PhD & Anthony Atala, MD

Anchala Guglani, Victoria Weis
Basic Science
Student
Wake Forest Institute Regenerative Medicine (WFIRM)

Necrotizing enterocolitis (NEC) is an intestinal disease occurring in preterm or very low birth weight infants in which the intestine becomes necrotic, potentially leading to sepsis and multi-system organ failure. Clinical management remains limited, with up to 50% requiring surgical intervention, and no direct therapy exists. Human placental stem cell-derived extracellular vesicles (hPSC-EV) are a promising multifaceted therapeutic approach for NEC. Thus, their therapeutic efficacy to promote epithelial repair and immunomodulation was assessed in vivo as a novel, cell-free strategy to meet a critical need in neonatal care. Their therapeutic efficacy to promote epithelial repair and immunomodulation was assessed in vivo in this cell free based strategy.

hPSC-EV treatment significantly reduced intestinal injury in NEC pups compared to healthy controls. Severity of damage and extent of tissue involvement were decreased following hPSC-EV therapy. Further, intestinal architecture, including villus-crypt morphology and key epithelial cell populations, showed marked improvement compared to untreated NEC pups. Flow cytometric profiling of LPLs also revealed immunomodulatory effects of hPSC-EV therapy. The number of $Foxp3^{+}$regulatory T cells per gram of ileal tissue increased nearly two-fold in the hPSC-EV-treated group compared to healthy controls. Additionally, the frequency of proliferating $Foxp3^{+}$cells, which was slightly reduced in NEC pups relative to controls (NEC = 28.18%), and significantly increased with hPSC-EVs (EV = 48.61%). The absolute count of proliferating $Foxp3^{+}$ cells per gram of tissue also significantly increased with hPSC-EV therapy. Conversely, inflammatory cytokine analysis also showed a significant reduction in TNF-a expression among $CD4^{+}$T cells in the hPSC-EV group compared to NEC pups.

Our findings demonstrate that hPSC-EV therapy significantly mitigates intestinal damage in experimental NEC, shown by improved histological outcomes and tissue architecture. hPSC-EV treatment also modulates key immune responses in NEC.

35. Quantifying Head and Neck Tumor Margin Shrinkage Following Formalin Fixation: A Meta-Analysis

Andrew Fansler, BA J. Dale Browne, MD

Mary Dover Kyle Hrabovsky Haodong Xu J. Dale Browne
Clinical Science
Student
Surgery-Otolaryngology (Dentistry)

Background: Pathological evaluation of resected tumor margins is a critical component of diagnosing and treating cancers of the head and neck. Tumor margin shrinkage following surgical resection and formalin fixation can compromise assessment accuracy and influence tumor staging. This study aims to review current literature to quantify head and neck tumor margin shrinkage.

Methods: 13 studies examining ex vivo head and neck tumor margin shrinkage were identified via literature review. A meta-analysis was conducted to determine the average margin shrinkage across studies.

Results: 11 studies were identified that compared head and neck tumor margins before and after formalin fixation. On average, tumor margins shrank 12.6% following formalin fixation (zval: 6.09, 95% CI: 8.55-16.65, $p < 0.0001$). Across these studies, there was moderate to high heterogeneity and funnel plot asymmetry due to small-study effects (zval: 3.55, $p = 0.0004$). Based on these conditions, there is significant shrinkage of tumor margins following formalin fixation, however, due to small study effects, the true degree of shrinkage is likely closer to 4.7% (95% CI: 1.26-8.13). 13 studies were identified that examined overall tumor shrinkage comparing post-formalin fixation measurements to in-situ 1cm margins. On average, tumor margins shrank 23.6% following excision and formalin fixation (zval: 7.33, 95% CI: 17.01-29.44, $p < 0.0001$).

Across these studies, there was moderate to high heterogeneity and funnel plot asymmetry due to small-study effects (zval: 5.52, p = <0.001). After accounting for small study effects, the true degree of tumor margin shrinkage following excision and fixation is likely closer to 3.88% and is not statistically significant (95% CI: -1.42-9.18).

Conclusion: Our analysis shows that tumor margin shrinkage occurs following surgical excision and formalin fixation. While shrinkage is statistically significant in our pooled analyses after formalin fixation alone, small-study effects suggest the true magnitude may be smaller. The exact clinical significance of these findings remains unclear due to the limited body of research on this topic and study bias. A well-designed, large-scale study is needed to clarify this issue. Future research should separately evaluate pre-excision tumor margins, post-excision shrinkage, and post-formalin fixation shrinkage on a larger scale to guide surgical margin assessment in head and neck cancer.

36. Robotic-Assisted Versus Conventional Cochlear Implantations - A Comparative Assessment

Kenneth Feehs, MD Eric Kraus, MD

Mia Ferry, Pearce Hyatt, Pedrom Sioshansi, Michelle Gandolfi, Eric Kraus
Clinical Science
Resident
Surgery-Otolaryngology (Dentistry)

Introduction: Cochlear implants have been utilized to restore sensorineural hearing loss since the 1960's with initial FDA approval in 1984. During this procedure, an otolaryngologist accesses the round window through a facial recess approach to place the cochlear implant electrode into the scala tympani to restore hearing. Traditionally, the electrode is manually inserted into the cochlea by the surgeon. Research has demonstrated that higher insertion speeds of the electrode array and interruptions in implantation lead to marked increases in hydraulic forces that traumatize the cochlea and may impact long term hearing outcomes. Manual insertion of cochlear implant arrays remains limited by the constraints of human movement with slowest manual insertion speeds recorded at 0.87 mm/second. This led to the development of the iotaSOFT Insertion System, a robotic-assisted insertion tool used to standardize the speed and velocity of implantation to 0.2 mm/second. This system has been increasing utilized at select academic medical centers and came to Wake Forest Baptist (WFBMC) in 2023. Since that time, approximately 40 robotic cochlear implant insertions have been performed at WFBMC. Given the novelty of this insertion assistance system, this study aims to evaluate and compare operative parameters as well as post-operative audiometric outcomes between robotic and conventional electrode insertions.

Objective: To evaluate and compare operative parameters as well as post-operative audiometric outcomes between robotic and conventional electrode insertions at Wake Forest from December 2023 - February 2025.

Methods: This retrospective case control study compared audiometric outcomes of patients who underwent manual implantation and robotic-assisted electrode implantation. Inclusion criteria consisted of patients >18 years of age who underwent initial cochlear implantation at Wake Forest Baptist from December 2023 to February 2025. Patient data including age at time of surgery, sex, etiology of hearing loss, length of deafness, laterality of cochlear implantation, electrode insertion technique, operative duration, and pre-op and post-op audiogram data. Statistical analysis was performed with Wilcoxon rank sum test to assess clinical outcomes between these groups.

Results: Our study analyzed the outcomes of 78 patients total, 37 of those underwent robotic-assisted cochlear implant insertion and 41 patients underwent manual insertion. he mean operating time for robotic-insertion cases was 187.8 minutes (95% CI [175.4, 198.8]) in comparison to 169.1 minutes (95% CI [154.9, 183.4]) operating time for manual insertion (p > 0.05). Complication rates among robotic insertions were found to be 4 of 37 (10.8%) in contrast to manual insertions demonstrating complications in 2 of 41 (4.9%) cases (p > 0.05). Post-operative improvement in pure tone average (PTA) was 55.0 dB (95% CI [27.4, 83.6]) in the conventional cohort and 50.5 dB (95% CI [26.4, 74.4]) in the robot-assisted (p = 0.3). Average post-operative AzBio (76.1 (95% CI [68.3, 83.8]) versus 67.2 (95% CI [51.0, 74.5])), CNC-Word (47 (95% CI [38.2, 55.8]) versus 46.5 (95% CI [36.8, 56.1])) and Phoneme (64.5 (95% CI [56.3, 72.7]) versus 61.4 (95% CI [51.9, 71.0])) scores were all higher in the robot-assisted group compared to conventional implant insertion though no difference was statistically significant.

37. Spring-Assisted Hinged Cranioplasty for Non-Syndromic Unicoronal Synostosis: A Novel Surgical Technique

Kara Fisher, MD Christopher Runyan, MD PhD

Mario Blondin, Katherine Belanger, Chesney Oravec, Lisa David, Daniel Courture, Christopher Runyan
Clinical Science
Resident
Surgery-Plastic & Reconstructive

Background:
Unicoronal craniosynostosis results from premature fusion of one coronal suture, leading to asymmetric craniofacial features including ipsilateral forehead flattening, orbital rim retrusion and elevation, contralateral frontal bossing, orbital depression, and skull base deviation. Traditional management involves fronto-orbital advancement (FOA), an extensive, open procedure aimed at supraorbital correction. More recently, endoscopic strip craniectomy with postoperative helmeting and distraction osteogenesis have shown success with less invasive remodeling, including improvement in skull base asymmetry. Spring-assisted cranioplasty (SAC) is well established for sagittal synostosis but underexplored for unicoronal cases, partly due to concerns about its ability to correct skull base deformities. This study presents a novel spring-assisted hinged cranioplasty technique for unicoronal synostosis and describes early outcomes.
Methods:
A retrospective review was conducted of five consecutive patients with non-syndromic unicoronal synostosis who underwent spring-assisted hinged cranioplasty at a single institution beginning in 2022. Surgical technique involved targeted removal of the fused suture, osteotomy of the fronto-orbital bandeau, and placement of two posteriorly directed expansion springs with preservation of a medial hinge. Demographics, operative details, hospitalization course, and short-term outcomes were analyzed.
Results:
Five patients (mean age 6.4 months) underwent spring-assisted hinged cranioplasty. Average operative time was 122.2 minutes, and average length of stay was 2.8 days. Intraoperative transfusion was required in 60% of cases. The average duration of spring therapy was 5.4 months. Spring removal was performed in 48.4 minutes on average; 60% of patients were discharged the same day and 40% on postoperative day one. Three minor complications occurred, with no major adverse events. Early aesthetic outcomes showed improvement in frontal symmetry and orbital positioning without the need for helmeting or active distraction.
Conclusions:
Spring-assisted hinged cranioplasty is a safe, effective surgical option for unicoronal craniosynostosis. This technique offers a dynamic remodeling alternative with a favorable morbidity profile, shorter operative and hospital courses, and no need for prolonged caregiver-dependent helmeting or device activation. Early results suggest comparable advantages to endoscopic and distraction techniques, with potentially improved compliance and surgical control.

38. The Role of TGF-β in Radiation-Induced Pain Driven by Osteoclast-Neuron Crosstalk

Jeffrey Foster, MD Jeffrey S. Willey, PhD

Sun H. Park, Joseph Moore, Kaitlyn E. Reno, Alicia Costa-Terryll, Jeffrey S. Willey
Basic Science
Fellow
Surgery-Orthopedics

INTRODUCTION: Chest wall pain affects ~40% of patients with lung cancer who receive thoracic stereotactic body radiotherapy (SBRT). While radiation increases osteoclast (OC) resorptive activity and induces rapid bone loss with subsequent fracture, the molecular mechanism responsible for radiation-induced pain is unclear. A clinical trial completed at our institution used risedronate, a bisphosphonate that reduces OC activity and bone loss, to prevent rib fractures in lung cancer patients receiving SBRT. Although treatment with risedronate showed no reduced fracture rate, the risedronate group had a significant reduction in Grade 2+ chest wall pain. Our group has shown that neurons treated with conditioned media from irradiated OCs demonstrate elevated expression of pain biomarkers Calcitonin Gene-Related Peptide (CGRP) and Substance P (SP). However, this increased expression is prevented when neurons are exposed to conditioned media from irradiated OCs treated with risedronate. To investigate the molecular mechanism responsible for risedronate reducing radiation-induced pain, proteomics analysis of small extracellular vesicles isolated from conditioned media of irradiated

OCs identified TGF-βR1 as a central molecule implicated in both bone loss and pain signaling. Therefore, the objective of this in vitro study was to determine if TGF-βR1 inhibition decreased pain biomarker expression when exposing sensory neurons to conditioned media from irradiated OCs.
METHODS: Animal procedures were approved by the Institutional Animal Care and Use Committee (IACUC) at the Wake Forest University School of Medicine (IACUC Protocol #A23-056). RAW264.7 murine macrophages were differentiated into mature osteoclasts using RANKL (35 ng/mL). After 3 days of differentiation, cells were re-fed with fresh growth media containing RANKL (35 ng/mL). The treatment group was irradiated with 10 Gy using the Precision X-ray SmART+ system (220kVP X-Rays). Control osteoclasts were not irradiated. Thoracic dorsal root ganglia (DRG) from T1-T13 were dissected from WT C57BL/6 mice (8-12 weeks old) and prepared following the protocol by Park et al. DRG cells were washed, counted, and seeded on coverslips pre-coated with Poly-D-lysine and laminin for 48 hours in a 24-well plate using neuronal growth medium. Neuronal cultures were treated with conditioned media from irradiated osteoclasts ± a TGF-βR1 inhibitor (galunisertib, 20 μM). 48 hours after treatment with conditioned media ± TGF-βR1 inhibitor, DRG were lysed in RLT Buffer + β-mercaptoethanol (β-ME). RNA expression of pain biomarkers was quantified via RT-qPCR. Pain biomarker expression was calculated using the delta-delta Ct method (fold change) and analyzed via two-way ANOVA with Tukey post-hoc test for multiple comparisons. Statistical significance was assessed at an alpha threshold of 0.05. All analyses were performed with GraphPad Prism (GraphPad Software, San Diego, CA, USA).
RESULTS: TGF-βR1 inhibitor effectively inhibited TGF-βR1 ($p < 0.001$). Pain biomarker expression (CGRP and SP) increased with 10 Gy. The TGF-βR1 inhibitor was associated with decreased expression of CGRP ($p=0.09$) and SP ($p=0.04$).
DISCUSSION: Proteomics analysis of small extracellular vesicles from irradiated OCs identified TGF-βR1 as a central mediator of bone loss and pain signaling between irradiated OCs and sensory neurons. Conditioned media from irradiated OCs increased expression of TGF-βR1, CGRP, and SP in sensory neurons. Increased expression of pain biomarkers was prevented when neurons were treated with a TGF-βR1 inhibitor. Therefore, TGF-βR1 inhibition combined with anti-resorptive therapy may serve as a therapeutic strategy for preventing both radiation-induced fracture and chest wall pain in patients undergoing thoracic SBRT.

39. Pigment Epithelium-Derived Factor Orchestrates Early Molecular Changes in Alkali-Induced Corneal Injury

Emily Fresenko, BS Yuanyuan Zhang, PhD

Daniella Beiner, Tarek Zaho, Carol Bosholm, Vy Vuong; Jay Ma, Anthony Atala, Yuanyuan Zhang
Basic Science
Student
Wake Forest Institute Regenerative Medicine (WFIRM)

Severe alkali burns to the cornea can cause serious damage, leading to inflammation, angiogenesis, and oxidative stress that compromise healing. Current treatments often cannot fully control these processes, leaving a critical need for target interventions. Pigment epithelium-derived factor (PEDF) is a natural glycoprotein in the eye with known anti-angiogenic, anti-inflammatory, and antioxidant properties, yet its therapeutic role in acute corneal injury remains
underexplored. This study investigated whether exogenous PEDF delivery could influence early molecular events following alkali-induced corneal damage.
We hypothesized that topical application of PEDF protein would regulate early corneal injury responses by suppressing VEGF-mediated angiogenesis and modulating IL-1β driven inflammation, thereby supporting improved healing after alkali-induced damage.
A rabbit corneal alkali injury model was established by applying 1 M NaOH to the central cornea for two minutes, followed by immediate saline rinsing. Injured corneas were either left untreated (injury control) or treated with recombinant PEDF protein. Corneal tissue was harvested at 0.5-, 1-, and 3-hours post-injury to evaluate early molecular responses. Gene expression was analyzed using quantitative PCR with customized primers targeting inflammatory (IL-1β), angiogenic (VEGF), and epithelial repair (PEDF) markers, normalized to GAPDH, and quantified using Cq-standardized and $2^{-\Delta\Delta Cq}$ fold-change methods. Additional data included gross eye photographs to capture phenotypic differences between treatment groups and histological sections from parallel alkali injury experiments to illustrate the characteristic corneal swelling associated with chemical injury.
PEDF treatment significantly influenced early molecular responses in alkali-injured rabbit corneas. VEGF expression was markedly reduced by 3 hours post-injury, indicating early suppression of angiogenic signaling. IL-1β expression showed a time-dependent pattern, with a transient increase at 0.5 hours followed by a significant decrease at 3 hours. These effects were confirmed by quantitative PCR analysis (Cq-standardized values, $2^{-\Delta\Delta Cq}$ fold change), with statistical significance at $p<0.05$. Gross eye photographs documented phenotypic differences between treated and control groups, while histological sections from parallel experiments illustrated characteristic corneal swelling associated with alkali injury.

These findings suggest that PEDF promotes corneal healing through complementary mechanisms, simultaneously suppressing pro-angiogenic signaling (VEGF) and modulating inflammatory responses (IL-1β). Together, these effects highlight PEDF's strong therapeutic potential for preserving corneal clarity after chemical injury. Future work will evaluate long-term efficacy, with particular focus on exosome-based delivery systems to enhance stability, half-life, and targeted release, addressing current limitations of protein-based therapies.

40. PEDF-Enriched Exosomes from Urine-Derived Stem Cells as Potential Treatment for Mustard-Induced Corneal Injury

Emily Fresenko, BS Yuanyuan Zhang, PhD

Carol Bosholm, Daniella Beiner, Sarfaraz Ahmad, Vy H. Vuong, David Ornelles; Gagan Deep Anthony Atala, Patrick McNutt, Jay Ma, Yuanyuan Zhang
Basic Science
Student
Wake Forest Institute Regenerative Medicine (WFIRM)

Exposure of the cornea to alkylating agents such as sulfur mustard (SM) and nitrogen mustard (NM) can lead to severe ocular damage and vision loss, with limited effective therapies available. Pigment epithelium-derived factor (PEDF) is a potent anti-inflammatory and anti-angiogenic protein that promotes epithelial regeneration, but its short half-life hinders clinical application. This study aimed to engineer PEDF-enriched exosomes derived from human urine-derived stem cells (USCs) as a novel therapeutic strategy for mustard-induced corneal injury.
Human USCs were isolated from urine samples (n=3), cultured, and transfected with PEDF mRNA at 80% confluency. Exosomes were collected from conditioned media, isolated, and characterized by transmission electron microscopy (TEM), nanoparticle tracking analysis (NTA), flow cytometry for exosome markers, ELISA, and Western blotting for PEDF expression.
NM exposure resulted in significant corneal thinning and endothelial cell loss, accompanied by a marked reduction in epithelial PEDF expression ($p<0.01$). Transfection of USCs with PEDF mRNA significantly increased PEDF protein expression compared to controls, confirmed by Western blot and ELISA. Exosomes derived from transfected USCs exhibited elevated PEDF levels while maintaining expected size distribution and marker profiles.
Engineering USCs with PEDF mRNA successfully generated PEDF-enriched exosomes, demonstrating a promising, non-invasive therapeutic approach for mustard-induced corneal injury. This strategy offers a sustainable source of bioactive exosomes that may enhance corneal repair and could be extended to other ocular surface diseases. Further in vivo studies are warranted to optimize efficacy and therapeutic delivery.

41. Obesity influences the tissue resident breast microbiota impacting complement signaling and tumorigenesis

Mohamed Gaber, PhD Katherine L. Cook, PhD

Adam S. Wilson, Adam J. Katz, Karen Haas, Katherine L. Cook
Basic Science
Fellow
Cancer-Biology

Obesity is a risk factor for breast cancer, influencing both the incidence and prognosis of the disease. Obesity alters the breast microbiome in ways that may promote breast carcinogenesis, and microbiome perturbations are evident in breast cancer patients. Yet, it is unclear if these microbial perturbations are drivers of breast cancer. Our group previously showed that diet and anti-cancer therapies modify the breast tissue microbiome. We further showed that certain commensal bacterial species in the mammary gland reduce tumorigenesis in high-fat diet-fed MMTV-PyMT mice, implicating tissue-resident microbiota in modifying breast cancer risk. Thus, we investigated the impact of obesity-induced microbiome alterations on genomic instability in mammary epithelial cells, as a hallmark of breast cancer risk. Our preliminary studies showed that obesity caused elevated systemic and breast tissue levels of lipopolysaccharide (LPS) and flagellin. In vitro and in vivo experiments demonstrated their ability to induce DNA damage in the mammary epithelium. 16S rRNA sequencing on DNA isolated from non-cancerous breast tissue revealed an enrichment of Proteobacteria in obese premenopausal subjects. Bacteria from this phylum harbors highly immunogenic LPS and the majority of them are flagellated. Importantly, Proteobacteria proportional abundance was associated with breast tissue levels of DNA damage. Intriguingly, these as-

sociations were absent in postmenopausal women. One key difference between breast tissues of the two menopausal groups was in their complement activity and immune responses to LPS and flagellin. Redox proteomics analysis showed that obesity caused an enrichment in the oxidation of several complement C3 peptides in both menopausal groups. Normally, oxidation of complement C3 causes its activation through the generation of a C3 convertase that cleaves C3 into the active fragments; C3a and C3b. However, this was only observed in premenopausal women where the C3 oxidized peptides showed significant correlations with C3a levels. Complement system dysfunction in postmenopausal women was also manifested by having lower C3a levels, higher B-cell trafficking and lower anti-LPS IgA levels in their breast tissues than premenopausal women. Ongoing experiments are being performed to determine if there are breast tissue differences in complement regulatory proteins such as factor H and CD59. To demonstrate causality, we performed a carcinogen-induced mammary tumorigenesis model in wild-type (WT) and C3 knockout (KO) mice fed a low-fat or high-fat diet. C3 KO mice showed increased tumor-incidence compared to WT in the context of a high-fat diet, but not a low-fat diet, suggesting a role of complement signaling in anti-tumor immunity in the context of obesity. In a mammary tumor progression model, murine E0771 cells injected into the left 4/5 mammary fat pads showed lower tumor growth in C3 KO mice than their WT counterparts, regardless of the dietary background. Flow cytometry analysis performed on tumors harvested at the end of the study showed classical signs of immune suppression in C3 KO mice including higher PD-1+ T cells and lower CD25+ (activated) T cells. However, FoxP3+ CD25+ T-regulatory cells (Tregs) showed a trending decrease in C3 KO tumors which might explain the increased tumor progression. Collectively, these results suggest a dual role for complement C3 in the different stages of breast tumor initiation vs. progression. Future studies will focus on the differential impacts of complement C3 activity in mammary epithelial cells vs. immune cells on both stages of tumor initiation and progression. Overall, this work identifies a novel immunity-microbiome signaling axis potentiating obesity-mediated breast cancer risk.

42. Mechanism Matters: When it comes to Whole Blood, not all Trauma is Created Equal

Jamie Hadley, MD Gregory Stettler, MD

Jeffrey R. Conner, Christopher S. Thomas, Kaysey M. Llorente, Aaron Gilani, Preston R. Miller III, Andrew M. Nunn, Gregory R. Stettler
Clinical Science
Fellow
Surgery-Trauma

Introduction: Blunt and penetrating trauma present with distinct coagulopathic profiles that may influence transfusion requirements. Civilian use of whole blood (WB) has been shown to be associated with improved outcomes and lower product utilization. Studies evaluating the effect of WB vs component-based resuscitation by mechanism of injury are limited. We sought to evaluate the effects of WB stratified by mechanism of injury.
Methods: Patients managed with a WB-first resuscitation strategy were compared with those who received a component-based strategy. Patients who had penetrating and blunt mechanisms were evaluated separately. Univariate and multivariable analyses were used to identify independent predictors of mortality and transfusion volumes.
Results: Between March 2016 and November 2021, 1013 injured patients received blood components. Overall, the use of WB was associated with lower transfusion volumes (Unstandardized Beta= -1183 mL 95% CI -1897 to -470 mL) but was not improved 30-day mortality (OR 1.43 95% CI 0.95-2.2). In penetrating injuries, WB was associated with increased 30-day mortality (OR 2.7 95% CI 1.2-5.9) but was not associated with total transfusion volumes. Excluding penetrating TBI, no mortality or transfusion differences were observed. In blunt trauma, WB did not have an association with 30-day mortality (OR 1.19 95% CI 0.74-1.91) but was associated with lower transfusion volumes (Unstandardized Beta= -1057 mL 95% CI -1878 to -273 mL) including after exclusion of severe TBI.
Conclusions: The impact of WB varies by mechanism of injury, with potential benefits in blunt but not penetrating trauma. Further studies are needed to define the populations most likely to benefit from WB-based resuscitation.

43. A Systematic Review of Cutibacterium acnes in Breast Surgery

Abgail Heilenman, MD Cassandra Driscoll, MD

Joey Kurtzman, Abigail Peoples, Adam Katz, Cassandra Driscoll
Clinical Science
Student
Surgery-Plastic & Reconstructive

Introduction: Cutibacterium acnes (C. acnes) is often isolated in breast surgery with no established causal role in adverse

outcomes like capsular contracture (CC) implant illness (BII). The aim is to identify current evidence and elucidate the role of C. acnes in breast implant complications and inform perioperative management.
Methods: Comprehensive systematic review of PubMed, Embase, and Web of Science was conducted for original clinical studies and case series investigating C. acnes in breast surgery. All included studies underwent eligibility and quality assessment.
Results: Twenty-two studies of 752 screened met criteria. C. acnes and coagulase-negative staphylococci were frequently identified on explanted implants, with advanced detection methods (sonication, sequencing) revealing high microbial diversity. Biofilm-forming C. acnes was strongly associated with CC, found in 25-58% of severe contracture specimens, while staphylococci dominated florid infections. BII was linked with C. acnes in culture, but mechanistic links remain unproven. Six studies identified perioperative benzoyl peroxide as an effective decolonization measure. However, significant heterogeneity and lack of standardized detection or prevention strategies persist, limiting consensus on best practices and outcome optimization.
Conclusions: C. acnes is a highly prevalent organism identified in implant-based breast surgery complications, though often under-appreciated. As next-generation sequencing and new prophylactic protocols emerge, there is a timely opportunity to establish evidence-based standards that could improve patient outcomes. Multi-institutional collaboration and clinical trials are needed to translate these insights into practice. This has the potential to decrease the burden of CC and BII while advancing care in aesthetic and reconstructive breast surgery.

44. Clinical Implications of Mastectomy Flap Temperature in Immediate Implant-Based Breast Reconstruction

Abgail Heilenman Cassandra R. Driscoll, MD

Iris Brammer, Nicole Polyachenko, Abigail Peoples, Adam Katz, Cassandra Driscoll
Clinical Science
Student
Surgery-Plastic & Reconstructive

Introduction: Clinicians frequently observe that mastectomy flaps feel cool intraoperatively and for months postoperatively, yet intraoperative flap temperature has not been objectively quantified in plastic surgery literature. Maintaining normothermia is well established as a critical factor in reducing surgical site infection and ischemic complication rates across multiple surgical fields, with plastic surgery literature citing a 5-30% ischemic complication rate in mastectomy flaps. The temperature differential between core body temperature and mastectomy flap tissue during immediate implant-based breast reconstruction (IBBR) remains uncharacterized. This study aimed to measure intraoperative mastectomy flap temperature relative to core temperature and evaluate its relationship to postoperative complications.
Methods: A prospective, single-institution, non-randomized study enrolled adult patients undergoing unilateral or bilateral IBBR. Flap temperature was measured at the subdermal plexus in four quadrants, upper outer, upper inner, lower outer, and lower inner, at three intraoperative time points: pre-mastectomy, post-mastectomy, and pre-implant placement. A 22-gauge myocardial probe was used for flap measurements. Core temperature, operating room conditions, and blood pressure were recorded simultaneously. Postoperative complications were monitored for 90 days.
Results: Fourteen patients (21 breasts) were analyzed (mean age 55 ± 10 years; BMI 27.9 ± 8.3). Across all time points, mastectomy flaps were consistently 4.8-6.7°C cooler than core temperature ($p < 0.001$), with mean core temperature 35.7°C and mean flap temperature 29.9°C. Flap temperature did not differ significantly by quadrant or side. Four ischemic complications occurred (19%), but flap temperatures were not statistically different between breasts with and without complications. Systolic blood pressure was significantly higher pre-implant compared to pre- or post-mastectomy ($p = 0.014$).
Conclusion: Mastectomy flaps demonstrate consistent intraoperative hypothermia compared to core temperature during IBBR. While not significantly linked to ischemic outcomes in this cohort, these findings support further investigation into targeted flap warming and thermal preconditioning as potential strategies to optimize reconstructive success.

45. From Petri Dish to Prognosis: Technical Mastery and Clinical Validation of Pancreatic Cancer Organoids

Julia Henault, BS Eleftherios Makris, MD PhD

Helen Bernardi Rathgeb, Sara Muhic Zukic, Caleb Strickler, Steven D. Forsythe, Richard A. Erali, Sydney Smith, Damian Chance Hutchins, Tiefu Liu, Nadeem Wajih, Cecilia Schaaf, Perry Shen, Edward A. Levine, Ralph

D'Agostino Jr., Adam Hall, Lance Miller, Shay Soker, Konstantinos I. Votanopoulos, Eleftherios A. Makris
Clinical Science
Student
Surgery-Oncology

Background: Pancreatic ductal adenocarcinoma (PDAC) remains among the most lethal cancers, with five-year survival rates below 13%. Despite therapeutic advances, response rates are modest and unpredictable, reflecting the inability to identify patients most likely to benefit from specific regimens. Patient-derived organoids (PDOs) preserve tumor architecture and enable scalable drug testing within clinically relevant timeframes. However, technical factors governing successful PDO establishment have never been systematically analyzed in PDAC, and clinical validation of organoid chemosensitivity remains limited.
Hypothesis: We hypothesize that integrating optimized technical protocols for PDAC organoid generation with organoid-guided chemosensitivity profiling will establish PDOs as validated functional biomarkers, simultaneously advancing reproducible model development and enabling precision therapy selection in pancreatic cancer.
Methods: This retrospective analysis evaluated tumor specimens from 32 patients with PDAC who underwent surgical resection. Technical variables including gross tumor features (fibrosis, necrosis, mucin content, stiffness), enzymatic digestion parameters, and cold ischemia intervals were systematically recorded-representing the first comprehensive analysis of technical determinants in PDAC organoid generation. PDOs were cultured in collagen-hyaluronic acid hydrogels and assessed for viability at 14 days. In a subset of 10 patients with established PDOs and matched clinical data, chemosensitivity to FOLFIRINOX and gemcitabine/nab-paclitaxel was quantified and correlated with clinical outcomes including post-treatment CA19-9 response, radiographic response, and survival.
Results: This study establishes the first systematic framework identifying technical predictors of PDAC organoid success. Univariate analysis revealed greater cell diameter variability (OR 5.39, p=0.021) and shorter processing time (OR 0.55, p=0.046) as predictors of ≥50% viability, while lower tumor stiffness (OR 0.32, p=0.022) and larger cell diameter (OR 3.55, p=0.023) predicted higher viable cell yield. Multivariate analysis confirmed shorter processing time (OR 0.40, p=0.040) and higher post-processing tissue mass (OR 1.004, p=0.004) as independent predictors. Machine learning models achieved 88.9% accuracy in predicting organoid viability, with cell diameter and tissue stiffness as the most important features. Critically, clinical validation in a 10-patient subset demonstrated strong correlation between PDO chemosensitivity and patient outcomes: organoid response to chemotherapy inversely correlated with post-treatment CA19-9 decline (ρ=-0.83, p=0.042), and patients with chemosensitive organoids experienced significantly longer overall survival (ρ=-0.71, p=0.022) and recurrence-free survival (ρ=-0.73, p=0.016). Treatment mismatches between clinical regimens and organoid-predicted optimal therapies were associated with shortened patient survival, providing strong validation of organoid-guided precision therapy.
Conclusions: This work provides the first systematic analysis of technical factors governing PDAC organoid establishment, identifying tissue recovery efficiency and processing parameters as key determinants of success. Most significantly, we demonstrate clinically meaningful correlation between organoid chemosensitivity and patient outcomes, establishing PDOs as validated functional biomarkers for treatment selection. These findings represent a critical advancement toward precision oncology in PDAC, providing both optimized technical protocols and clinical validation of organoid-guided therapy selection.

46. Peanut butter as primary treatment for esophageal foreign bodies: how are we doing?

Laren Himes, MD Eleanor Kiell, MD, MSEd

Eleanor Kiell, Daniel Kirse, Whit Mims, Joseph Sinnwell, Caleb Wilson, John Sykes
Clinical Science
Resident
Surgery-Otolaryngology (Dentistry)

Introduction: We have previously reported promising results for peanut butter as a primary intervention for esophageal foreign bodies. Our prior chart review established the criteria for giving peanut butter, as we delineated the patient characteristics that would most likely benefit from this treatment. In this study, we assess the implementation of our novel care pathway at the Brenner Children's Emergency Department.
Methods:
This is a retrospective chart review of 37 patients less than 18 years old who presented to a tertiary care pediatric emergency department from August 2024 through June 2025 with suspected esophageal coins. Patients eligible for a trial of peanut butter based on our pathway must be asymptomatic, 3.5 years or older, have a suspected ingestion <12 hours

prior to arrival, and have a coin below the aortic arch on chest radiograph. Patients were excluded if they were not seen at Brenner Children's ED or if no coin was suspected on imaging. Demographic and clinical management information was noted and compared with descriptive statistics.

Results:

All 37 patients were found to have metallic foreign bodies consistent with a coin. The pathway was inconsistently applied to patient care. In total, twelve patients were given peanut butter as their primary treatment. There were five patients who met criteria for peanut butter. Out of those five patients, four patients successfully passed their esophageal coin, giving an 80% success rate for this group. When peanut butter was trialed as the primary treatment for patients who did not meet criteria, only 1 out of 7 patients had successful passage of the coin. Ultimately, only 2 patients had spontaneous passage of their esophageal foreign body. On the other hand, 24 patients were treated primarily with OR endoscopic removal; most of these patients were symptomatic and thus excluded from the peanut butter care pathway.

Conclusions:

Our data supports the utilization of the peanut butter care pathway in esophageal coins when implemented appropriately. Real life implementation of complex care pathways is challenging even with significant education of the involved teams. It is difficult to draw conclusions from our data, as the criteria were not uniformly applied. Future work
is needed to specifically assess the success of our care pathway for patients who meet criteria.

47. Short-Term Outcomes of Temporary Microaxial Transvalvular Left Ventricular Assist Device Supported Coronary Artery Bypass Grafting

Allyson Howard-Green Bartlomiej R. Imielski, MD

Mark Cordell, Deevya Raman, Spencer Tingey, Akalya Villenthi, Timothy Craven, Bartlomiej Imielski
Clinical Science
Student
Surgery- Cardiothoracic

Background: High-risk coronary artery bypass grafting (CABG) in patients with severely reduced left ventricular ejection fraction (EF) remains a daunting procedure for cardiothoracic surgeons. Despite advances in mechanical circulatory support (MCS), perioperative morbidity and mortality in this population remained elevated. Temporary microaxial flow pumps (TMFP), particularly Impella devices, have been increasingly applied to surgical patients due to their ability to provide effective left ventricular unloading, as well as systemic support in cardiogenic shock. While current literature suggests benefit, the role of Impella in CABG for high-risk, low-EF patients has not been comprehensively evaluated, leaving a critical gap in perioperative decision making and patient selection.

Hypothesis: Impella support during CABG in high-risk, low-EF patients is associated with improved short-term survival and myocardial function, regardless of timing of device placement.

Methods: This IRB-approved single institution retrospective study reviewed 111 patients who underwent CABG with Impella support during the same hospitalization between April 2018 and January 2025. Patients who received extracorporeal membrane oxygenation (ECMO) were excluded. Baseline demographics, comorbidities, procedural details, and postoperative outcomes, including 30-day and 1-year mortality, hospital length of stay, changes in EF, and renal outcomes were collected from the electronic medical record. Continuous variables were assessed using descriptive statistics and the Mann-Whitney U test, while categorical variables were analyzed with Fisher's exact test, with significance defined as $p < 0.05$.

Results: The cohort (n=111) had a mean age of 67 years and consisted of 84 men (76%) and 27 women (24%). Comorbidities included hypertension in 94 patients (84.6%), hyperlipidemia in 91 (81.9%), diabetes mellitus in 63 (56.7%), and prior cardiac surgery or intervention in 34 (30.6%). Impella support was planned in 33 patients (30%) and unplanned in 78 (70%). At time of device placement, 86 patients received concomitant CABG alone, 8 received concomitant CABG with aortic valve repair/replacement, 7 received concomitant CABG with mitral valve repair/replacement, 2 received concomitant CABG with aortic aneurysm repair, and 2 received concomitant CABG with both aortic valve repair/replacement and aortic aneurysm repair; 6 patients received Impella support without concomitant procedures. 30-day and 1-year mortality were 10.8%, and 24.3% respectively. There was no significant difference in mortality between pump placement timing (preoperative, intraoperative, or postoperative), or across time periods (2018-2020 vs 2021-2025). Planned Impella placement was associated with significantly longer hospital stays ($p < 0.001$). Mean EF improved from a perioperative mean of 27% to 34% at discharge ($p < 0.001$). 8 patients required continuous renal replacement therapy or temporary hemodialysis (HD), 4 progressing to permanent HD of which 3 had pre-existing CKD stage III or greater.

Conclusion: Impella-supported CABG in high-risk, low-EF patients, once considered inoperable, yields survival outcomes exceeding national benchmarks. Mortality was unaffected by timing of support, suggesting use across diverse clinical scenarios. These findings support Impella's growing role in complex coronary surgeries, especially in patients who are not

percutaneous coronary intervention candidates or present in shock and underscore the need for prospective studies to define optimal application and expand surgical candidacy.

48. Renal Recovery in Cardiogenic Shock Patients Bridged to Cardiac Transplant with Impella 5.5 Support

Allyson Howard-Green Bartlomiej Imielski, MD

Kenneth Paik, Bartlomiej Imielski, Allyson Howard-Green, Deevya Raman, Austin Seals, Joseph Mishkin, Bradley LeNoir, Patricia Uber, Yaron Barac, Olivia Gilbert
Clinical Science
Student
Surgery- Cardiothoracic

Purpose:
Renal dysfunction portends high morbidity and mortality of patients with cardiogenic shock (CS). Though small case series suggest benefit from microaxial temporary left ventricular assist devices (Impella 5.5) in renal recovery for patients bridged to transplant, larger cohorts have not been published to date.
Methods:
This was a retrospective cohort study of 82 adults with CS supported with Impella 5.5 (2018-2025) who subsequently underwent cardiac transplant. Data was obtained from two sites within the same health system. Renal parameters including serum Creatinine, eGFR, and BUN as well as hemolytic parameters including LDH, haptoglobin, indirect bilirubin, and hemoglobin were measured at baseline and weekly for 4 weeks. Patients on pre-implant renal replacement therapy or ECMO were excluded. Data for each week was aggregated and summarized using mean (IQR). Paired analyses of baseline Week 0 and Week 4 differences were done using the Wilcox test. All analysis was done using 'R' version 4.4.1
Results:
The mean age of the cohort was 58.5 ± 10.4 years, 72.8% male, and 56.8% with coronary artery disease. The mean duration of Impella 5.5 support was 23.4 ± 19.6 days. Creatinine decreased from 1.28 ± 0.51 mg/dL at baseline to 1.17 ± 0.57 mg/dL at week 4 ($p=0.00034$). eGFR improved from 64.04 ± 37.5 mL/min/1.73m² at baseline to 70.53 ± 31.25 at week 4 ($p=0.00596$). Renal improvement was most pronounced by week 4, and no significant association was observed between renal outcomes and hemolytic markers.
Conclusion:
As the largest cohort to date investigating renal parameters in those bridged to cardiac advanced therapies with Impella 5.5, we demonstrate short-term renal improvement. These findings suggest benefit from utilization of Impella 5.5 as a bridge to transplant in those with renal dysfunction with further investigation needed for further validation.

49. Enhancing Patient Lymphocyte Response to Peritoneal Malignancies Using a Personalized Immunocompetent Microfluidic Co-Culture Platform

Damian Hutchins, MS Konstantinos Votanopoulos MD/PhD

Noor Refaqat, Caleb Strickler, Cecilia Schaaf, Tiefu Liu, Nadeem Wajih, Shay Soker, Adam Hall, Eleftherios Makris, Konstantinos Votanopoulos
Clinical Science
Student
Surgery-Oncology

Purpose: Isolation, expansion, and re-administration of autologous tumor-infiltrating lymphocytes (TILs) is an increasingly promising therapy for patients with solid tumors. However, despite their potential FDA approval, not all patients can produce sufficient, active TILs for therapeutic use. Often, TILs are difficult to proliferate and are already exhausted upon collection, leading to failure in the reduction of tumor burden. To improve the therapeutic use of TILs, patients need a source of abundant and reactive T cells. In this study, we endeavored to fulfill that need by training peripheral blood cells to respond to tumor in an ex vivo microfluidic device.
Methodology: Our device houses a central chamber containing organoids of human patient tumor (metastatic appendiceal and peritoneal mesothelioma) and antigen-presenting cells (APCs) grown in a biomimetic hydrogel mix. Autologous peripheral blood mononuclear cells (PBMCs) were circulated through the chambers for 7 days. These blood cells were

termed Organoid Infiltrating lymphocytes (OILs). We have conducted flow cytometry analysis as well as proteomics analysis to identify phenotype and polyfunctionality of the OILs compared to controls, in addition to cytotoxic function upon reintroduction to tumor cells. To expand upon human primary sample analysis, we have also developed an in vivo model to test peritoneal carcinomatosis tumor growth reduction in Balb/C mice. We injected a transfected murine colorectal cell line into the peritoneal cavity and analyzed tumor growth using multispectral optoacoustic tomography over a 2-week period.
Results: The reintroduction of human OILs to primary tumor cells induced significantly higher interferon gamma, granzyme b, perforin, and granzyme A expression than TILs. Furthermore, cytotoxicity analysis of patient-specific tumor cells in the presence of microfluidics-trained peripheral cells showed that for 17 patients, OILs induced significantly higher tumor cell death compared to controls (mean OILs 52% vs TILs 24% $p < 0.0001$). Initial murine in vivo analysis reveals successful OIL production and Tumor seeding using the Balb/C model.
Conclusion: These findings demonstrate that ex vivo tumor-organoid microfluidic system primed PBMCs can be transformed into potent, patient-specific cytotoxic lymphocytes. This approach not only circumvents the limitations of traditional TIL therapy (e.g. exhaustion and scarcity, but also offers a scalable, accessible alternative for patients with peritoneal malignancies. The enhanced cytotoxicity and polyfunctionality of OILs suggest strong therapeutic potential, and their derivation from peripheral blood may significantly broaden patient eligibility. Ongoing validation in our Balb/C murine model will further establish efficacy and safety to pave the way for clinical translation.

50. Personalized Organoid-Based Immunotherapy for Pancreatic Cancer: Real-Time Imaging of Cytotoxic Lymphocyte-Tumor Dynamics in an Ex Vivo Model

Damian Hutchins, MS Eleftherios Makris, MD, PhD

Nicholas Edenhoffer, Noor Refaqat, Caleb Strickler, Cecilia Schaaf, Tiefu Liu, Nadeem Wajih, Shay Soker, Adam Hall, Konstantinos Votanopoulos, and Eleftherios Makris
Clinical Science
Student
Surgery-Oncology

Background:
Pancreatic ductal adenocarcinoma (PDAC) is one of the most aggressive and treatment-resistant solid tumors, with a 5-year survival rate below 13%. While immunotherapy has transformed outcomes in several cancers, PDAC remains largely refractory due to its immunologically "cold" tumor microenvironment (TME), marked by dense desmoplasia, immune exclusion, and immunosuppression. A major barrier is the poor infiltration and functional exhaustion of T cells within the tumor. To address this, we developed an ex vivo strategy to generate and assess tumor-specific lymphocytes using a physiologically relevant organoid model that recapitulates key immunologic features of the TME.
Methods:
We engineered a personalized immunocompetent organoid model (iPTO) by co-culturing resected PDAC tumor cells with autologous tumor-draining lymph node (TDLN) cells. Autologous peripheral blood mononuclear cells (PBMCs) were circulated through the system using a microfluidic "tumor-on-a-chip" platform, generating tumor-reactive cytotoxic lymphocytes, termed Organoid Interacting Lymphocytes (OILs). To model stromal influence, multicellular PTOs were created by incorporating patient fibroblasts without hydrogel scaffolds, better simulating the PDAC TME. Each patient sample was expanded for 2 weeks before analysis. Real-time tumor-immune interactions were captured using high-resolution time-lapse microscopy via the Ramona Optics multi-camera imaging system, assessing lymphocyte infiltration, tumor engagement, spatial dynamics, and cytotoxicity.
Results:
Organoid Interacting Lymphocytes (OILs) exhibited significantly enhanced colocalization with tumor cells compared to control immune cells, indicating improved homing and immune synapse formation within PTOs. High-resolution time-lapse imaging captured dynamic tumor cell killing by OILs, along with tumor cell clustering and directional migration suggestive of active immune evasion. Representative stills from the time-lapse series highlight immune-tumor interactions, while single-cell tracking quantitatively confirmed movement dynamics. On average, OILs migrated 6.1 pixels closer to tumor cells over 24 hours versus 0.6 pixels for control immune cells ($P < 0.05$;). These findings align with prior results in appendiceal and mesothelioma PTO models, where OILs outperformed tumor-infiltrating lymphocytes (TILs) in inducing cancer cell apoptosis.
Conclusion:
Our findings indicate OILs as a potent, patient-specific adoptive cell therapy capable of overcoming PDAC's immunosuppressive TME. By leveraging advanced organoid models and live-cell imaging, we captured dynamic tumor-immune interactions and demonstrated functional immune activation. This platform provides a robust preclinical tool for evaluating personalized immunotherapy strategies and supports further clinical development of OIL-based therapies in pancreatic cancer.

51. Assessment of Hearing Preservation Outcomes in Robotic-Assisted Cochlear Implantation

Pearce Hyatt Kenneth Feehs, MD

Mia Ferry, Kenneth Feehs, Michele Gandolfi , Pedrom Sioshansi, Eric Kraus
Clinical Science
Student
Surgery-Otolaryngology (Dentistry)

Background: Cochlear implants have been utilized to restore sensorineural hearing loss since the late 1900s. During this procedure, an otolaryngologist accesses the round window in order to place the cochlear implant electrode into the inner ear to restore hearing. Traditionally, the electrode is manually inserted into the cochlea by the surgeon with lowest insertion speeds recorded at 0.87 mm/second. Research has shown that increased insertion speed of the electrode array and interruptions in implantation leads to peaks in insertion forces that traumatize the cochlea. With this in mind, surgeons work to maintain a low velocity, continuous insertion of the cochlear implant array to preserve residual hearing function. Manual insertion of cochlear implant arrays remains limited by the constraints of human movement which led to the development of the iotaSOFT Insertion System, a robotic-assisted insertion tool used to standardize the speed and velocity of implantation to 0.2 mm/second. This system has been increasing utilized at select academic medical centers and came to Wake Forest Baptist (WFBMC) in 2023. Since that time, approximately 40 robotic cochlear implant insertions have been performed at WFBMC. Given the novelty of this insertion assistance system, this study aims to evaluate and compare post-operative hearing outcomes between robotic and conventional electrode insertions.
Hypothesis: Patient who undergo robotic insertion of cochlear implants will have improved audiometric outcomes with greater preserved hearing compared to conventional manual insertion.
Methods: This retrospective cohort study compared audiometric outcomes of patients who underwent manual implantation and robotic-assisted electrode implantation. We looked at cochlear implant surgeries performed in patients > 18 years of age at Wake Forest Baptist from December 2023 to February 2025. Patient data including age at time of surgery, sex, etiology of hearing loss, length of deafness, laterality of cochlear implantation, electrode insertion technique, operative duration, and pre-op and post-op audiogram data were analyzed to assess clinical outcomes between these groups. Postoperative pure tone averages (PTA) were calculated at 500, 1000, 2000, and 3000 Hz to assess hearing preservation across groups.
Results: Our study analyzed the outcomes of 78 patients total, 37 of those received robotic-assisted cochlear implant insertion and 41 patients received manual insertion. The mean operating time for robotic-insertion cases was 187.8 minutes in comparison to 172.1 minutes operating time for manual insertion. Complication rates among robotic insertions were found to be 4 of 37 (10.8%) in contrast to manual insertions demonstrating complications in 2 of 41 (4.9%) cases. Preliminary audiometric outcomes demonstrated improved residual hearing preservation, reflected by higher postoperative pure tone average (PTA) values in the robotic-assisted group compared with the manual group.
Conclusions: Robotic-assisted cochlear implant insertion is an emerging technique designed to standardize implantation rates and minimize traumatic forces on the cochlea. Early results demonstrate residual hearing benefit for robotic-assisted implantation while operating time and complication rates remain comparable to manual insertion. Follow up data are currently limited to 6-12 months post-op, necessitating continued longitudinal assessment of hearing outcomes.

52. Recurrence Patterns and Survival after Left-Sided Pancreatectomy for Pancreatic Ductal Adenocarcinoma

Wesley Iobst, BA Perry Shen, MD

Greg Russell, Kathleen Cummins, Perry Shen
Clinical Science
Student
Surgery-Oncology

Background: Pancreatic ductal adenocarcinoma (PDAC) of the body and tail is typically managed with distal or subtotal pancreatectomy with curative intent; however, recurrence is frequent and often occurs within the first year. While prior studies have investigated factors associated with post-recurrence survival (PRS) in PDAC broadly, the determinants of PRS in left-sided disease remain poorly defined. We aimed to identify factors predicting PRS after left-sided pancreatectomy in patients with recurrent PDAC of the body and tail.
Methods: We conducted a review of 1,775 pancreatectomy procedures performed at Atrium Health Wake Forest Baptist

from 1/1/2000 to 12/31/2024. Patients with histologically confirmed PDAC of the body or tail who developed recurrence following distal or subtotal pancreatectomy were included. Recurrence was defined based on radiologic evidence of new metastatic or locoregional disease on surveillance imaging. PRS was defined as the interval from the date of recurrence to death or last follow-up. The Kaplan-Meier method was used to estimate survival times. To assess significance between clinical variables and PRS, Cox proportional hazards regression models were used to estimate hazard ratios (HR) and corresponding 95% confidence intervals (95%CI). Those variables with p-values < 0.10 in a univariate model for PRS were used to create a multivariable model.

Results: During the study period, 132 patients underwent distal or subtotal pancreatectomy for PDAC. Of 132 patients with resected PDAC of the body and tail, 48.5% (64/132) developed recurrence at a median time of 8.0 months (IQR 4.4 - 16.6). The median overall survival was 10.2 months and the median PRS was 6 months. Multifocal recurrence was associated with worse PRS when compared to liver (HR 3.91, 95%CI 1.39 - 11.0), locoregional (HR 4.17, 95%CI 1.53 - 11.4), and lung recurrence (HR 5.24, 95%CI 1.56 - 17.5). Factors associated with improved PRS were adjuvant chemotherapy (HR 0.44, 95%CI 0.20 - 0.95) and post-recurrence chemotherapy (HR 0.42, 95%CI 0.22 - 0.80). Median PRS was 14.6 months with salvage chemotherapy compared to 5.0 months without salvage chemotherapy.

Conclusion: Multifocal recurrence was associated with significantly worse post-recurrence survival, whereas both adjuvant and salvage chemotherapy conferred survival benefit. These findings underscore the prognostic role of recurrence patterns and the benefit of systemic therapy in recurrent left-sided PDAC.

53. A Vascularization Device for Beta Cell Replacement Therapy

Adam Jones Giuseppe Orlando, MD, PhD

Quentin Perrier, Timothy Sganga, Brett Ritchey, Amish Asthana, Giuseppe Orlando
Basic Science
Student
Wake Forest Institute Regenerative Medicine (WFIRM)

Although islet transplantation has promise to cure T1D, this approach leads to poor revascularization. Macro devices offer a promising alternative for islet delivery due to their ease of retrieval. Previous research has shown that inserting an arteriovenous (AV) bundle into a macro device can achieve rapid vascularization. This research builds on this approach to develop a vascularization device (VD), designed to improve islet viability and function, with the ultimate goal of reversing T1D.

The biocompatibility of both research and clinical grade fibrin with different additives (2-210 µg/mL aprotinin and 0.1-1.0 mg/mL dECM) was determined. Islets were incorporated in 5 µL fibrin drops followed by viability and insulin secretion assessments. For in vivo experiments, the AV bundle was isolated from immune competent rats and was inserted into the VD. Devices containing fibrin supplemented with 0.1-1.0 mg/mL dECM were explanted after 5-7 days to determine vascularization.

Fibrin from both sources and with different additives had comparable insulin secretion to control islets after 2-5 days in culture with only a slight reduction in viability. Using research grade fibrin with 210 µg/mL aprotinin and 0.1 mg/mL dECM, we found that vascularization occurred after 5 days and progressively increased through 14 days in the VD, with widespread CD31 expression in conjunction with mature αSMA+ vessels.

These findings suggest that fibrin is an optimal biomaterial to support islet health and function as well as to promote angiogenesis from AV bundles. This offers strong evidence that incorporating islets into the VD will promote rapid revascularization, enhancing islet survival and potentially reversing diabetes.

54. Development of A Stable and Effective Off-The-Shelf Wound Care Treatment for Combat Burn Injuries: A Preclinical Large Animal Stud

Abdulkadir Kabasakal, MD Young Min Ju, PhD

Sunil K. George, Olivia Clemenson, Denethia Green, Erika Billman, Ji Hyun Kim, Sang Jin Lee, Bill Vaughan, Antony Atala, James Yoo, Young Min Ju
Basic Science
Fellow
Wake Forest Institute Regenerative Medicine (WFIRM)

Burn injuries, prevalent in battlefield trauma, necessitate prompt necrotic tissue removal and wound coverage to optimize

patient outcomes. Traditional grafts encounter limitations such as donor site constraints and immune rejection. We previously developed a novel treatment employing conditioned media factors (CMFs) derived from human placental stem cells (hPSCs),which demonstrated enhanced wound healing in small animal models. In this study, we investigated growth factor mimetic peptides as a potential substitute, highlighting their advantages, including reduced immunogenicity, cost-effectiveness, and enhanced stability. We assess their therapeutic efficacy in promoting cell proliferation and migration in comparison to CMFs in a preclinical large animal model.

We have developed a novel alginate/gelatin-based skin graft that incorporates either hPSC-derived CMFs or synthetic growth factor mimetic peptides, which represent key proteins from the stem cell secretome. Nine recombinant protein and mimetic peptide cocktails were initially evaluated in vitro for their effects on cell proliferation and migration. The most promising formulations were subsequently tested in a full-thickness wound model in specific pathogen-free pigs. The extent of wound healing was assessed through measurements of wound closure, contraction, and detailed histological analyses that evaluated cell proliferation, new tissue formation, and angiogenesis.

The results showed that the mimetic peptide cocktail enhances cell proliferation and migration in vitro and facilitates wound closure in vivo. The mimetic peptide treatment appears as a similar effective CMF treatment, showing a potential alternative with further development.

In summary, this study highlights mimetic peptides as a promising off-the-shelf alternative to CMF-based treatments. The alginate/gelatin skin graft, loaded with specific mimetic peptides, emerges as an advanced wound care strategy for full-thickness combat burns. This approach offers enhanced healing potential, improved formulation stability, and reduced production costs.

55. Human Urine-Derived Stem Cells for Personalized Corneal Repair: Autologous Stratified Epithelial Construction

Caleb Keoho Yuanyuan Zhang MD, PhD

David Long, Carlo Christine, Qian Wan, Anthony Atala and Yuanyuan Zhang
Basic Science
Student
Wake Forest Institute Regenerative Medicine (WFIRM)

Purpose: Corneal wounding and limbal stem cell deficiency (LSCD) can lead to significant visual impairment and ocular health challenges. Tissue engineering approaches using stem cells seeded on biomaterials show promise for corneal repair and offer a potential solution to restore vision and improve patient outcomes. Autologous adult stem cells isolated from various tissues such as bone marrow, fat, and corneal-limbal stroma have multipotent potential to promote corneal repair. However, obtaining these stem cells requires invasive biopsies. This study investigates the regenerative potential of human urine-derived stem cells (USCs), a non-invasive and readily available stem cell population, seeded on decellularized small intestinal submucosa (SIS) to generate autologous stratified epithelium for corneal repair.

Methods: USCs were isolated from healthy donors (n=9, M:F 6:3). A novel differentiation protocol was established to direct USCs towards a corneal epithelial lineage by evaluating epithelial cell markers, tight junction formation via transwell assays, and barrier function after epithelial differentiation. thin SIS scaffolds seeded with USCs as an alternative corneal construct were evaluated by immunohistochemistry.

Results: After differentiation, USCs exhibited a cobblestone morphology, a multilayered well-stratified epithelium, and microvilli-studded tight junctions. Differentiated USCs expressed epithelial cell markers (cytokeratin 7, 13, 19, and 20). The 3-5 layered epithelium of USCs showed appropriate structural and functional characteristics resembling native corneal epithelium as evidenced by tight junction proteins (ZO-1, ZO-2, claudins, and occludin) and barrier functional characteristics. The stratified epithelium of SIS seeded with differentiated USCs is positive for AE1/AE3.

Conclusions: The results suggest that human USCs have significant potential as a convenient, low-cost cost, and personalized source for the generation of autologous corneal epithelial constructs for the treatment of corneal defects and LSCD. This approach opens new avenues for personalized regenerative medicine in ophthalmology and may pave the way for innovative treatments of various corneal diseases and injuries, corneal disease modeling, and drug testing.

56. Social Media Use Among Cardiothoracic Surgeons: The Online Landscape and Comparisons Between Subgroups

Zohaib R. Khawaja Bartlomiej R. Imielski, MD

Akalya Villenthi, Charles E. Bardawil, Simran P. Patwa, Aaron S. Gilani, Benjamin I. Schachner, Ulysis H. Baal, Gabriel E. Cambronero, Joseph C. Sweeney, Nidhi N. Desai, Timothy E. Craven, Bartlomiej R. Imielski
Educational Science
Student
Surgery-Cardiothoracic

Objectives:
Social media use among cardiothoracic surgeons has yet to be analyzed. This study aimed to explore how online media utilization by cardiothoracic surgeons differs by subspecialty, sex, geographic region, practice type, level of experience, and training pathway.
Methods:
A list of 223 cardiothoracic surgeons was generated by querying the 1,066 members of the American Association for Thoracic Surgery and randomly selecting 223 actively-practicing surgeons. Demographic information and online platform information was searched for each surgeon in a standardized fashion. Platforms assessed included: practice websites, personal
websites, CTSNet, LinkedIn, ResearchGate, Wikipedia, X/Twitter, Facebook, Instagram, practice YouTube, personal YouTube, and TikTok. A cumulative online presence score was then calculated for each surgeon.
Results:
CTSNet (98.2%), LinkedIn (78.9%), and ResearchGate (57.4%) were the most commonly used online platforms. X/Twitter (32.7%) was the most popular social media platform used. There were no differences in online platform utilization by subspecialty, practice type, or training pathway. However, differences did exist by sex, geographic region, and level of experience. Females more frequently used Facebook and Instagram. Surgeons in the Southwest were more likely to use Facebook and Instagram, as well as have a personal website. Early-career surgeons had a higher median cumulative online presence score and were more active on X/Twitter, while mid-career surgeons were more likely to use LinkedIn.
Conclusions:
99.6% of cardiothoracic surgeons use professional networking platforms; however, social media use remains relatively low overall (42.6%). These findings lay a foundation regarding how cardiothoracic surgeons engage with the online landscape to supplement their practice.

57. Do Vomer Flaps or Lateral Releasing Incisions Affect Midface Growth After Primary Palatoplasty? A Meta-Analysis

Halle Kincaid, BA Christopher Runyan, MD, PhD

Daiven Sharma, Kathleen Smith, Iris Brammer, Stavros Karagiorgis, Kate Dilley, Christopher Runyan
Clinical Science
Student
Surgery-Plastic & Reconstructive

Purpose: Orofacial clefts are a major worldwide congenital condition that benefit from early intervention to ensure proper feeding, breathing, speech, aesthetics, and psychosocial wellbeing. Following surgical correction of cleft lip and palate, midfacial growth is often restricted. The degree of invasiveness required to repair the palate has been hypothesized to affect long term midfacial growth; however, there are currently no studies examining long term midfacial growth related to the specific surgical methods of lateral releasing incisions and vomer flaps. This meta-analysis aims to determine whether utilizing lateral releasing incisions and vomer flaps is associated with higher rates of midface hypoplasia in order to inform optimal surgical practices.
Methods: A comprehensive literature search was conducted in Medline Ovid and Embase in 2025, evaluating articles meeting inclusion criteria following PRISMA guidelines. For meta-analysis, only studies reporting cohorts of patients with Veau III clefts (unilateral cleft lip, palate, and alveolus) who underwent one-stage primary palatoplasty (PP) without active orthopedic intervention or gingivoperiosteoplasty were included. Studies were excluded if they did not report cephalometric SNA or SNB angles at a minimum of 8 years post-PP. Studies describing primary techniques as "vomopalatoplasty" or single-layer vomer closure were distinguished from those specifying the use of an extended vomer flap as an adjunct. For

analysis purposes, both were included under "vomer flap" usage, with the specific primary technique recorded separately. Lateral releasing incisions were also recorded as a binary variable. Primary exposure variables of interest were the use of vomer flap and lateral releasing incisions; Outcomes of interest were SNA and SNB angles.
Univariable and multivariable random-effects models were conducted using restricted maximum likelihood (REML) in R. Multivariable models controlled for potential confounders, including age at PP, secondary alveolar bone grafting (ABG), passive orthopedic/orthodontic device use, and age at cephalometric imaging.
Results: Out of the 23 studies that met inclusion criteria, 21 had sufficient data for all the variables of interest and were included in multivariable analysis. The total sample size was 589 subjects with a measured SNA variable and 361 subjects with a measured SNB variable. Statistical analysis results are summarized in the table below. The use of a vomer flap was associated with a decrease in the SNA and SNB degree measurements, and lateral releasing incisions were associated with a decrease in the SNA measurement; however, none of these findings were statistically significant.
Conclusions: The use of vomer flaps and lateral releasing incisions in Veau III patients with one stage PP has no effect on long term midfacial growth. Future studies are warranted to examine midfacial growth outcomes with further division of palatoplasty techniques and in patients with different cleft severities.

58. Perforator and Pedicled Flap Reconstruction for Hidradenitis Suppurativa: A Review of the Literature

Samuel Kogan, MD, PhD Kyle Robinson, MD

Katherine Zurbuch Dilley Kyle Edward Robinson
Clinical Science
Resident
Surgery-Plastic & Reconstructive

Background: Hidradenitis suppurativa (HS) is a chronic and debilitating disease, in which reconstructive approaches vary among surgeons. Reconstruction of HS defects classically involves secondary intention healing (SIH), primary closure, or skin grafting. Emerging with increasing popularity, however, are perforator and pedicled flaps. Flaps offer the unique advantage of transferring vascularized healthy tissue free of disease, do not require extensive postoperative wound care, and offer robust coverage for complex defects.
Methods: A literature review was performed according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. PubMed was searched to identify articles pertaining to reconstructive surgery for HS using perforator and pedicled flaps. Data collected included patient characteristics, operative techniques, complications, recurrences, and revision surgeries.
Results: A total of 129 articles were screened, and 29 studies (222 patients, 234 flaps) met inclusion criteria. Anatomic locations included axillary (81.6%), inguinal (5.6%), and perineal/perianal/gluteal (12.8%). Complications were reported in 46 cases (19.7%), including dehiscence, necrosis, venous congestion, hematoma, and infection. Rates of disease recurrence (3.2%) and revision surgery (5.4%) were found to be lower than those reported in published studies on SIH and skin grafting for HS reconstruction.
Conclusions: Perforator and pedicled flaps are a reliable and effective technique for the reconstruction of HS defects. They allow for complete resection of diseased tissue and enable reconstruction of large defects with decreased recurrence, reduced need for revisionary surgery, and minimal postoperative morbidity compared to conventional closure techniques used for this debilitating disease.

59. Is Out-of-Sequence Kidney Allocation Associated with a Weekend/Holiday Effect?

Rana Kumar, MD Robert Stratta, MD

Arianna E Cabrales, Christopher J Webb, Emily K McCraken, Giuseppe Orlando
Alan Farney, Robert J Stratta
Clinical Science
Fellow
Surgery-Transplant

Introduction: The presence and magnitude of a "weekend or holiday effect" in kidney transplantation (KT) remains controversial, particularly with respect to in-sequence versus out-of-sequence (OOS) kidney allocation. With the most recent change in the Kidney Allocation System (KAS-250) coupled with implementation of new OPO performance measures,

out-of-sequence (OOS) kidney allocation has risen dramatically. Whether changes in kidney allocation may influence the weekend /holiday activity is unknown.
Methods: Single center retrospective study of deceased donor kidney transplant (DDKT) activity according to eras immediately before and after implementation of KAS-250. Era 1 (E1) ranged from 1/26/17 - 3/8/21 and Era 2 (E2) from 3/16/21 - 1/14/25 to achieve 648 adult KT recipients (n=648) in each era. Weekend/holiday activity was defined as DDKTs occurring on Saturday, Sunday, or designated national holiday. Data were analyzed in each era and also according to in-sequence versus OOS allocation (defined as patients who received a KT with a sequence number ≥100 [SN≥100] on the Match Run list).
Results: In Era 1, the annual proportion of DDKTs performed on weekends or holidays ranged from 26.1% to 33.2% (overall mean 30.2%) and was not different for either in-sequence (30.5%) or OOS (29.5%) allocation. Similarly, in Era 2, the annual proportion of DDKTs performed on weekends or holidays ranged from 26.0% to 32.3% (overall mean 29.0%) and was likewise not different for either in-sequence (28.3%) or OOS (30.1%) allocation. SN≥100 (OOS) KT occurred in 251 patients (38.7%) in E1 vs 266 patients (41.0%) in E2 (p=0.43). When compared to E1, E2 had higher rates of organ import (50% E1 vs 69.4% E2), DCD donors (27.8% E1 vs 41.7% E2), delayed graft function (DGF, 28.7% E1 vs 39.7% E2), and one-year patient survival (94.6% E1 vs 97.3% E2, all p<0.05).
Conclusions: In our single-center experience spanning 8 years, 1296 KTs, and 2 eras based on the KAS-250 allocation change, changes in or type of allocation had no discernible effects on weekend/holiday activity, which was commensurate with weekday activity. Outcomes were comparable regardless of day of the week, thus negating any evidence for a weekend/holiday effect.

60. Understanding Macromastia-Associated Headache and the Impact of Reduction Mammoplasty: A Pilot Prospective Cohort Study

Elizabeth Laikhter, MD Lisa R. David, MD, MBA, FACS

Kristyn Spera Pocock, Joseph Rigdon, Liza Smirnoff, Adam J. Katz, Sandhya Kumar, Ivo Pestana, Bennett Calder, Rebecca Erwin Wells, Lisa R. David
Clinical Science
Resident
Surgery-Plastic & Reconstructive

Background: Over 100,000 women with symptomatic macromastia undergo reduction mammoplasty (RM) annually in the United States. Up to 69% of patients cite headache as a reason for pursuing surgery, with 53-94% reporting post-operative headache improvement. Despite this reported relationship between headache and macromastia, macromastia-related headache is not clearly defined, often described as "tension-type" or "myofascial" in surgical literature. In collaboration with the Department of Neurology Comprehensive Headache Program, our study aimed to identify macromastia-related headache according to International Classification of Headache Disorders (ICHD) criteria, a consensus-based headache classification system developed by Headache experts, and determine response to surgical intervention in women with macromastia-associated headache undergoing RM.
Methods: A prospective observational cohort study was performed from 3/16/2023 to 2/24/2024. Thirty-four women with symptomatic macromastia, headache, and insurance approval for RM recruited from the Plastic Surgery clinic were surveyed pre- and postoperatively (preop, 1-4wk postop, and 12-16wk postop). All patients were cisgender women ≥ 18 years or older, English-speaking, with >4 headache-days/month. Patients with brain or C-spine surgery within 2 years, history of breast malignancy, and use of >50mcg estradiol were excluded. The primary outcome was headache type assessed preoperatively with the validated ID-Migraine survey and semi-structured interview by a Headache specialist. Secondary outcomes included pre-to postoperative change in migraine disability, monthly headache-days, allodynia, and sleep apnea risk score as assessed through validated Migraine Disability Assessment Score (MIDAS), Allodynia Symptoms Checklist (ASC), Berlin sleep apnea risk surveys, and postoperative headache responder status (≥ 50% reduction in headache-days).
Results: Of 34 enrolled patients (median age 33.5 years, 62% Caucasian, 32% African American), most (97%) screened positive for migraine. Thirty-three patients completed 120-day follow-up. Mean migraine disability scores improved from 16.1 preoperatively (moderate disability) to 5.2 postoperatively (little or no disability) (CI -14.7, 4.59; p=0.0005). Mean monthly headache days decreased from 13.4 to 3.6 days (-9.8, CI -12.8, -6.8; p<0.0001). Most (77%) experienced ≥50% improvement in monthly headache-days postoperatively. Additionally, patients experienced improvement in allodynia score (3.4 to 1.3, CI -3.3, -0.9; p=0.0014) and over 1/3 (36%) experienced improvement in sleep apnea risk status (CI -4.2, -38.9; p=0.0196).
Conclusion: In our cohort, most women with headache pursuing RM experience migraine, contrary to established assumptions that macromastia-associated headache is tension-type. Migraine-related disability, monthly headache-days,

headache severity, neck pain, allodynia, and sleep apnea risk improved following RM. Additional collaborative research is necessary to understand the impact of macromastia on migraine and further elucidate migraine pathophysiology.

61. Artificial Intelligence in Surgical Qualitative Research: Assessing Codebook Reliability and Thematic Consistency

Bonnie Laingen, MS Lucas P Neff, MD

Wesley Iobst, Gabriel E. Cambronero, Maggie E. Bosley, Lucas P. Neff
Basic Science
Student
Surgery-General

Introduction: Artificial Intelligence (AI), such as ChatGPT, is increasingly being integrated into scientific research due to its ability to process large volumes of data, summarize literature, and assist in drafting and revising scientific writing. Beyond these applications, there is growing interest in leveraging AI for qualitative data analysis, a process that historically requires labor-intensive analysis through manual coding and interpretation by human reviewers. While AI has commonly excelled in quantitative data analysis, it is important to evaluate AI's performance with qualitative data to ensure that its increased efficiency does not result in decreased data quality of interpretive depth. This study compares the inter-rater reliability (IRR) of human- versus AI-derived codebooks applied to the same qualitative dataset, aiming to assess the feasibility and limitations of AI-assisted thematic analysis in research settings.
Methods: An open-ended survey on barriers surgeons face when performing laparoscopic common bile duct exploration (LCBDE) compared to endoscopic retrograde cholangiopancreatography (ERCP) at their institutions was performed as part of a larger study. Inductive coding of 200 of these responses was performed by two readers (BEL, WI). Responses were uploaded into ChatGPT for zero-shot inductive clustering of the responses; this codebook was then used by the same two readers to deductively analyze responses. RStudio was used to calculate inter-rater reliability represented by agreement rate and Cohen's kappa coefficient with bootstrapped 95% confidence intervals in both human and AI-generated codebooks.
Results: Both human- and AI- derived codebooks identified 13 codes across the 200 provided responses. Of these, five codes were identical between the two codebooks, corresponding to barriers related to equipment, time constraints, cost constraints, global support, and low volume of LCBDE cases. Overall, the average agreement rate was 95.1% for the human codebook and 92.3% for the AI-generated codebook. Inter-rater reliability (Cohen's κ) was 0.754 [95% CI: 0.708-0.794] for the human codebook and 0.638 [95% CI: 0.589-0.685] for the AI-generated codebook. Quantitative comparison of IRR for the five shared codes showed no statistically significant differences, as indicated by overlapping confidence intervals. None of the confidence intervals for IRR in the human codebook included 0, whereas four of thirteen confidence intervals for the AI-generated codebook did include 0. Qualitative comparison of the non-identical codes revealed largely similar themes; however, the human codebook separated themes more distinctly to reduce confusion, while the AI-generated codebook contained several overlapping themes, which anecdotally made coding more difficult.
Conclusion: Overall, both the human and AI codebook resulted in high average agreement between two coders, with the human codebook demonstrating slightly higher IRR and more consistent thematic separation. For codes shared between the two codebooks, there was no statistically significant difference in IRR observed, suggesting that AI can reliably identify broad thematic categories in surgical survey data. Nevertheless, the AI-generated codebook resulted in more uncertain or low agreement between coders, which may be attributed to the AI-generated codebook providing more overlapping themes, which increased coding ambiguity. These findings indicate that while AI can efficiently highlight overarching barriers and trends reported by surgeons, human oversight remains essential for refining nuanced themes and ensuring consistent interpretation, particularly for complex or context-specific surgical issues. Overall, this study supports a hybrid approach in surgical qualitative research, in which AI assists with initial thematic clustering and human reviewers validate and refine coding with each other and with AI assistance.This hybrid approach may offer a more efficient, more comprehensive method to analyzing surgical qualitative data sets in the future.

62. Multi-functional Solid 3D Organ Bioreactor Platform for Regenerative Medicine Applications

Po-Feng Lee, PhD James Yoo, MD, PhD

Po-Feng Lee, Adit Mehta, Eric Renteria, Frank Marini, Ji Hyun Kim, Tracy Criswell, Thomas Shupe, Anthony Atala, Joshua Hunsberger, Metin N. Gurcan, Shay Soker, Young Min Ju, James J. Yoo
Basic Science
Fellow

Wake Forest Institute Regenerative Medicine (WFIRM)

Purpose:
Regenerative medicine is rapidly transitioning from the research phase towards the clinical phase. Many cell-based tissue-engineered products require the use of tissue-specific bioreactors for preconditioning and maturation; however, clinically usable tissue or organ-specific bioreactors are not available, and many bioreactors are custom-made which creates regulatory and manufacturing challenges. This study aimed to develop a standardized, self-contained, and modular bioreactor platform that allows for a scalable and automated process for the clinical manufacturing of solid 3D organ constructs.
Methods:
The design considerations for the solid 3D bioreactor components included biocompatibility, scalability, and functionality. Applying these design considerations, we developed a solid 3D organ-specific bioreactor prototype, consisting of a rotatable and pressurizable organ enclosure to fit and stabilize organs in different shapes or sizes. This enclosure also minimizes stress concentration from gravity influence during whole organ perfusion. The constant-pressure motion was carried out by integrating the flow pump, flow rate sensor, pressure sensor, and PID controller to minimize the delay or overshoot of the flow rate, which could lead to organ damage. Baseline tests under constant pressure and constant-flowrate perfusion modes were conducted using a decellularized porcine kidney to confirm the functionality and reliability of the bioreactor.
Results:
Our results showed the bioreactor system's proper operation, with quantitative data displayed by the integrated sensors. Under the proportional-integral-derivative (PID)-controlled flow, we were able to perfuse multiple organs with one gear pump simultaneously, and the pressure of the renal artery during perfusion was successfully maintained for 48 hours without a flow rate overshoot observed. The design of rotable and pressurizable organ enclosure improved the organ circulation as evidenced by the dye perfusion experiment. The module was successfully used for porcine kidney conditioning to maintain scaffold integrity.
Conclusion:
The multi-functional perfusion bioreactor has been successfully validated and may be used as a standard tool for biomanufacturing tissue-engineered solid 3D organ constructs, and the perfusion system can be applied to other perfusion-based tissue bioreactors. The development of a standardized tissue-specific bioreactor platform may facilitate rapid translation of tissue-engineered medical products to the clinic.

63. The Exposure to Muscadine Grape Extract During Pregnancy Does Not Alter Cardiac Hemodynamics but Increases Proteinuria in Preeclamptic Rats

Nykea Lewis Liliya M. Yamaleyeva, MD, MS, FAHA

Nildris Cruz-Diaz, Xuming Sun, Ann E. Tallant, Patricia E. Gallagher, and Liliya M. Yamaleyeva
Basic Science
Student
Wake Forest Institute Regenerative Medicine (WFIRM)

Muscadine grape extract (MGE) is a common supplement taken by women of reproductive age. However, the effects of MGE on pregnancy are unknown. Maternal cardiac hemodynamic adaptations during gestation represent a key physiological mechanism that facilitates the progression of pregnancy and ensures fetal viability and development. In this study, we determined whether MGE treatment during the pre-gestational and gestational periods influences maternal and fetal characteristics and cardiac function in normal Sprague-Dawley (SD) or preeclamptic transgenic (PE) rats. At the end of pregnancy at days 19-20 (GD19-20), rats were placed in metabolic cages for the assessments of daily urine excretion, food, and water intake; mean arterial pressures (MAP) were recorded using femoral intra-arterial catheters under 2% anesthesia (NIBP100). Echocardiography was used to assess cardiac function in rats using Vevo LAZR ultrasound (FujiFilm VisualSonics). Our data demonstrated that maternal or fetal weight was not influenced by the MGE intake in either SD or PE rats. The organ weights (heart, kidney, pancreas, liver, spleen, lungs, and brain) were unaffected by MGE in either strain (n=3-6). The PE rats had elevated MAP compared with the normal SD rats (SD: 84.4±3.5 vs. PE: 137.1±4.8 mmHg; data are mean±SEM, $p < 0.05$; n=5 in each group). MGE intake had no effect on MAP in either strain (PE-MGE: 135.9±7.6 mmHg; $p > 0.05$; n=4-6; or SD-MGE: 77.9 ± 5.9 mmHg; $p > 0.05$; n = 5-6). No differences in food or water intake or urine excretion were observed in SD rats (n=3-6). However, proteinuria was increased by the MGE in PE rats (PE: 86.06±14.16 vs. PE-MGE: 161.3±33.86 mg/kg/day; $p < 0.05$; n=5). The analysis of maternal cardiac hemodynamics showed that MGE treatment had no effect on SD or PE rats (SD-MGE: 73.8 ± 8.1 mL/min; $p > 0.05$; n=5-6 vs. PE-MGE: 54.9 ± 18.9 mL/min; $p > 0.05$; n=3-6). No differences were observed in fractional shortening (SD: 51.1±10.9 vs. PE: 51.1 ± 6.3%; $p > 0.05$, n=6), ejection fraction (SD: 78.9±14.3 vs. 81 ± 5.8%; $p > 0.05$, n=6) or stroke volume (SD: 192.9 ± 29 vs. PE: 171.6 ± 11.4 µL; $p > 0.05$, n=6) between untreated SD and PE rats. Furthermore, MGE intake had no effect on maternal, fetal, or hemody-

namics parameters during normal or PE pregnancy. We conclude that although MGE did not influence maternal, fetal, or hemodynamic characteristics during normal or PE pregnancies, its potential effect on proteinuria warrants caution against its use during preeclamptic pregnancies. Further investigation is needed to evaluate the safety profile of MGE consumption during pathological gestation.

64. Induction of Neurogenesis, Angiogenesis and Remyelination in vitro via a Novel Hydrogel (ReyaGel) for use in Acute Traumatic Spinal Cord Injury

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

Eric Jason Marrotte, Anthony Atala
Basic Science
Fellow
Wake Forest Institute Regenerative Medicine (WFIRM)

Introduction: Spinal cord injury (SCI)-induced paralysis profoundly impairs patients' ability to perform essential daily activities, and currently, no effective therapies exist to restore motor function after this devastating injury. Critical barriers to repairing and reinnervating damaged spinal cord tissue include glial scar formation and demyelination. Although stem cell therapy holds therapeutic potential, stem cell monotherapy alone has shown limited efficacy, lacking the capacity to sufficiently counteract the complex structural and cellular changes necessary for full motor recovery. In a previous study we have found that the active peptide sequences of fibronectin and laminin will augment neurogenesis and angiogenesis in vitro and therapeutically in vivo. ReyaGel is an FDA-approved hydrogel that is utilized in clinical settings for the treatment of skin wounds; which contains central nervous system full molecule extracellular matrix molecules such as laminin, fibronectin, and collagen IV. ReyaGel's formulation is well-suited to inhibit scar formation and induce central nervous system regeneration; therefore, in this study we investigate its therapeutic potential in vitro.
Methods: We evaluated the elasticity of ReyaGel through rheologic analysis. The diffusion of small, medium and large molecules was evaluated with a SDS page diffusion assay. The ability of the cells to infiltrate into ReyaGel and maintain viability was determined via cell culture, live/dead staining and confocal microscopy. Subsequently, neurogenesis, angiogenesis, and myelination were evaluated via cell culture, immunostaining and confocal microscopy.
Results: We found that elasticity of ReyaGel is 200 kPa, which is well within therapeutic range needed to induce neurogenesis and avoid gliosis. Small, medium and large molecules are able to diffuse through ReyaGel. Placental derived stem cells, neural stem cells, neurons, endothelial
cells and oligodendrocytes all demonstrated the ability to infiltrate into ReyaGel and maintain viability. Through histologic analysis, we found the neurons formed neural networks within the ReyaGel, and that oligodendrocytes myelinated these neural networks. Endothelial cells demonstrated the ability to infiltrate, spread and interact with each other in ReyaGel.
Conclusion: Therapeutic assessment of ReyaGel in vitro demonstrated significant induction of neurogenesis, angiogenesis, and remyelination, supporting its potential use in acute spinal cord injury.

65. Open, Laparoscopic, and Robotic Liver Resection for Hepatic Neoplasms: Trends and Outcomes Over More than a Decade

Jessica Liu, BS Perry Shen MD, FACS, FSSO

Jessica Liu, Queena Chen, Rasikh N. Hamid, Bonnie Etta Laingen, William W. Kennedy, Jordan Perry, Sujeeth Shanmugam, Avery Z. Wright, Joni Evans, Kathleen Cummins, Clancy J Clark, Perry Shen
Clinical Science
Student
Surgery-Oncology

OBJECTIVE:
This study examines the evolution of minimally invasive versus open surgical approaches for hepatic neoplasms over a decade of practice within a single institution.
METHODS:
A retrospective review was conducted of 411 hepatectomies for primary and secondary liver malignancies via laparoscopic liver resection (LLR), robotic liver resection (RLR) or open surgery. We stratified the study into two periods: 2012-2017 (n=188) and 2018-2023 (n=223). Two-way analyses were performed to evaluate main and interaction effects between surgical approach and time period on perioperative outcomes. For remaining operative characteristics and postoperative

outcomes, we analyzed differences between surgical approaches within each time period.

RESULTS:

Surgical approach changed markedly over time with the proportion of RLR increasing from 4.8% in 2012-2017 to 31.4% in 2018-2023 (p<0.001). Interaction analyses demonstrated that RLR had significantly lower readmission rates than LLR and open surgery over time (interaction p=0.046). Additionally, these analyses revealed trends of shorter OR time (interaction p=0.057) and less blood loss (interaction p=0.065) with RLR over time. Although length of hospital stay (LOS) did not show significant differences over time (interaction p=0.266), RLR exhibited lower shorter LOS in 2018-2023 (3 days [IQR 2-5] vs. 4 [2-6] LLR vs. 6 [4-7] open, p<0.001). Open surgery remains the primary approach to major hepatectomies over accounting for 67.7% of cases in 2012-2017 and 59.5% in 2018-2023 (interaction p<0.001).

Individual time-period analyses revealed no significant differences in margin status, postoperative complication rate, and 90-day mortality across surgical approach. Open surgery was favored for larger lesions in 2018-2023 (3.5cm [IQR 1.9-7.9] vs. 2.8 [1.7-4.2] RLR vs. 2.4 [1.6-3.0] LLR, p=0.013).

CONCLUSION:

Over the last decade, the use of RLR has increased by nearly 700%. This approach demonstrated improved perioperative outcomes over established surgical approaches without compromising oncologic outcomes. Open hepatectomy remains essential for extensive or complex diseases, but the role of RLR continues to expand as experience and technology advance.

66. A Multicenter Study on Immediate Breast Reconstruction: Balancing Efficiency and Patient Outcomes

Kelsey Lloyd, MD Thomas Steele, MD

Joyce Cui; Eric Zeng, Marion Tapp, Mary Duet, Caitrin Curtis, Anna A Stipe, Lilian D. Galarza Paez, Abigail Heilenman; Thomas Steele, J. Michael Robinson

Clinical Science

Resident

Surgery- Plastic & Reconstructive

Introduction:

Immediate breast reconstruction offers psychosocial, cost, and logistical benefits for breast cancer patients but presents challenges in implant-based reconstruction (IBR) and autologous breast reconstruction (ABR). Complication rates vary, and revision outcomes remain under-researched. This study evaluates complications and revision rates in immediate IBR and DIEP flap reconstruction at two institutions.

Methods:

A retrospective review of patients who underwent immediate IBR (65 patients, 116 breasts) or ABR with DIEP flaps (158 patients, 158 breasts) post-mastectomy in 2018-2024 at two institutions. Patient demographics, medical history, operative details, complications, and revisions were analyzed.

Results:

IBR and ABR patient characteristics were comparable, except for BMI (IBR: 25.46, ABR: 30.75, p<0.001), ptosis grade (p=0.002), and radiation history (IBR: 21.5%, ABR: 44.9%, p=0.002). IBR breasts had significantly lower odds of minor complications (p<0.001, OR 0.22), including infection (p=0.005, OR 0.26) and wound dehiscence (p=0.027, OR 0.39). Rates of major complications, seroma, hematoma, and skin necrosis were comparable. IBR patients were 5.9 times less likely to undergo revision surgery (52.3% vs. 71.5%, p<0.001), 2.5 times less likely to require fat grafting (p=0.003), and 5.3 times less likely to undergo scar revision (p<0.001). The total revisions per patient were also lower in IBR (0.71 vs. 0.96, p<0.001).

Conclusion:

IBR patients are 83% less likely to require revision surgery, suggesting greater reconstructive efficiency. Despite the need for additional procedures in both groups, IBR was associated with fewer revisions and lower minor complication rates, while major complication rates were comparable. These findings underscore the importance of individualized decision-making in immediate reconstruction.

67. Muscadine grape extract supplement (MGES) as a cardio-protectant in triple-negative breast cancer

Chole Loth Patricia Gallagher, PhD

Ana Clara Melo, E. Ann Tallant, Patricia E. Gallagher

Basic Science

Student

Polyphenols are bioactive compounds found abundantly in fruits and vegetables, contributing to their antioxidant and anti-inflammatory health benefits. Muscadine grapes, native to the southeastern United States, are particularly rich in phenolic compounds such as ellagic acid, gallic acid, anthocyanins, and flavan-3-ols, with the highest concentrations in the skin and seeds. A proprietary muscadine grape extract supplement (MGES) was well-tolerated in a Phase I clinical trial in cancer patients, and ongoing Phase II trials are assessing its effects in elderly cancer patients experiencing fatigue and in prostate cancer patients undergoing androgen deprivation therapy. The present study investigates whether MGES mitigates doxorubicin (DOX)-induced cardiac injury in a mouse model of triple-negative breast cancer (TNBC). Athymic female nude mice were injected with MDA-MB-231 human breast cancer cells into the mammary fat pad and treated with a cumulative dose of 22 mg/kg DOX via intraperitoneal injection, with or without MGES supplementation (100 μg/mL total phenolics) in drinking water. Echocardiographic analysis showed that MGES significantly attenuated DOX-induced cardiotoxicity with ejection fraction, cardiac output ($p < 0.05$), fractional shortening ($p < 0.01$), and relative wall thickness ($p < 0.001$) exhibiting marked improvement. MGES also reduced markers of lipid peroxidation (4-hydroxynonenol, $p < 0.01$; malondialdehyde, $p < 0.0001$) and enhanced antioxidant enzyme activity in the heart, including superoxide dismutase ($p < 0.001$), catalase ($p < 0.0001$), and glutathione peroxidase ($p < 0.01$). While DOX remains a potent chemotherapeutic for TNBC and other malignancies, efficacy is limited by cumulative, dose-dependent cardiotoxicity. These findings suggest that MGES confers robust cardio protection against DOX-induced oxidative stress and structural damage while preserving antitumor efficacy, supporting potential of this supplement as a novel adjunct therapy to improve cardiovascular and therapeutic outcomes in cancer treatment.

68. Risk Factors for Failed Same-Day Discharge After Shoulder Arthroplasty: Retrospective Analysis to Inform Inpatient vs. Outpatient Surgical Planning

Jonathan Marter Nicholas Trasolini, MD

Jonathan A. Marter, BS; Kathleen C. Smith, BS; Garrett S. Bullock, PhD, DPT;
Brian R. Waterman, MD; Nicholas A. Trasolini, MD
Clinical Science
Student
Surgery-Orthopedics

Introduction: Same-day discharge (SDD) after total shoulder arthroplasty (TSA) has gained popularity as a strategy to optimize resource utilization and enhance patient satisfaction. However, prolonged postoperative length of stay (LOS) remains a challenge, contributing to increased healthcare costs, increased hospital volume, and risk of complications. Identifying preoperative and intraoperative factors predictive of failed SDD is critical for guiding patient selection, optimizing surgical planning, and safely transitioning appropriate patients to outpatient pathways. The purpose of this study was to evaluate risk factors associated with failure of SDD after TSA, including both anatomic (aTSA) and reverse (rTSA) shoulder arthroplasty.

Methods: This was a single-center retrospective review of 808 patients who underwent primary TSA between September 2016 and July 2025 at Atrium Health Wake Forest Baptist Hospital. Patients undergoing hemiarthroplasty and revision arthroplasty were excluded. Data collected included demographics, comorbidities, preoperative laboratory and imaging findings, physical examination metrics, and intraoperative details including anesthesia and surgical technique. SDD success was defined as discharge within 24 hours of surgery without overnight admission; failure was defined as discharge >24 hours after surgery or overnight admission. Logistic regression models were used to evaluate potential predictors of SDD failure, controlling for age, body mass index (BMI), sex, laterality, race, and type of arthroplasty (aTSA vs rTSA). The Benjamini-Hochberg procedure was applied to control for false discovery. Odds ratios (OR) with 95% confidence intervals (CI) were reported.

Results: Among 808 patients, 107 (13%) achieved SDD. Patients who failed SDD were largely similar to those who were successfully discharged, except for abnormal preoperative electrolyte status, which was observed only in the failure group. ASA score was the only statistically significant predictor of SDD failure ($p<0.001$), with higher scores associated with increased odds of inpatient admission. Pulmonary disease approached significance ($p=0.060$), suggesting a potential association underpowered by sample size. No other demographic or intraoperative variables demonstrated statistically significant associations with SDD failure.

Conclusion: In this cohort, ASA score was the primary predictor of failure for same-day discharge after TSA, underscoring

its importance in preoperative evaluation and patient selection for outpatient arthroplasty. Abnormal preoperative electrolyte status and pulmonary comorbidities may also contribute to SDD failure, warranting further study. Delineating failure of LOS as > 24 hours vs. overnight stay and < 24 hours warrants further study which may also guide more detailed patient selection criteria. These findings can inform clinical decision-making to optimize outpatient surgical pathways, improve patient counseling, and reduce costly inpatient admissions and insurances costs for the patient and physician.

69. Variables Predictive of Functional Outcomes Following Endoscopic Hip Abductor Repair

Ava McKane John Hubbard, MD

Caleb Puckett, John Hubbard
Clinical Science
Student
Surgery-Orthopedics

BACKGROUND: Literature guiding surgical management of hip abductor tendinopathy is limited. The purpose of this study is to identify variables predictive for functional outcomes following endoscopic repair of hip abductor tears.

METHODS: Patients undergoing endoscopic hip abductor repair between 2016 and 2024 by a single surgeon were administered a survey to collect pre-operative and post-operative modified Hip Harris Score (mHHS), Visual Analogue Scale (VAS), and a custom hip abductor functional outcome survey simultaneously at a minimum of 6 months post-operatively. Patients were then stratified by whether they reached mHHS thresholds for the minimal clinically important difference (MCID), or patient acceptable symptomatic state (PASS), as well as sex, presence of osteoarthritis, use of bio-inductive patch augmentation, and number of suture anchors to compare functional outcomes based on these variables. Student t-test and $\chi 2$-test were used for statistical analysis.

RESULTS: 39 (78%) patients responded to the mHHS, VAS, and custom surveys and 11 (22%) responded to only the VAS and custom surveys with an average follow-up of 23.13 ± 13.58 months. The mean age of the cohort was 62.52 ± 12.56, with 10 (20%) and 40 (80%) being male and female respectively. No significant associations between functional improvement and sex, age, BMI, tear size, bio-inductive patch augmentation, or number of anchors used was seen. Patients failing to reach mHHS PASS threshold had longer time between survey response and surgery (19.3±11.6 vs 33.4±23.1 months; $p = 0.01$). 40.0% of patients who did not reach the MCID threshold and only 13.8% of those that did reach the threshold had hip osteoarthritis at the time of follow up ($p = 0.001$).

CONCLUSIONS: Age, sex, BMI, tear size, bio-inductive patch augmentation, and number of anchors used did not demonstrate an impact on the level of functional outcome seen following
endoscopic repair of hip abductor tears. However, length of time after surgery and presence of hip osteoarthritis may be associated with lower post-operative patient reported outcomes.

70. Identifying Health Disparities in Pediatric Patients Undergoing Anterior Cruciate Ligament Reconstruction

Ava McKane Alejandro Marquez-Lara, MD, PhD

Caleb Puckett, Jonathan Groothoff, Alejandro Marquez-Lara
Clinical Science
Student
Surgery-Orthopedics

BACKGROUND: There is increasing evidence that health disparities affect access to care and postoperative outcomes following orthopaedic procedures. Few studies have assessed the impact of socioeconomic status as measured by the Child Opportunity Index (COI) on pediatric patient outcomes after anterior cruciate ligament (ACL) surgery.
HYPOTHESIS: Lower COI scores will be associated with reduced access to surgery and physical therapy (PT) when compared to higher COI scores.
METHODS: The charts of all patients under the age of 18 who underwent ACL reconstruction between 2012 and 2022 at a single academic center were reviewed. Revision cases and those part of multi-ligamentous reconstruction were excluded. The patient cohort was stratified by socioeconomic status based on COI categories (Low and Very Low vs High and Very

High). Disparities in days from injury to surgery, injury to initial consultation, initial consultation to surgery, initial consultation to MRI, MRI to surgery, time to physical therapy (PT) after surgery, and number of PT visits were analyzed. Statistical analyses included student t-test and mean differences with 95% confidence intervals ($p<0.05$).

RESULTS:
A total of 164 patients met the inclusion criteria: 78 from lower COI areas and 86 from higher COI areas. The average age in the lower COI cohort was 15.73±1.1 years and 16.06±0.9 years in the higher COI cohort (95% CI [16.2, 15.9] vs. [15.9, 15.6], p=0.044). There were no significant differences in sex distribution between groups. The mean number of days between injury and first appointment with an orthopaedic surgeon was 32.1±163 in the higher COI group, compared to 96.8±581.5 in the lower COI group (95% CI [67.7, -3.5] vs. [231.5, -38], p=0.333). Time from injury to surgery was shorter in the higher COI group (95.3±117.3 days) than in the lower COI group (152.6±584 days), though the difference was not statistically significant (95% CI [134, 56.6] vs. [287.9, 17.4], p=0.395). From initial appointment to surgery, the time interval averaged 62.3±65.7 days for higher COI patients, and 55.7±65.1 days for lower COI patients (95% CI [76.4, 48.2] vs. [70.3, 41.1], p=0.520). Similarly, the mean number of days between initial appointment and MRI was 17.6±61.3 for higher COI and 27.6±69.2 for lower COI (95% CI [30.7, 4.4] vs. [43.7, 11.5], p=0.334). On average, the number of days between MRI and surgery was 44.7±49 for the higher COI group and 30.4±54 for the lower COI group (95% CI [55.2, 34.2] vs. [43, 17.8], p=0.082). Post-operative follow-up duration was similar between groups - the mean number of days of follow-up was 264.2±194.3 for higher COI and 259.5±197.4 for lower COI (95% CI [305.9, 222.6] vs. [303.8, 215.3], p=0.878). Time from surgery to the first PT appointment was significantly shorter in the higher COI group at 8.1±9.9 days, compared to 15.7±27.8 in the lower COI group (95% CI [10.2, 5.9] vs [22.7, 8.7], p=0.021). Within the first six months after surgery, patients in the higher COI cohort attended more PT sessions on average (26.3±12.6) than those in the lower COI cohort (21.4±12.9), (95% CI [29, 23.6] vs. [24.6, 18.1], p=0.020). Finally, 1 patient (1.2%) in the higher COI group and 16 patients (20.5%) in the lower COI group did not attend any physical therapy sessions.

CONCLUSIONS: The present study identified health disparities based on socioeconomic status. Lower COI scores were associated with a longer time to initiation of physical therapy after surgery. Of those that attended physical therapy, fewer visits were completed among patients with higher COI scores. Future studies are warranted to better characterize the impact of socioeconomic status on access to care after ACL injury including diagnosis, treatment and quality of rehabilitation.

71. A Novel Open Surgical Approach to Treatment of Zenker and Killian Jamieson Diverticula

Erich Mildner, BS Hafiz Patwa, MD, PharmD & Lyndsay Leigh Madden, DO

Thomas Rodrigues BS, Joann Bluj MD, Lyndsay Madden MD, Hafiz Patwa MD
Clinical Science
Student
Surgery-Otolaryngology (Dentistry)

Background: A Zenker Diverticulum is a posterior herniation of the pharyngeal mucosa and submucosa above the cricopharyngeal muscle and below the inferior pharyngeal constrictors. A Kilian Jamieson (KJ) diverticulum is an anterolateral herniation of the pharyngeal mucosa and submucosa below the cricopharyngeal muscle and above the circular muscles of the esophagus. First-line surgical interventions usually involve rigid endoscopy with diverticulum reduction and cricopharyngeal myotomy. However, open surgical repair is sometimes needed in cases of failed endoscopic repair. This study aims to describe a novel approach of open surgical repair for Zenkers and Killian Jamieson diverticula and post operative outcomes.

Methods: Retrospective chart review completed over 8 years of adult patients undergoing novel surgical repair of Zenker and KJ diverticula. This surgical approach involves making an incision at the level of the cricoid. A flap of the investing layer of the cervical fascia along sternocleidomastoid and omohyoid is raised to cover the great vessels at the end of the case. The diverticulum and cricopharyngeal muscle are then visualized. Cricopharyngeal myotomy and diverticulum excision are then performed. The cervical fascia flap is then rotated and secured to the pre-vertebral fascia to separate and protect the carotid artery from the diverticulectomy site.

Results: Total patients: 28. Gender: 19/28 (68%) Male, 9/28 (32%) Female. Average age: 72.3 years old. Race: 22/28 (79%) White, 4/28 (14%) Black, 2/28 (7%) Unknown. Mean Preoperative EAT-10 Score: 18.1. Mean Postoperative EAT-10 Score: 10. Preoperative aspiration study: 10/28 (36%) aspirated, 15/28 (54%) did not aspirate, 3/28 (10%) unknown. Postoperative aspiration: 3/28 (11%) aspirated, 19/28 (68%) did not aspirate, 6/28 (21%) unknown. Post operative leak: 1/28 (4%) experienced post operative leak, 27/28 (96%) did not leak. Endoscopic repair: 16/28 (57%) had prior endoscopic repair, 12/28 (43%), no prior endoscopic repair.

Conclusion: This novel surgical open diverticulectomy with cricopharyngeal myotomy provides treatment for both Zenker and KJ diverticula. Patients had improvement in EAT-10 scores and aspiration rates after this approach. 96% of patients had no postoperative leak. Over half of these patients previously failed endoscopic repair but were successfully treated with this approach. Ultimately, these data suggest this technique as a safe and effective open approach to repairing these diverticula. Research is ongoing.

72. Development of a Sensor-integrated Bladder Bioreactor System for Reconstructive Procedures

Brendyn Miller, PhD Anthony Atala, MD

Chancen Law, Damir Kantimerov, Po-Feng Lee, Adit Mehta, Seunggyu Jeon, Ji Hyun Kim, Tracy Criswell, Anthony Atala, Young Min Ju, James J. Yoo
Basic Science
Student
Biomedical Engineering

Introduction: Engineering bladder tissues for reconstruction involves a complex process, which includes cell isolation and expansion, scaffold design and fabrication, cell seeding, and construct preconditioning and maturation. One critical step in this process is the preconditioning and maturing cell-contained engineered tissue constructs using a bioreactor system. Unfortunately, the current bioreactor systems are unable to offer similar physiologic stimulations of native tissues and monitor the maturation processes. This study aimed to develop and validate a sensor-integrated bladder bioreactor platform for physiologic stimulations, real-time monitoring of bladder tissue maturation, and a controlled media exchange system.

Methods: A bladder bioreactor system which consisted of a chamber to accommodate bladder tissue constructs and a controlled perfusion system for applying expansile stimulation and providing nutrients to the tissue construct was developed. Precise control over the volume of inflation of the bladder construct was achieved via a closed-loop control pressure monitoring system. The tissue-engineered bladder constructs, created from electrospun polycaprolactone (PCL)-collagen scaffolds, were seeded with primary human urothelial cells (UCs). The cell-seeded scaffolds were sutured to a surgically created defect on the outer surface of a porcine bladder and then either loaded into the bioreactor for dynamic stimulation. Scaffolds were also sutured onto a second bladder and maintained in a petri dish as a static control. For the bioreactor group, the bladder volume was cycled between 50 ml and 400 ml to reflect the average range of a normal human bladder. After 48 hours of mechanical stimulation, scaffolds were retrieved for histomorphological analysis.

Results: Tissue viability and maturation was confirmed using Image J to evaluate immunofluorescent images. Cytokeratin expression was increased by 23% in the bioreactor-stimulated tissue constructs after only 48 hours, suggesting that the urothelial cell maturation increased.

Conclusions: The multifunctional bladder bioreactor provides a controlled environment for preconditioning and maturing engineered bladder constructs. The multi-functional bladder bioreactor may be used as a standard tool for biomanufacturing tissue-engineered bladder constructs for improved outcomes in bladder reconstructive procedures.

73. Automated Electronic Frailty Index and Postsurgical Events Following Vitrectomy

Christina Molkenthin Sally Ong, MD

Arieno Fresenko
Clinical Science
Student
Surgery-Ophthalmology

Objective: To determine whether patient frailty, classified as frail, pre-frail, or fit using the eFI, is associated with adverse outcomes following vitrectomy.

Main Outcomes and Measures: The primary outcome was a composite of 30-day emergent ophthalmology visits, 30-day emergency department visits, 30-day hospital admission, 6-month and 1-year reoperation rates, visual acuity outcomes at 6-months and 1-year follow-ups, and 6-month all-cause mortality.

Results: Of 1212 patients (median age 68 years [IQR: 61-74]; 556 female [45.9%]), 399 (32.9%) were classified as fit,

516 (42.6%) were pre-frail, and 297 (24.5%) were frail. In the minimally adjusted logistic regression model, frail (OR, 4.30; 95% CI, 2.11-9.48) and pre-frail (OR, 2.34; 95% CI, 1.16-5.14) patients had significantly more emergency department visits within 30 days of vitrectomy. Frail patients also had more hospital admissions within 30 days of vitrectomy (OR, 5.45; 95% CI, 2.14-16.7) and worse visual acuity outcomes at 1-year post-vitrectomy (OR, 2.24; 95% CI, 1.22-4.23). In the full adjusted model, frail patients had more emergency department visits within 30 days of vitrectomy (OR, 2.58; 95% CI, 1.07-6.60) and pre-frail patients had visual acuityMworse than 20/40 at 6 months following vitrectomy (OR, 0.57; 95% CI, 0.35-0.90) compared to fit patients.

Conclusions: This study found that frailty and prefrailty are associated with adverse events following vitrectomy. This emphasizes the importance of using risk stratification tools for ophthalmic procedures that are considered low risk.

74. Factors Influencing Aseptic Loosening in Total Knee Arthroplasty: The Impact of Age and Race

Deron Morrison John Shields, MD

Caitlyn Perrone, Kristen Harmody , Ava McKane, John Shields, Garrett Bullock, John Shilt
Clinical Science
Student
Surgery-Orthopedics

Introduction:
Total knee arthroplasty (TKA) is used for treatment of osteoarthritis (OA) with 1.1 million procedures performed in the U.S. in 2022. Aseptic loosening (AS), a major cause of TKA failure, is influenced by factors like high BMI and cementing techniques. This study hypothesizes that higher bone density in Black or African American males contributes to increased early AS rates.
Methods:
IRB approval was granted for a retrospective chart review from 2013 to 2022. Inclusion criteria consisted of primary TKA. Excluded cases were those performed in outside hospital settings and TKA revisions. Patient demographics, diabetes, hypertension, laterality, vendor, implant design, manipulation under anesthesia (MUA), and tibial AS were recorded. Descriptive statistics, odds ratios (OR) with 95% confidence intervals (CI), and p-values were used to evaluate the impact of patient factors on aseptic loosening rates.
Results:
A total of 1540 patients were included, and 733 followed up for two years. The prevalence of tibial AS was 1.0% (95% CI: 0.5, 1.6) for all follow-ups and 1.7% (95% CI: 0.9, 3.0) for two-year follow-up. Patients with tibial AS who met the two-year follow-up were younger (mean age 63.4 years) than those without loosening (mean age 66.2 years). Black or African American patients had significantly higher odds of tibial AS: 3.7 times (95% CI: 1.3, 11.1, $p < 0.001$) for all follow-ups and 4.4 times (95% CI: 1.4, 14.2, $p < 0.001$) for the two-year follow-up.
Discussion:
Younger patients and Black or African American patients have statistically significant higher rates of tibial AS. We hypothesize that this is secondary to increased bone density resulting in decreased cement penetration. Future studies should focus on larger, more diverse populations and explore the underlying mechanisms driving these associations.

75. Obesity and menopause interactions drive metabolic endotoxemia to alter breast cancer outcomes

Lauren Moulden Katherine Cook, PhD

Lauren Moulden, Mohamed Gaber, Adam Wilson, Valerie Payne, Marissa Howard-McNatt, Katherine Cook
Basic Science
Student
Cancer Biology

Breast cancer is the most diagnosed cancer in women and the second most deadly, responsible for 670,000 deaths globally each year. Two main risk factors for breast cancer are aging and obesity, both of which are known to cause microbial dysbiosis and alterations in gut barrier function. These changes can result in chronic low levels of circulating lipopolysaccharides (LPS) in the blood, termed metabolic endotoxemia (ME). LPS interacts with toll-like receptor 4 (TLR4) resulting in the release of pro-inflammatory cytokines. Our group previously showed in non-cancerous postmenopausal women that obesity increased circulating LPS levels and other biomarkers of ME. However, in breast cancer patients, age, not obesity, is the main driver of ME. To support these findings, we have employed a C57BL/6 murine study modeling both

diet-induced obesity and menopausal status in the absence and presence of breast tumors. Female 10-week-old C57BL/6 mice were placed on a low-fat control diet (10% kcal from fat) or a high-fat lard diet (60% kcal from fat). Subgroups of mice on each diet underwent sham or ovariectomy (OVX) surgeries to model menopause. Here, we will measure markers of ME both pre & post tumor to determine the influence of obesity and menopause on ME, the impact of breast cancer on ME, and the effect of ME on breast cancer progression. We will also determine overall inflammatory signaling from circulating plasma LPS via a hTLR4 reporter cell line. Circulating LPS can vary in structure (displaying varying numbers of fatty acid chains) and can differentially activate downstream TLR4 signaling. We show that different isoforms of LPS can differentially regulate macrophage polarization and inflammation. Overall, we aim to show whether the presence of breast cancer can directly influence ME and determine whether ME can impact breast cancer growth, thereby identifying a novel risk factor for breast cancer.

76. Breaking Resistance: Multitargeted Kinase Inhibitors Drive Synthetic Lethality in Patient-Derived Lung Cancer Organoids

Sara Muhic Zukic Eleftherios Makris, MD, PhD

Julia Henault, Helen Bernardi Rathgeb, Caleb Strickler, Damian Chance Hutchins, Tiefu Liu, Lance Miller, Mchale Cody, Krishnaiah Maddeboina, Dhananjaya Pal, Donald Durden, Rajeev Dhupar, Shay Soker, Konstantinos I. Votanopoulos, Nadeem Wajih*, Eleftherios A. Makris

Basic Science

Student

Wake Forest Institute Regenerative Medicine (WFIRM)

Background: Lung cancer's molecular complexity and therapeutic resistance demand platforms that surpass traditional 2D cell lines and animal models. Patient-derived tumor organoids (PTOs) preserve the genomic and morphological features of primary tumors, offering a superior tool for precision medicine and individualized therapy development. This study evaluates two rationally designed multi-targeted kinase inhibitors-LCI 133 (CDK4/6-CDK9-AURKA/B) and LCI 139 (PI3K-CDK4/6-CDK9-AURKA/B)-for their ability to induce synthetic lethality in lung cancer organoids, compared with standard chemotherapeutics.

Methods: Lung cancer specimens were prospectively collected under IRB approval from seven patients. PTOs were generated using unsorted tumor cell suspensions in a PEPGEL hydrogel matrix and characterized by H&E staining and immunofluorescence for canonical lung cancer markers (TTF-1, Ki67, P63, Claudin-4, PDL-1, desmoglein). Organoids were treated with LCI 133 and LCI 139 (0.25-1.0 μM) and standard chemotherapeutics (gemcitabine, pemetrexed, cisplatin; 5 μM) for 72 hours. Cytotoxicity was assessed via metabolic activity assays, apoptosis via Annexin V binding and caspase 3/7/8 activation, and mechanistic pathways via immunoblotting for phospho-CDK9, AURKA/B, pAkt, MCL-1, and pRNA polymerase II.

Results: PTOs were successfully established from all seven specimens, including small cell carcinoma and adenocarcinoma subtypes, retaining histological architecture and biomarker fidelity. LCI 139 demonstrated potent, dose-dependent cytotoxicity: 49% viability reduction at 0.25 μM ($p<0.0018$), 62% at 0.5 μM ($p<0.0001$), and 78.4% inhibition at 1 μM ($p<0.0001$). LCI 133 showed significant activity only at 1 μM (51.4% reduction, $p<0.0012$). Both compounds triggered robust apoptotic signaling with caspase 3/7 and caspase 8 activation, validated by Annexin V staining. Mechanistic analysis revealed marked inhibition of CDK9 phosphorylation (LCI 133: 65% inhibition at 1 μM and LCI 139: 85% inhibition at 1 μM compared to control), AURKA/B, and downstream cell cycle mediators, confirming effective pathway blockade and arrest. Standard chemotherapeutics were markedly less effective: gemcitabine (29.2% inhibition, $p<0.02$) and cisplatin (28.2%, $p<0.03$), while pemetrexed showed no significant activity.

Conclusions: This study establishes PTOs as a robust precision medicine platform for lung cancer, enabling simultaneous therapeutic testing and mechanistic interrogation. Novel multi-targeted
kinase inhibitors LCI 133 and especially LCI 139 demonstrate superior efficacy over standard chemotherapies, achieving synthetic lethality via coordinated inhibition of CDK, PI3K, and Aurora kinase pathways. Key advantages of this platform include: (1) individualized chemo-sensitivity profiling for clinical decision making, (2) direct evaluation of novel compounds across diverse tumor subtypes, and (3) mechanistic validation to accelerate drug discovery. These findings support the clinical advancement of multi-targeted kinase inhibitors and validate organoid-based platforms as transformative tools for personalized lung cancer therapy.

77. Improved experience with liver transplantation utilizing DCD grafts preserved with normothermic machine perfusion leads to decreased variable costs over time

Namratha Mylarapu, MD Dionisios Vrochides, MD, PhD, MBA, FACS, FRCSC

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

Background: Management of end stage liver disease continues to be an expensive process costing the US upwards of $4 billion per year. Liver transplantation remains a definitive treatment, but the demand continues to outpace supply. Multiple efforts have been made to expand the donor pool. The normothermic machine perfusion (NMP) pump has been shown to rescue marginal livers grafts from donation after circulatory death (DCD) donors. Since its introduction 3 years ago, nationwide utilization of the pump has significantly increased. In this study, we aim to analyze the cost trends of NMP utilization at our institution.
Methods: From a total of 200 patients who underwent a liver transplant with a DCD graft preserved with NMP pump, complete financial data was obtained for 79 patients over a two-year period since the introduction of the pump at our institution. Patients were divided into early (2023) and late (2024) cohorts. We compared patient age, BMI, and native 3.0 MELD as well as total cost of transplant. Subgroup analysis of fixed and variable costs between the two cohorts was performed. In addition, total hospital length of stay (LOS), ICU length of stay (ICU LOS), time the graft remained on pump, and total operative time were analyzed. Statistical analysis was performed using an unpaired T-test. The current revenue system used in our institution is Strata.
Results: There were 36 patients in the early cohort and 43 patients in the late cohort. Patient age and BMI were comparable. The average native 3.0 MELD in the early cohort was 19.5 compared to 24.6 in the late cohort. Average total cost per transplant increased between the early and late cohorts by 19.2% (p=0.003). The increase represents an approximately $50,000 increase considering the average cost of transplant in the US is $215,000. The fixed cost increased by 75.3% (p=0.004) from 2023 to 2024 while the variable cost decreased by 24.2% (p=0.003). This represents an approximate increase in fixed costs by $161,250 and decrease in variable costs by $51,600 based on the national average cost of transplant. Between our two cohorts, the total LOS for
patients decreased from 15.5 days to 11.7 days (p=0.03), while ICU LOS decreased from 4.2 days to 3.2 days (p=0.005). The recipient's operative time decreased from 526.97 minutes per case to 470.39 minutes (p=0.22).
Discussion: The increase in total cost of transplant during index admission between the cohorts is driven by a substantial increase in the fixed cost which reflects, among others, rising inflation and changes in reimbursement practices. The decrease in variable costs, however, reflects the gained experience of the surgeon and patient care team with use of the pump and the subsequent improvement in recipient outcomes, as demonstrated by decreased hospital LOS, ICU LOS, and decreased recipient time in the operating room. This is despite the use of more marginal grafts and transplantation for higher acuity patients as reflected by the increase in native 3.0 MELD. NMP is a valuable tool in expansion of the donor pool, and experience over time can help reduce variable costs. Further long-term follow-up as well as multi-institutional studies are needed to verify these findings.

78. Establishing a Comprehensive Liver Transplant Oncology Program: Collaborative Integration of a Liver Transplant Division with an Established Cancer Institute

Namratha Mylarapu, MD Dionisios Vrochides, MD, PhD, MBA, FACS, FRCSC

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

Background: New technologies have expanded the liver transplant donor pool, facilitating the growth of dedicated Transplant Oncology programs. At our institution, rather than establishing an independent program, we integrated certain functions of our transplant center with Levine Cancer Institute (LCI). The Division of Abdominal Transplantation at Carolinas Medical Center has performed over 1700 liver transplants in the last 30 years. In addition, it offers ex-vivo hepatectomy

with liver remnant auto-transplantation. Levine Cancer, which includes LCI, has been designated as a National Cancer Institute for the past 50 years. It has presence throughout the entirety of the Advocate healthcare system. Here we describe our experience establishing our Transplant Oncology program, its growth in its first year since inception, and its integration within LCI.
Methods: Patients were referred via a structured multi-disciplinary review board, exclusive to Transplant Oncology. Eligible patients were considered for either ex-vivo hepatectomy and liver remnant auto-transplantation or for cadaveric homotransplantation. Donated livers were allocated either from extended criteria donors preserved via normothermic machine perfusion pump or from split liver grafts. All patient data is maintained prospectively in an intention to treat database.
Results: In the 18 months, there were 49 new referrals from 18 referring medical oncologists. Twelve of the referrals were from outside Advocate Health. Average time to evaluation was 27 days.
Eleven transplants, nine cadaveric, two ex-vivo with auto-transplantation, were performed. Average enrollment-to-transplant time was 284 days. A total of 212 clinic visits were recorded. The most common indication for transplant was colorectal cancer metastases.
Discussion: Integration of our Division of Abdominal Transplantation at Carolinas Medical Center with LCI gave all patients seamless access to both transplant and cancer coordinators, prehabilitation services, nutrition experts and kinesio/music/aroma therapy services, while facilitating rapid evaluation and enlistment without disruption of cancer care. Given our experience, we assert that integrating the oncology functions of a transplant center under the umbrella of an already established cancer center can best support patient enrollment in Transplant Oncology programs, maximizing access to available liver allografts without compromising oncologic care.

79. Establishing an Orthognathic Center in Vietnam: Utilizing Collaboration and Innovation to Advance Global Plastic Surgery Infrastructure

Jacob Nasser, MD Christopher Runyan, MD, PhD

Mario S. Blondin; Nguyen N. Lan, Hang Duong; Tran V. Truong; Ky Nguyen Van; Robin Yang; Phuong Nguyen; Christopher M. Runyan
Clinical Science
Resident
Surgery-Plastic & Reconstructive

Introduction: Congenital and traumatic craniofacial pathology disproportionately impacts low- and middle-income countries (LMICs), where disparities in access and quality of care are particularly pronounced. In these regions, barriers to comprehensive craniofacial care can stem from inadequate resources and infrastructure. Our team aimed to establish an orthognathic surgery (OGS) center in Vietnam to meet the demand for comprehensive craniofacial care in an LMIC. We outline our approach to setting up the OGS center and identify patient complications associated with this model of care.

Methods: We developed a structured curriculum through various lecture series and demonstrative surgeries to instruct the host surgeons on orthognathic care. The infrastructure required to execute long-term orthognathic care included: three-dimensional printing, operative planning software, and partnerships with support organizations, which were integrated into the care provided. Moreover, we examined short-term patient outcomes and identified gaps in our developed model of care.

Results: The model was adopted in March of 2024, with a total of 6 host surgeons and 3 visiting OGS surgeons. Ten patients were treated over the course of six weeks. Surgical interventions were performed for patients with hemimandibular elongation (N=X), cleft lip and palate (N=X), and
hemifacial microsomia (N=X). Immediate patient complications included suboptimal sagittal splits and partial nerve damage. We identified key requirements for the sustainability of the OGS program, including industry partnerships for essential resources and a mix of charitable care for congenital anomalies alongside cosmetic OGS cases.

Conclusions: The establishment of OGS centers in LMICs may provide an avenue to educate host surgeons, empowering them to continue treating orthognathic conditions independently after the visiting surgeons have left, while also fostering partnerships with charitable organizations and educational institutions abroad. These collaborations aim to create sustainable orthognathic infrastructure in Vietnam. Long-term patient outcomes and qualitative data will provide valuable insights into potential shortcomings, helping to enhance this model for future centers in LMICs. As the foundations of global surgical care shift toward building infrastructure and education, it is crucial to explore various models for training subspecialty surgeons in LMICs.

80. A Tunable Melanoma-Skin Organoid Platform to Model Tumor-Intrinsic and Microenvironmental Drivers of Progression and Therapy Response

Gemma Nomdedeu-Sancho, MS Anthony Atala, MD

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

Resistance to systemic therapies-driven by oncogenic mutations, the tumor microenvironment (TME), or both-remains a challenge in metastatic melanoma treatment. To model these attributes ex vivo and support the NIH efforts to reduce animal testing, we developed physiologically relevant 3D melanoma-skin organoids (mSOs), generated by combining primary healthy skin cells with melanoma cells representing key mutational subtypes (BRAF-mutant, NRAS-mutant, and Triple Wild Type).

Melanoma cells within mSOs invaded the superficial epidermal layer and expanded outward, mimicking in vivo melanoma growth. Tracking tumor volume over time revealed expected treatment responses: BRAF-mutant cells responded to BRAF/MEK inhibitors, NRAS-mutant cells to MEK inhibition, and Triple WT cells showed resistance.

To further simulate tumor and microenvironment interactions, mSOs were embedded in fibroblast-laden collagen gels, forming melanoma-TME organoids (mTMEOs). Melanoma cells invaded the matrix, akin to local dermal invasion seen in patients. The presence of fibroblasts enhanced cell migration via increased extracellular matrix (ECM) remodeling, while inhibition of cell-ECM interactions, blocking focal adhesion kinase (FAK), reduced invasion, underscoring the model's relevance for TME-directed therapy testing.

This platform could incorporate patient-derived melanoma and stromal cells, offering a powerful tool to investigate resistance mechanisms and guide the development of personalized therapies targeting both tumor-intrinsic and microenvironmental factors.

81. Focal Therapy for Localized Prostate Cancer

Jackson Nowatzke, BS Ronald Davis, MD

Maxwell Sandberg, David Thole, Gavin Underwood, Emily Ye, Soroush Rais-Bahrami, Ronal Davis, Alejandro Rodrigeuz
Clinical Science
Student
Surgery-Urology

Background: Prostate cancer (PCa) remains prevalent in the US, with over 299,000 new cases in 2024 and a five-year cancer-specific survival rate of 97%. Traditional whole-gland therapies such as radical prostatectomy (RP) and radiation remain the mainstay of treatment. However, both have significant side effects, including urinary incontinence and erectile dysfunction (ED). Advances in MRI and targeted biopsy have improved risk stratification, supporting the exploration of focal therapies such as high-intensity focused ultrasound (HIFU), cryotherapy, and irreversible electroporation (IRE), which aim to treat localized lesions while sparing healthy tissue. Although evidence is promising for functional outcomes, oncologic control data remain limited, and no randomized trials directly compare focal therapy to RP or radiation. This study reports a case series on focal HIFU, cryoablation, and IRE, focusing on functional outcomes, costs, and short-term cancer control.
Methods: This retrospective study included 45 patients (4 HIFU, 20 cryoablation, 21 IRE). Demographic, comorbidity, functional, and oncologic data were collected. Postoperative follow-up included PSA monitoring at defined intervals, MRI at one year, and biopsy when indicated. Complications were recorded using Clavien-Dindo, and outcomes tracked included operative time, PSA trends, need for repeat biopsy, metastasis, and survival. Cost analysis was performed for IRE and cryoablation. Statistical analyses included t-tests and ANOVA to assess differences in cost, operative time, and PSA changes.
Results: The mean age was 70.1 years, and median follow-up was 6 months. Most patients were Caucasian (76%), and the mean Charlson Comorbidity Index was 5.7. 29% had prior PCa treatment. Preoperatively, 60% had ED and 51% had lower urinary tract symptoms (LUTS); postoperatively, 36% had ED and 44% had LUTS. Mean IIEF scores declined from

14.7 to 7, while IPSS improved from 7.9 to 6. Mean prostate size was 46.1 cc, and mean preoperative PSA was 7.7 ng/mL, decreasing to 3.1 ng/mL postoperatively. 67% had GG2 disease and favorable intermediate-risk PCa (78%). Mean operative times in minutes were HIFU 114.3, cryoablation 65.2, and IRE 43.1. 36% experienced complications, though only two exceeded Clavien-Dindo grade II. On analysis, PSA significantly decreased after IRE and cryoablation but not HIFU. Three cryoablation patients underwent repeat biopsy, all positive for GG2 PCa. No metastases or deaths occurred during follow-up.
Conclusions: In this case series, outcomes of treating localized PCa patients with HIFU, cryoablation, or IRE were presented. Outcomes show focal therapy to be feasible, with excellent functional outcomes and adequate oncologic control. More evidence evaluating focal therapy compared to the standard of care in PCa is required before fully implementing these therapies. Nevertheless, they seem poised to change the landscape of PCa management and represent an exciting new area for research.

82. Hospital-Based Violence Intervention Program: A Value-Oriented Institutional Review

Emily Oakley, BS Carma Goldstein, MD

Carma Goldstein Martin Avery Richa Saxena
Clinical Science
Student
Surgery-Trauma

Introduction:
Hospital-based violence intervention programs (HVIPs) aim to reduce reinjury, healthcare costs, and recidivism by addressing the social and structural determinants of violence. Beyond reductions in injury recurrence, HVIPs may also improve medical engagement and post-discharge continuity of care, which are critical metrics of value in trauma systems. Our objective was to evaluate the hospital system value of a newly implemented HVIP by assessing post-discharge healthcare engagement, including follow-up appointment attendance and emergency department (ED) utilization.
Methods:
A retrospective cohort analysis was conducted comparing two time periods: pre-HVIP implementation and post-HVIP implementation. Patients were included if they were admitted with a penetrating injury and qualified or would have qualified for the HVIP. The pre-HVIP patients were included one year prior to HVIP implementation and the post-HVIP for one year after. The primary and secondary outcomes were measured in the same time period. Patients discharged from the emergency department, those who died in the ED or in hospital, those who left against medical advice, or those discharged to a correctional facility were excluded. Primary outcomes included rates of appointment scheduling and follow-up attendance. In the patients scheduled to follow-up, subspecialty follow-up rates, surgeries performed, and ED visits were also evaluated as secondary outcomes. Proportions of patients were compared between the two groups using Chi Squared Analyses. A p-value of 0.05 was considered significant.
Results:
Patients in the pre-implementation group (N=177) had a higher likelihood of having any scheduled follow-up in the health system (97% vs. 85%, $p<0.001$) compared to the post group (N=93). However, among those with scheduled appointments, follow-up adherence significantly improved post-HVIP, rising from 88% to 100% ($p=0.002$, 95% CI [0.55, 0.173]). Notably, follow-up with a medicine service significantly increased from 38% pre-HVIP to 67% post-HVIP ($p<0.001$, 95% CI [0.155, 0.411).This held true for primary care follow-up as well, 27% pre to 56% post ($p<0.001$), reflecting enhanced engagement with longitudinal care. Surgical follow-up remained stable (97% vs. 95%, $p=0.509$, 95% CI [-0.93, 0.034]), and there was no significant difference in the rates of post-discharge surgical interventions (26% vs. 19%, $p=0.232$, 95% CI [-0.177, 0.49]). Although 30-day ED return visits increased slightly (44% pre vs. 52% post), this difference was not statistically significant ($p=0.221$, 95% CI [-0.049, 0.212]), though it may indicate increased acute care contact.
Conclusion:
Implementation of a hospital-based violence intervention program was associated with a significant improvement in post-discharge follow-up attendance, particularly with medicine and primary care services, representing a shift toward sustained, preventive care rather than episodic, reactive treatment. While surgical follow-up and ED revisits remained unchanged, the increased connection to longitudinal care reflects improved patient engagement and care coordination - key elements of hospital value in a trauma-informed system. These findings support the broader value of HVIPs, not only in reducing violence, but also in enhancing system-level patient engagement, particularly in traditionally hard-to-reach populations. Strengthening care continuity through HVIPs may improve long-term health outcomes, reduce system strain through more efficient resource use, and add value to the health system.

83. Psychosocial Frailty Risk Score Assessment in Kidney Transplant

Emily Oakley, BS Emily McCracken, MD

Carma Goldstein Martin Avery Richa Saxena
Clinical Science
Student
Surgery-Trauma

Background: Psychosocial frailty is a growing area of interest in kidney transplantation, yet its evaluation remains subjective. To minimize subjectivity between evaluations, social workers at Atrium Health Wake Forest Baptist Abdominal Transplant Center developed a 5-point frailty risk score covering 16 psychosocial domains. This study aims to evaluate associations between psychosocial frailty and kidney transplant outcomes. We hypothesized a direct relationship between risk score and major post-transplant complication.
Methods: The score classifies patients as low, average, above-average, high, and prohibitive risk. Demographic and clinical data were collected retrospectively via chart review from patients evaluated between 11/2022 and 11/2024. Outcome variables included post-operative
complication, readmission, mortality, and 1-year creatinine levels, with groups compared via ANOVA on Statistical Analysis Software.
Results: Of the 1,088 patients were evaluated, 411 (37.8%) underwent kidney transplantation. In the overall cohort, median age was 53 years, 40.5% of patients were female, 59.5% were male, 46.6% identified as black, 41.3% identified as white, and 12.1% identified as another race, median weight was 87.2 kg, and median BMI was 29.5 kg/m2. Diabetes (54%) and hypertension (97.7%) were the most common comorbidities. Among transplanted patients, the total median cold time (CIT) was 1089 minutes, median KDPI was 56%, and median 1-year creatinine was 1.5 mg/dL.
Of the patients evaluated, 183 (16.8%) were categorized as low risk, 530 (48.7%) average, 236 (21.7%) above average, 131 (12.0%) high, and 5 (0.5%) prohibitive risk. Of the transplanted patients evaluated, 75 (18.2%) were categorized as low risk, 209 (50.9%) average, 83 (20.2%) above average, 42 (10.2%) high, and 0 (0%) prohibitive risk.
Post-transplant complications (i.e., surgical complication, infection, rejection) were observed in 238 (57.9%) patients who received kidney transplantation. Complication rates varied across risk groups: 65.85% in the high-risk group, 60.29% in the above average risk group, 64.67% in the average risk group, and 63.64% in the low-risk group. There was no statistically significant relationship between risk group and rate of complications ($p = 0.9194$).
There were 378 transplanted patients with readmission data. The estimated least squares mean number of readmissions were: 0.79 in the high-risk group, 0.50 for the above average group, 0.57 for the average group, and 0.34 for the low-risk group. There was no statistically significant difference across risk groups ($p = 0.2363$)
Discussion: This study explores a novel, standardized frailty risk-scoring assessment in the kidney transplant population. While there was no relationship between risk score and post-transplant complication, those patients with higher scores may have been more closely followed postoperatively and managed differently than their lower-risk counterparts. We therefore plan to score patients transplanted before the implementation of this assessment to determine if complication rates were different in earlier eras, or if long-term outcomes differ beyond the 2 years studied here. Finer evaluation of the individual domains and the type of complication may also be more informative, and they will likewise be evaluated further.

84. Second Thoughts on Second Looks: Retrospective Cohort Analysis of Damage Control Techniques in Colonic Ischemia

Heather Ots, MD Matthew Painter, MD

Hope Werenski, Elizabeth Wood, Bonnie Laingen, Mary Alyce McCullough, Preston Miller, Matthew Painter
Clinical Science
Resident
Surgery-General

Introduction:
Identifying firm indications for damage control surgery (DCS) in emergency general surgery (EGS) patients has been challenging. However, EGS patients with intestinal ischemia are generally considered to benefit from a planned "second-look" operation, particularly when physiologic instability is present or intestinal viability is uncertain. In 2017, our department implemented a protocol promoting DCS for patients with colonic ischemia. This study aimed to evaluate the outcomes of DCS in EGS patients presenting with colonic ischemia.

Methods:
A retrospective cohort study was performed for patients presenting to the hospital with colonic ischemia between 2013 and 2022. Demographics, physiologic parameters, perioperative variables, operative management, and outcomes, including survival, were compared. Logistic regression modeling was used to assess the impact of these variables on perioperative mortality.
Results:
116 patients underwent operations for colonic ischemia, of which 85 required DCS. Compared to non-DCS patients, those undergoing DCS had higher ASA scores (4 vs 5, $p<0.001$), elevated preoperative lactate levels (1.9 vs 3.6, $p<0.001$), and more frequent perioperative vasopressor use. DCS patients had lower Charlson Comorbidity Index (CCI) scores (4 vs. 6, $p = 0.01$). The location of ischemia and the rates of arterial or nonocclusive etiologies and vascular interventions were similar between groups. End colostomy was performed in 68% of non-DCS patients compared to 32% in the DCS group. Among DCS patients, 46% died before definitive surgery, and 41% required additional resection during the second-look operation. Complication rates were comparable between groups, except for ileus (22.6% in DCS vs. 3.5% in non-DCS, $p = 0.004$) and mortality (64.7% in DCS vs. 29% in non-DCS, $p < 0.001$). Logistic regression identified CCI, preoperative lactate, degree of contamination, and postoperative vasopressor requirements as predictors of perioperative mortality.
Conclusion:
A planned 'second look' operation utilizing DCS may not be mandatory for patients with colonic ischemia. Physiologic parameters may better predict who would benefit from DCS. Further studies are needed to better predict the progression of ischemia and the need for additional resection.

85. Trends in Plastic Surgery Applicant Characteristics

Abigail Peoples, MD Lisa David, MD

Educational Science
Resident
Surgery-Plastic & Reconstructive

Background: The Plastic Surgery Match has long been known to be a competitive process for applicants. While some metrics of a successful applicant are not quantifiable, some data helps demonstrate the competitiveness of the matching process. The National Residency Matching Program (NRMP) collects data from applicants. Every other year this data is published in a document, Charting the Match. Publication of this data began in 2006 and the information that was included in this publication was revised in 2007. From 2006 to 2011 this was a collaborative review by the NRMP and the American Association of Medical Colleges (AAMC). In 2014 the NRMP began collecting data independently. Because plastic and reconstructive surgery (PRS) has transitioned away from use of the AAMC application system, 2023 was the last year the NRMP published data on the PRS match.
Methods: NRMP charting the match publications were reviewed from 2006 to 2023 to isolate applicant metrics of interest and demonstrate trends in PRS and all residency applicant qualifications over time.
Results: Since 2017, the percentage of applicants who match into PRS has overall downtrend. Additionally the average number of interviews for successfully matched applicants increased from 7 in 2007 to 13.9 in 2022.While the Step 1 exam is now pass/fail, analysis of trends in student scores demonstrates matched PRS applicants' average exam score increased overtime and PRS applicants have always performed above average when compared to all residency applicants. The same trend is noted when reviewing Step 2 scores though the difference in average Step 2 scores between PRS applicants and all residency applicants has narrowed significantly over time. Research has become a way for applicants to distinguish themselves. In 2007 the average match applicant had an average combined abstracts, presentations, publications. By 2022 this number had increased to 28.4
Conclusions: Over the years, students have had to perform higher on standardized exams, increase their research productivity, and interview at more programs in order to be a successfully matched integrated PRS applicant. NRMP data remains one of the most accessible ways for students to understand what constitutes a successful plastic surgery applicant. The range of Step 2 scores for all residency applicants has narrowed, decreasing its utility as a metric for differentiating applicants. Increasing volume of research remains a central way students attempt to differentiate themselves. As a specialty PRS needs to determine if this ever increasing focus on research productivity is serving the advancement of our field or if research volume is being emphasized at cost to other valuable experiences and skill sets for the field in areas of volunteerism, entrepreneurship, and education. The effect of no longer having PRS data available in Charting the Match publications on applicant metrics should be evaluated moving forward.

86. Effect of Intracellular Bacteria on Breast Cells

Spencer Phillips, MS Adam Katz, MD

Adam Katz , Nicole Levi
Basic Science
Student
Biomedical Engineering

PURPOSE - Recent research has shown that bacteria reside within cells in the tumor microenvironment, making them more proliferative than their non-infected counterparts. There is a need to understand how intracellular bacteria associated with breast cancer can be mitigated, since downstream effects might impact breast reconstruction. Here, we quantified differences in the number of intracellular colony forming units (CFUs), proliferation, cytoskeleton, and uptake of therapeutic nanoparticles (NPs) in breast cells with and without intracellular bacteria.
METHODS - Photothermal NPs were custom-designed by combining heat-generating and fluorescent polymers utilizing solvent evaporation via published methods. Pseudomonas aeruginosa (PA) 27853 was used for infecting breast cancer cells, or normal breast epithelial cells. Bacteria were cultured with cells for 4 hours, after which cells were treated with gentamicin to eliminate extracellular bacteria. The next day, a portion of the infected cells were lysed, serially diluted, and then plated to determine CFUs/cell. The remaining infected cells were plated on a chamber slip, and after 24h, cells were incubated with 100 ug/mL of NPs for a further 24h. Following incubation, NPs were removed, and cells were fixed, permeabilized, and stained for PA, DAPI to visualize nuclei, actin expression, and NP uptake, which was quantified via fluorescent intensity of the actin (green) and intracellular NPs (red). Infected and non-infected cells were allowed to culture for 1 week to calculate differences in doubling time.
RESULTS - Cancerous (MCF7 and MDA-MB-231) breast cells had increased proliferation rates of approximately 23% compared to their non-infected counterparts. There was no significant difference in proliferation rates between infected and non-infected non-cancerous breast epithelial cells (MCF10A). Additionally, MCF7 and MDA-MB-231 cells had a 29.1-fold and 61.7-fold increase in CFUs/cell over MCF10A cells, respectively. There was no significant difference in actin expression between infected and non-infected MCF10As, however, infected MDA-MB-231 cells had more than twice the amount of actin expression compared to their non-infected counterparts. There was no significant difference in NP uptake between infected and non-infected MCF10A cells, but there was an almost 9-fold increase in NP uptake by infected MDA-MB-231 cells compared to non-infected ones.
CONCLUSIONS - Increased actin expression in infected cancerous cells is a possible explanation for the observed morphological differences. The photothermal NPs used in this study were not functionalized with a targeting moiety, making the fact that there was increased uptake by infected MDA-MB-231 cells even more intriguing, since passive targeting of infected cells is a potential strategy for enhanced delivery of therapeutic NPs. Additionally, increased actin expression in infected cancerous cells could potentially be leveraged for treatments of breast cancer by adding targeting moieties on the surface of NPs to increase NP-cell interactions. Finally, although infected epithelial breast cells do not contain clinically relevant amounts of intracellular bacteria, the mere presence of bacteria could be a contributing factor to increased infection rates seen in post-mastectomy breast reconstruction compared to aesthetic reconstruction, necessitating a deeper understanding of how intracellular bacteria in the breast tumor can be effectively treated.

87. Do Osseous Radiographic Measurements Provide Indicators for Soft Tissue Pathology? - A Novel Radiographic Approach to Identifying the Incidence of Forefoot Neuroma

Stephen Polacek, DPM Paula Gangopadhyay, DPM, FACFAS

Taylor Woodward, Devon Niewohner, Bahram Kiani, Paula Gangopadhyay
Clinical Science
Resident
Surgery-Orthopedics

Introduction: Diagnosis of forefoot neuromas is typically clinical, however radiographic studies are useful for confirmation with MRI and Ultrasound being modalities of choice (1). Symptomatic neuromas are caused by interdigital nerve compression. Further injury has been attributed to foot morphology including relative metatarsal lengths (2, 3). Naraghi et al was the first to attempt to identify structural factors through plain film x-rays that may predispose individuals to neuroma formation. This study was unable to demonstrate a relationship between foot morphology and symptomatic neuromas. In addition, it did not assess the influence of hindfoot structure on neuroma formation (4). The purpose of this study is to expand on

previous research and evaluate additional radiographic parameters in patients with surgically confirmed neuromas to determine what foot structural components can be used to further assist with diagnosis of this common pathology.
Methods: A retrospective case-control design was utilized. Weight-bearing radiographs were assessed for 69 patients with surgically confirmed neuromas and 69 matched controls without neuromas. Radiographic parameters included Meary's angle, calcaneal inclination angle, talar declination angle, lateral talocalcaneal angle, hallux valgus angle, intermetatarsal angles (1-2, 2-3, 3-4, 4-5), digital divergences between toes, and relative metatarsal lengths (1-5). Measurements were performed independently by a musculoskeletal radiologist and podiatric physician. Group comparisons were made using t-tests. Interrater reliability was determined using Shrout-Fleiss intraclass correlation coefficients (ICC). To evaluate which variables best discriminated between cases and controls, a Classification and Regression Tree (CART) analysis was performed.
Results: Several radiographic differences were observed between cases and controls. Meary's angle was significantly increased in neuroma patients (p=0.0008). Talar declination angle was significantly decreased in these same individuals (p=0.0372). Intermetatarsal angle 1-2 (p=0.0467) and digital divergence between digits 2-3 (p=0.0020) were also significantly greater in neuroma patients. CART analysis identified Meary's angle and digital divergence 2-3 as the strongest predictors, producing a model with 61% sensitivity and 90% specificity. Reliability testing demonstrated good to excellent agreement for most variables (ICC >0.75), with highest reproducibility in intermetatarsal angle 1-2 (ICC=0.9780) and digital divergence 2-3 (ICC=0.9871). Only intermetatarsal angle 3-4 demonstrated poor reliability (ICC=0.3381).
Discussion: These findings suggest a possible relationship between foot morphology and forefoot neuroma. Increased Meary's angle and decreased talar declination angle suggest that cavus foot types may be more predisposed to symptomatic neuroma development. Digital divergence between digits 2-3 was also strongly associated with neuroma cases which is consistent with the observation that most neuromas occur in the second interspace (5). The CART model reinforces these associations, identifying a combination of Meary's angle and 2-3 digital divergence as effective discriminators between neuroma and control populations. More studies should be incorporated to evaluate the potential association between foot structure and neuromas. By evaluating these measures this may enhance diagnosis accuracy, facilitate earlier recognition, and potentially guide treatment strategies for symptomatic patients.

88. MICROFLUIDIC SPERM SORTING (MSS) ENHANCES ACROSOME MORPHOLOGY WITH FEASIBLE RECOVERY RATES

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Nicos Prokopiou, MD Hooman Sadri, MD, PhD

Amanda Greer,Rachel Ruble, Chenchu Srujan Nagarakanti, Megan Escott, Samuel Pendergraft, Tamer Yalcinkaya, Banafsheh Nikmehr, Hooman Sadri-Ardekani,
Clinical Science
Resident
Surgery-Urology

Introduction:
Sperm preparation methods for assisted reproductive techniques (ART) such as Intra Uterine Insemination (IUI) and In Vitro Fertilization (IVF), including swim-up, simple washing, and density-gradient centrifugation (DGC), are widely used to enrich motile and healthy sperm. While effective, these techniques may increase exposure to reactive oxygen species and DNA damage due to centrifugation. Microfluidic sperm sorting (MSS) has emerged as a novel approach that uses a porous membrane plate to isolate progressively motile sperm under more physiologic conditions. Broussard et al. (2019) and Parrella et al. (2019) reported improved DNA fragmentation rates with MSS compared to DGC, and additional studies have shown higher rates of blastocyst euploidy [1, 2]. Whether MSS also improves sperm and acrosome morphology is yet to be elucidated. Acrosome defects, which limit oocyte penetration, are more common in infertile men and characteristic of globozoospermia. Enhancing acrosome morphology has the potential to increase fertilization capacity and improve IUI and IVF outcomes.
Methods:
In this preliminary study, we assessed the ZyMot (CooperSugical) MSS system in a cohort of 10 patients to evaluate its effectiveness in improving acrosome yield. Following semen sample collection and initial semen analysis, 3 ml samples are added into the inlet of the Zymot device and incubated for 30 minutes at 35-37 ºC. Samples are collected from the outlet chamber, and semen analysis and acrosome morphology classification were repeated. Sperm were classified as either having an acrosome present or not present for analysis. Student's t-test was utilized for comparative analytics.
Results:
Following sorting, the sperm recovery rate was 24% (pre-MSS: 70.1 ± 49.1 × 106, post-MSS: 19.0 ± 18.1 × 106, $p < 0.01$), consistent with recovery levels reported for advanced sperm selection methods and sufficient for ART applications. Normal acrosome morphology increased by 36.6% (pre-MSS: 53.38 ± 24.1 %; post-MSS: 90.75 ± 11.3 %, $p = 0.01$).

Conclusions:
These results demonstrate that the ZyMot MSS system achieves clinically acceptable recovery while improving acrosome morphology, supporting its potential clinical impact. Ongoing data collection and analysis will further define the effects of MSS on sperm morphology and acrosome integrity as the study cohort expands.

89. Chaperone Utilization Amongst Andrologists for Intimate and Sensitive Physical Examinations

Nicos Prokopiou, MD Hooman Sadri, MD, PhD

Kimberly Waggener, Samuel Pendergraft, Hooman Sadri
Clinical Science
Resident
Surgery-Urology

Intimate examinations are a cornerstone of the physical exam in the field of andrology. A medical chaperone is an individual who acts as a witness in patient and physician interactions, particularly during intimate examinations of the genitalia. Many institutions require the use of chaperones; however, there is currently a dearth of research and no formal recommendations for their use by major urologic organizations. Current literature demonstrates that patients view rectal and genital or pelvic examinations as sensitive, but few prefer the use of chaperones. When selecting chaperones, patients most often prefer a family member to a staff member; in contrast, most physicians prefer the use of a clinical staff member. Our ongoing survey polls members of andrology societies to characterize chaperone usage and preference amongst andrology specialists during sensitive examinations.

Currently, a total of 37 individuals have completed the survey, of which 29 (82.9%) are male, a mean age of 50 ± 13 years, and a mean of 17 ± 13 years in practice. Participants work in academic practice (19, 54.3%), private practice (13, 37.1%), and both academic practice and private practice (2, 5.7%). About half of the respondents were familiar with their institution's current policies or guidelines on the use of chaperones (59.5%). Interestingly, when performing intimate examinations on a patient of the same sex, 49.9% of responders said they never utilize a chaperone. In contrast, when performing intimate examinations on a patient of the opposite sex, 91.9% of responders state they always use a chaperone. When a chaperone is used, andrologists exclusively (100%) utilize clinically trained staff such as a nurse, medical assistant, resident, PA/NP, etc.

Our data indicates that chaperone usage is not consistent among andrologists, and utilization differs dramatically depending on the gender of the patient.

90. Endoscopic Hip Abductor Repair Demonstrates High Rates of Achieving Meaningful Outcomes: A Retrospective Cohort Study

Caleb Puckett, BS John B. Hubbard, MD

Ava McKane, John B. Hubbard
Clinical Science
Student
Surgery-Orthopedics

BACKGROUND: Greater trochanteric pain syndrome (GTPS) is commonly attributed to trochanteric bursitis, but recent literature suggests many cases are due to gluteus medius and minimus tendinopathy. Historically, hip abductor tears have been treated conservatively, with surgical intervention reserved for severe functional abnormalities. The purpose of this study is to evaluate rates of achieving meaningful outcomes following endoscopic repair of hip abductor tendon tears.
METHODS: Data from patients undergoing endoscopic hip abductor repair between 2016 and 2024 was retrospectively collected. Pre-operative and post-operative modified Hip Harris Score (mHHS), Visual Analogue Scale (VAS), and a custom hip abductor functional outcome survey were collected simultaneously at a minimum of 6 months post-operatively. Thresholds for achieving the minimal clinically important difference (MCID), patient acceptable symptomatic state (PASS), and substantial clinical benefit (SCB) were defined using thresholds previously calculated in literature. Student t-test was used for statistical analysis.
RESULTS: A total of 50 patients, with an average follow-up of 23.13 ± 13.58 months, participated in the study. 39 (78%) patients responded to the mHHS, VAS, and custom surveys and 11 (22%) responded to only the VAS and custom surveys.

The mean age of the cohort was 62.52 ± 12.56, with 10 (20%) and 40 (80%) being male and female respectively. Statistically significant improvement was seen for VAS, mHHS and custom survey scores with average improvement of 5.24 ± 2.8, 31.08 ± 20.3, and 8.54 ± 5.8 respectively. 74.4%, 64.1%, 51.3% of patients reached MCID, PASS and SCB thresholds respectively.
CONCLUSIONS: Patients undergoing endoscopic hip abductor repair demonstrated high rates of achieving meaningful outcomes. Future research investigating endoscopic repair of hip abductor tears are needed to elucidate variables predictive of functional outcomes.

91. Outcomes of Valve-in-Valve Transcatheter Aortic Valve Replacement in Degenerated Freestyle Xenografts

Deevya Raman, MS Bartlomiej Imielski, MD

Allyson Howard-Green, Spencer Tingey, Akalya Villenthi, Timothy Craven, Bartlomiej Imielski
Clinical Science
Student
Surgery-Cardiothoracic

Purpose:
Valve-in-valve (ViV) transcatheter aortic valve replacement (TAVR) offers a less invasive alternative for failed bioprosthetic valves, but outcomes in patients with stentless Freestyle roots remains considerably underexplored. This study analyzes a larger cohort to better characterize ViV TAVR outcomes in this unique, understudied patient population.
Methods:
We conducted a retrospective chart review of 46 patients who underwent ViV TAVR in prior Freestyle root replacements at a single tertiary referral center between March 2018 and September 2024. 26% (12/46) of TAVRs were balloon-expanded and 74% (34/46) were self- expanding valves. Pre-, intra-, and post-operative characteristics were recorded. Primary end point was mortality; secondary outcomes included MACE, conversion to open surgery, ViV TAVR migration, need for second TAVR, and peri-valvular leak (PVL). Additional comparative analyses were performed between the two TAVR valve types. A subgroup analysis was also conducted based on the size of the implanted Freestyle valve, specifically comparing the 27 mm and 29 mm cohorts. Categorical variables were analyzed using Fisher's exact test, while continuous variables were assessed with descriptive statistics and compared using the Wilcoxon rank-sum test.
Results:
Mean age was 69 years old [62,74], and 20% (9/46) female. Median time from Freestyle to TAVR was 13.8 years [11.1,16.9]. Primary indication for TAVR implantation was aortic insufficiency (balloon-expanded 83%, self-expanding 85%). Mortality was 2.2% (1/46) at 30 days and 10.9% (5/46) at 1 year. Myocardial infarction, mechanical support, and sepsis occurred in 16.7% (2/12) of balloon-expanded valves versus none in the self-expanding cohort. One patient required conversion to open-heart surgery for Type A aortic dissection related to valve deployment. Pre- implantation balloon aortic valvuloplasty (pre-BAV) was performed in 4% (2/46) and post-BAV in 16% (7/46). 18% (8/46) required implantation of a second transcatheter valve during the index TAVR
procedure. 96% (44/46) had no/trace PVL on TEE. Median length of hospital stay after the TAVR procedure was 6 days [2, 9], with a majority admitted for 2 days. 13% (6/46) were re- hospitalized within 1 month, 13% (6/46) within 6 months, and 15% (7/46) within 1 year. Pacemaker implanted in 9% (4/46), and 11% (5/46) developed cerebral vascular accidents. Mortality (p=0.63) and MACE (p>0.9) did not statistically differ between 27 mm and 29 mm valves, but 29 mm valves had more complications, including an intraprocedural Type A dissection and complex recovery courses.
Conclusions:
Freestyle ViV TAVR procedures demonstrate favorable procedural success and immediate outcomes. Our practice has evolved to predominantly offer self-expanding ViV TAVR for Freestyle roots, given limited calcium for anchoring and large annulus size. Additionally, our surgical practice has shifted away from using 29 mm xenografts to facilitate easier ViV implantation.

92. Correlation Between Body Mass Index and Postoperative Wound Complications in Adult-Acquired Buried Penis Reconstruction: A Single-Institution Retrospective Analysis

David Rezko, BS Brandon A. Casas, MD

Casas, Brandon A. Chaves, Bruna. Dilley, Kate. Calder, Bennett White
Clinical Science
Student

Background: Adult-acquired buried penis (AABP) is a challenging reconstructive condition characterized by phallic concealment within prepubic fat or scar tissue, resulting in urinary, sexual, and hygienic dysfunction. Obesity is a major etiologic factor, contributing both to disease development and to increased perioperative morbidity. Excess adiposity leads to impaired wound healing through reduced perfusion, chronic inflammation, and mechanical shear stress. While obesity's association with AABP is well established, its direct correlation with postoperative wound complications after surgical repair has not been clearly defined. This study investigates the relationship between body mass index (BMI) and postoperative wound outcomes in patients undergoing buried penis reconstruction at a tertiary academic center.
Methods: A retrospective chart review was conducted of 27 adult patients who underwent buried penis reconstruction between 2015 and 2025. Data extracted included demographics (age, BMI, comorbidities, smoking status), operative characteristics (type of procedure, graft use and type, intraoperative penile length exposed, estimated blood loss), and postoperative outcomes (wound severity, graft take, urinary or skin issues, readmission, and subjective surgical success). Wound severity was classified as none, mild, minor, moderate, or major based on chart documentation. Patients were stratified by presence of any postoperative complication, and mean BMI was compared between groups. Additional correlation analysis assessed BMI as a continuous variable against wound severity grade to explore dose-response trends. Descriptive analyses were also performed to evaluate the interplay between BMI, graft use, and overall complication rate.
Results: The mean age was 53.6 ± 12.7 years, and mean BMI was 41.0 ± 10.1 kg/m², with 81.5% of patients classified as obese (BMI ≥ 30). The overall complication rate was 55.6%, consisting primarily of minor (33.3%) and moderate (25.9%) wound events; major complications occurred in 7.4% of cases. Patients who experienced wound complications demonstrated a higher mean BMI than those without complications (43.5 vs 37.2 kg/m²; trend toward significance). When stratified by BMI category, the incidence of any wound complication increased from 33% in BMI < 35 to 67% in BMI ≥ 40. Correlation analysis revealed a positive association between BMI and wound severity (Spearman's rho = 0.41), suggesting a dose-dependent effect of obesity on wound morbidity. Notably, grafted patients (64.7%), who also tended to have higher BMI values, exhibited higher complication rates (64.7%) compared with non-grafted cases (40.0%). Functional improvement and subjective surgical success remained high (100% and 79.2%, respectively) across BMI strata.
Conclusions: This study identifies a positive correlation between elevated BMI and postoperative wound complications following adult buried penis reconstruction. Obese and morbidly obese patients were more likely to experience minor to moderate wound breakdown, though major complications were uncommon and overall functional outcomes remained favorable. These findings underscore the multifactorial impact of obesity on surgical healing, reinforcing the need for preoperative weight optimization, nutritional counseling, and careful perioperative wound management in this high-risk population. Future multicenter analyses with larger cohorts are warranted to validate BMI as an independent predictor of postoperative morbidity and to refine perioperative strategies for obese patients undergoing complex genital reconstruction.

93. Differences in Demographic, Clinical, and Imaging Features of Ocular Syphilis by HIV Status

James Rhead, BS David Browning, MD, PhD

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

Purpose: To assess whether the clinical presentation of ocular syphilis differs by HIV status.

Methods: Retrospective review of 42 patients (76 eyes) with ocular syphilis from 2015-2024. Imaging findings were compared by HIV status using two-proportion z-tests. Clinical variables, including age, sex, smoking status, cerebrospinal fluid results (CSF), and reported sexual partner type, were analyzed with t-tests and chi-square tests.

Results: HIV-positive patients were more often younger (48.9 vs 55.5 years, p = 0.037), male (100% vs 53.8%, p < 0.001), and had higher CSF protein (145.3 vs 71.3 mg/dL, p = 0.020). Full-thickness retinitis on color fundus photography (p = 0.025) and choroidal hyperreflective foci on optical coherence tomography (p = .045) were more prevalent in HIV-positive patients, while granular pattern on near-infrared reflectance (p = 0.027) was more frequently seen in HIV-negative patients.

Conclusion: HIV-positive patients were more often younger, male, and presented with elevated CSF protein and greater retinal and choroidal involvement, suggesting HIV-related patterns that may aid diagnosis and reflect severity.

94. Mitochondrial Transplantation Preserves Human Islet Function Under Hypoxic Stress

Thomas Ritchey, BS Giuseppe Orlando, MD, PhD

Quentin Perrier, Adam Jones, Tim Sganga, Amish Asthana, Giuseppe Orlando, Kelsey Fisherwellman
Clinical Science
Student
Biomedical Engineering

Mitochondrial transplantation is a novel emerging field that aims to mitigate oxidative stress in tissues due to ischemia via treatment with exogenous mitochondria. This study investigated the potential for mitochondrial transfer to protect human pancreatic islets from hypoxia-induced injury. In vitro, mitochondria were isolated and compared across various tissue sources and were characterized using different preparation methods. Using fluorescent imaging techniques, it was confirmed that human pancreatic islets have the capacity to uptake exogenous mitochondria. Furthermore, this study revealed that mitochondria treatment preserved islet viability, morphology, and glucose stimulated insulin secretion following exposure to hypoxic conditions. These findings support the hypothesis that mitochondria transplantation can protect human pancreatic islets from hypoxia and related disfunction. These results provide a basis for future optimization and eventual therapeutic applications in transplantation surgery.

95. Evaluating the Split Trocar Technique as a Safe Method for Abdominal Access in VP Shunt Placement

Richa Saxena Daniel Couture, MD

Katherine Belanger, Chesney Oravec, Alexa Hirschman, Anna Munro, Carol Kittel, Molly Ehrig, Daniel Couture
Clinical Science
Student
Surgery-Neurosurgery

Introduction:
The most common surgical treatment for hydrocephalus is ventriculoperitoneal shunt (VPS). Abdominal access traditionally involves an open mini- laparotomy but can also be achieved using a disposable split trocar which can be performed through a smaller abdominal incision. Research comparing complication and revision rates of these two techniques is sparse and has been mixed.
Objective:
This study aims to demonstrate noninferiority of the abdominal trocar for distal VPS catheter placement compared to mini-laparotomy in peri- operative infectious or abdominal catheter shunt complications, operative duration, and distal catheter survival at two years.
Method:
A retrospective review of pediatric patients undergoing VPS at a single institution by two pediatric neurosurgeons from 2014-2020 was conducted. One surgeon utilized a mini-laparotomy while the other a trocar for abdominal access. Generalized linear mixed models were performed to determine the impact of technique on complications and shunt failure within the two-year follow-up. A Wilcoxon Rank Sum test was performed to compare operative time by technique.
Result:
145 patients with 200 unique distal catheters placements were reviewed. 125 cases were performed utilizing a trocar vs. 75 utilizing a mini- laparotomy. There are equal odds of complication utilizing the trocar (8/125, 6.4%) vs. mini-laparotomy (10/75, 13.3%) (OR 0.44, 95% CI 0.17-1.18, p=0.10). Similarly, in distal catheter failure the trocar (30/125, 24%) was not inferior to mini-laparotomy (28/75, 37.3%) (OR 0.53, 95% CI 0.26-1.01, p=0.053). Median [IQR] operative time was less utilizing the trocar (20 [16-27] minutes) vs. mini-laparotomy (29 [21-47] minutes) (p <0.001).
Conclusion:
Use of the abdominal trocar for placement of the distal VPS catheter is a noninferior method compared to mini-laparotomy in complications, operative duration, and shunt survival. The trocar was associated with shorter operative time and similar rates of complications and distal revisions. The abdominal trocar should be considered as a viable alternative to mini-laparoscopy for distal VPS catheter placement.

96. Postoperative Sleep Disturbances in Cancer Surgery Patients: Patient-Reported Contributors and Recovery Priorities

Richa Saxena Perry Shen, MD

Carlos Lombardero, Pearce Hyatt, Perry Shen
Clinical Science
Student
Surgery-Neurosurgery

Introduction:
Post-operative sleep disturbances are common after major cancer surgeries and may negatively affect recovery, pain management, and overall patient well-being. While prior studies have focused on physiological outcomes, patient-reported sleep experiences remain underexplored. Our objective was to evaluate post-operative sleep quality in cancer surgery patients and identify factors-including pain, hospital environment, and emotional stress-that contribute to sleep disruption.
Methods:
We conducted a cross-sectional survey of patients undergoing major abdominal surgery for malignancy (n=9) assessing sleep quality before and after surgery, factors affecting sleep, and potential interventions. Patients reported demographics, surgical type, comorbidities, baseline and post-operative sleep quality (0-10 scale), time to fall asleep, number of awakenings, and total sleep duration. Additional factors assessed included hospital environment (noise, interruptions, bed comfort), physical discomfort, emotional factors, and use of medications or sleep aids. Open-ended responses captured patient-perceived barriers to sleep and suggestions for improvement.
Results:
The cohort included 9 patients (5 female, 4 male) with a mean age of 62.8 years (range 42-90). Surgical procedures included HIPEC (2), Whipple procedures (2), retroperitoneal sarcoma resections (3), gastrectomy and splenectomy (1), and liver lobectomy (1). The average length of stay in the hospital was 6 days (median 5 days). Common comorbidities included anxiety and depression, arthritis, chronic back pain, GERD, obstructive sleep apnea, COPD, and insomnia. Average sleep quality declined from 7.2 (median 7.5) pre-operatively to 6.1 (median 5.5) post-operatively. Sleep latency increased, with 5/9 requiring >30 minutes to fall asleep and frequently waking ≥2 times per night. Post-operative sleep duration was limited, with 7/9 patients sleeping 4-6 hours or less nightly and only 3/9 achieving 7-9 hours nightly. Pain and physical discomfort impacted sleep, with 5/9 patients identifying these as major disruptors. Hospital-related factors were also disruptive; 6/9 patients reported disturbances due to routine interruptions, and 9/9 needed to get out of bed at night for physical care, such as managing surgical sites or equipment. Emotional factors were reported by 7/9 patients, including anxiety (6/9) and depression (5/9). Sleep aids were used by 3/9 patients, all reporting some benefit. Open-ended feedback highlighted pain management, quieter hospital environments, difficulty finding comfortable positions, and anxiety as key barriers to post-operative sleep.
Conclusion:
While some patients maintained baseline sleep, most experienced longer sleep latency, frequent awakenings, and reduced sleep duration. These findings suggest that post-operative sleep disturbances in cancer surgery patients are not solely due to the surgery itself, but are strongly influenced by modifiable factors . Patient feedback emphasized improved pain management, quieter hospital environments, and strategies to facilitate comfortable sleep positions as priorities for enhancing post-operative recovery. Emotional stress, including anxiety and depression, also emerged as major contributors to sleep disturbances. Interventions targeting these areas may optimize post-operative recovery, enhance patient satisfaction, and improve overall well-being.

97. Extension of liver graft preservation time using normothermic machine perfusion in simultaneous liver-kidney transplantation increases rates of ureteral stricture

Madeleine Schlafly, MD Dionisios Vrochides, MD, PhD, MBA, FACS, FRCSC

Namratha Mylarapu, William Archie, Rohit Mantha, Katheryn Peterson, Natasha Adlakha, Andrew deLemos, Mark Russo, Paul Schmeltzer, Steven Zacks, Phillippe Zamor, Peale Chuang, Chris Fotiadis, Guneet Kochar, Adit Mahale, Gautam Phadke, Vincent Casingal, Roger Denny, Lon Eskind, David Levi, Jose R. Soto, Dionisios Vrochides
Clinical Science
Resident
Surgery-Transplant

Background: Simultaneous liver-kidney transplantation was first performed in 1983 and has since become a widely accepted treatment for end stage liver disease (ESLD) in patients with concurrent kidney disease due to the associated increase in both pre- and post-liver transplant mortality risk. Advancements in liver perfusion technology, namely normothermic machine perfusion (NMP), have changed the clinical and logistical aspects of abdominal transplantation, increasing both the liver allograft donor pool and maximum preservation time between procurement and implantation. The indirect renal impact of NMP on SLK transplant, by a potential increase in the kidney graft cold ischemia time, has not been studied.
Methods: Between January 1, 2021, and December 31, 2024, we have performed 19 SLK transplants, 12 following donations after brain death with the livers preserved with static cold storage (DBD-SCS cohort), and 7 following donations after circulatory death with the livers preserved with an NMP pump (DCD-NMP). All kidneys in both cohorts were preserved with a hypothermic perfusion pump. A retrospective review of overall, liver, and kidney graft survival, as well as ureteral complications was performed.
Results: Of the 19 recipients, 16 patients have completed at least one year of follow up (10 DBD-SCS and 6 DCD-NMP) and had 100% liver and kidney graft survival. No patient to date has experienced liver or kidney graft loss. However, the DCD-NMP cohort had significantly higher liver graft preservation time (401 min vs 940 min; p-value < 0.05) and higher rate of ureteral complications (0% vs 42.9%; p-value < 0.05). All ureteral complications occurred in patients whose liver grafts were maintained on NMP for > 1,000 minutes, thus leading to longer kidney graft cold ischemia times.
Discussion: Prolonged cold ischemia time is a known risk factor for post-renal transplant ureteral complications. Despite similar graft survival, the DCD-NMP cohort had a significantly higher ureteral stricture rate. This in part could be attributed to the increase in kidney graft cold ischemia time due to the longer preservation times on NMP. Because ureteral complications occurred only in patients with NMP liver preservation times over 1,000 minutes, we recommend not exceeding this threshold in SLK transplants, so as to reduce renal cold ischemia times and potentially avoid ureteral complications. Further validation of our findings with larger cohort, prospective, multi-
center studies is needed to better define the optimal duration of NMP during SLK transplantation in relation to ureteral complications.

98. Racial Differences in the Geriatric Breast Cancer Population

Audry Sebikali-Potts, MD Marissa Howard-McNatt, MD

Rui Zheng-Pywell, Crystal Diaz, Michelle Boyd Tressler, Kathleen Perry, Edward Levine, Charity Glass, Howard-McNatt
Clinical Science
Resident
Surgery-Oncology

INTRODUCTION: Breast cancer is a common malignancy that is curable when caught early in otherwise healthy patients. When patients are older, and have comorbidities and other risk factors, the outcomes can be significantly varied. Some physicians may be less inclined to offer treatments to older patients and older patients may be less agreeable to receiving them There has been limited analysis into the impact of frailty on breast cancer outcomes, in particular amongst Black women. We sought to determine any racial differences in frailty and outcomes of elderly breast cancer patients.
METHODS: This is a retrospective review of a prospectively managed single-center database including all breast cancer patients >65 years undergoing surgery in 2021. Frailty was determined using an electronic frailty index (eFI) derived from electronic health data. Patients were categorized as Fit (eFI ≤0.10), Pre-frail (0.10<eFI≤0.21), or Frail (eFI >0.21). Chart review was collect on data examining adjuvant therapies and complications after surgery. Descriptive statistics and logistic regression were performed.
RESULTS: Among 134 patients, Black women presented at a higher stage in comparison to White women (1.50 vs 1.29) but this did not reach statistical significance (p=0.124). The average age of Black breast elderly patients was 72.6 +/- 6.2 years as compared to 74.2 +/- 7.0 years (p=0.278). The medium eFrailty index was higher in Black women in comparison to White women (69% vs. 42.5% p=0.01278). Emergency department visits within 30 days was also increased in Black women as compared to White women (6.67% vs 5.66%, p= 0.01278).
CONCLUSION: We found that Black breast cancer patients are more likely to be frail and have more Emergency department visits postoperatively than Caucasian women. This analysis highlights ongoing racial disparities and the need for continued work to improve breast cancer care for all patients.

99. Physiomimetic Microwell Platform For Biomanufacturing Human Pancreatic Isletoids

Tim Sganga Amish Asthana, PhD

Adam Jones, Quentin Perrier, Lori Byers, Giuseppe Orlando, Amish Asthana
Basic Science
Student
Wake Forest Institute Regenerative Medicine (WFIRM)

Diabetes mellitus is a significant and chronic socioeconomic burden on a global scale, with 1 in 11 adults affected, and in response to its prevalence and severity, large efforts are underway to overcome this burden, utilizing both islets and isletoids (re-aggregated islet cells) for both research and clinical transplantation. However, islets tend to be highly sensitive and vulnerable to stressors that occur in traditional culture. Additionally, due to their heterogeneous sizes when isolated, larger islets tend to be susceptible to hypoxia and reduced compound diffusion, contributing to analytical inconsistencies. Thus, traditional culture methods often fail to maintain proper function and viability of these cells, while microphysiological systems (MPS), such as 3D culture, provide a more natural environment, offering a potential avenue for optimal function and lifespan, as well as homogeneous sizing when used in conjunction with re-aggregation techniques. Therefore, the objective is to provide a versatile, physiomimetic culture platform for generating and maintaining homogenously sized isletoids for long-term culture, reproducible analysis, and clinical use.
This study utilized a multilayer polymethyl methacrylate device with a polystyrene through-pore microwell array bonded to a porous transparent polycarbonate transwell membrane. The device fits into a standard 6-well plate to ensure compatibility with traditional lab hardware and is designed to minimize disturbance or damage to the isletoids during culture. Human islets were isolated from cadaveric tissue, dissociated into single cells, and seeded into the device to aggregate into isletoids. Brightfield imaging was conducted daily to measure size and sphericality (ratio; length/width), confocal imaging was conducted to assess viability (live/dead), and static glucose-stimulated insulin secretion (GSIS) assays were conducted to assess function as compared to intact islets.
When seeded at a concentration of 1,000 cells/well, the single cells aggregated into distinct isletoids by the second day of culture. By day 4, the isletoids were compact, with a sphericality ratio (length/width) of 0.81±0.008, and a diameter of 148.4±1.6μm (similar to 1 IEQ (islet equivalent)). Viability was 84.68±3.39% and comparable to control islets (87.73±1.59%, p=0.45, n=4). Moreover, isletoids exhibit a similar insulin stimulation index compared to control (3.18±0.44 vs. 3.32±0.47, p=0.83, n=5).
These findings suggest that this platform is suitable for the aggregation and culture of homogeneously sized and spherical isletoids, exhibiting high viability as well as comparable function to free islets. The reconfigurability of the device for perfusion culture enables the evolution of its ability to provide a dynamic and physiomimetic cell environment. With its capabilities, this platform should prove useful for the development, long-term maintenance, reproducible analysis, and experimentation with various cell types in addition to islets, especially with iPSCs for the generation of tissue-specific organoids, without the limitations of traditional culture.

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

Tim Sganga Amish Asthana, PhD

Quentin Perrier, Adam Jones, Thomas Ritchey, Lori Byers, Rita Bottino, Sandrine Lablanche, Christopher A. Fraker, Alice Tomei, Giuseppe Orlando, Amish Asthana
Basic Science
Student
Wake Forest Institute Regenerative Medicine (WFIRM)

Background: Islet transplantation is an effective cell therapy for treating type 1 diabetes. However, a high therapeutic dose is required to achieve optimal glycemic control, as a significant proportion of islets is destroyed shortly post-transplantation due to oxidative stresses. Adenosine has been shown to decrease the metabolism of rat islets and, also to provide protection against ischemia-reperfusion injury. Therefore, the objective was to assess the impact of adenosine in preventing hypoxia-associated adverse effects on human islets viability and function.
Methods: This study investigates the effect of adenosine on human islet (HI) metabolism, function, and survival under hypoxic conditions (1% O2). HI were exposed to adenosine (1 mM and 10 μM) for 24h, followed by assessments of viability, insulin secretion, and hypoxia resilience.

Results: Results demonstrated that adenosine at 1 mM significantly reduced insulin content, an effect that was reversible within 96h, without impairing islet viability or functionality (stimulation index, and insulin secretion in response to glucose). Furthermore, preconditioning of human islets with adenosine 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).
Conclusions: These findings suggest that adenosine preconditioning offers a simple and effective strategy to enhance HI survival and function during the transplantation process, by downregulating islet metabolism and insulin content, enhancing resistance to hypoxia. This approach holds potential for integration into various stages of beta-cell replacement therapies, including islet culture, encapsulation, and 3D bioprinting. It also presents opportunities for improving outcomes in alternative transplantation sites, such as the subcutaneous space. In conclusion, adenosine preconditioning represents a promising avenue for mitigating ischemia-reperfusion injuries in cell therapies for type 1 diabetes, paving the way for more efficient and resilient beta-cell replacement strategies.

101. Impact of Travel Distance and Geographic Barriers on Adjuvant Radiation Therapy Compliance and Survival in HNSCC

Daiven Sharma, BS Joshua Waltonen, MD

Joann Bluj, Madison Hinson, Malini Suresh Nair, Ryan Hughes, Ralph D'Agostino Jr, Joshua Waltonen
Clinical Science
Student
Surgery-Otolaryngology (Dentistry)

Introduction:
The optimal treatment for advanced-stage head and neck squamous cell carcinoma (HNSCC) is multi-modal, and incomplete adjuvant radiation therapy (adj RT) is associated with inferior survival. This study aims to investigate how distance from treatment facilities affects compliance with treatment and survival.
Methods:
This retrospective cohort study included adult HNSCC patients who received primary surgical resection at a single academic tertiary care center and were recommended to undergo adj RT or chemo-RT from 2010-2023. Exclusion criteria included neoadjuvant treatment, surgical resection alone, and nasopharyngeal subsites. Patients were divided into cohorts based on completion of adj RT, with incomplete adj RT defined as receiving < 100% of the prescribed dose.
Results:
A total of 171 patients were included, with 31 (18.1%) in the incomplete adj RT cohort. Traveling ≥20 miles for adj RT was associated with decreased odds of completing a full RT course (OR 0.341, 95% CI 0.116-1.00, p = 0.051). Complete adj RT conferred significantly improved 1-year (OR 10.9, 95% CI 2.16-55.6, p = 0.004) and 5-year (OR 9.43, 95% CI 1.79-50.0, p = 0.008) overall survival (OS). Traveling ≥20 miles conferred worse 1-year OS (OR 0.212, 95% CI 0.044-1.028, p = 0.054) but did not significantly affect 5-year OS (OR 0.600, 95% CI 0.184-1.953, p = 0.396). Living in a Health Professional Shortage Area (HPSA) was associated with worse 1-year OS (OR 0.045, 95% CI 0.002-0.906, p = 0.028). Increasing pathologic T stage (OR 0.502, 95% CI 0.254-0.992, p = 0.047), older age (OR 0.898, 95% CI 0.827-0.974, p = 0.010), and hypertension (OR 8.55, 95% CI 1.42-50.0, p = 0.019) were all associated with decreased 1-year survival. Hyperlipidemia (OR 5.92, 95% CI 1.17-30.3, p = 0.032) was independently associated with worse 5-year OS.
Conclusion:
Traveling ≥20 miles for adj RT was associated with lower odds of completing treatment and worse 1-year OS, although the effect diminished by 5 years. Complete adj RT strongly predicted both 1-year and 5-year survival. Patients from HPSAs and those with comorbid hypertension or hyperlipidemia also had poorer outcomes. These findings suggest that patients requiring longer travel distances or with geographic and medical barriers may benefit from enhanced support during the first year of treatment to optimize long-term survival.

102. Characterizing Outcomes of Preoperative GLP-1 Receptor Agonist Use in DIEP Flap Reconstruction

Courtney Stone, MD Thomas Steele, MD

Eric Zeng, Mary Duet, Marion Tapp, Joyce Cui, John M. Robinson, Thomas N. Steele
Clinical Science

Resident
Surgery-Plastic & Reconstructive

Purpose: This study investigates the postoperative outcomes and complications of DIEP flap reconstruction in patients with and without history of preoperative GLP-1 receptor agonist (GLP-1RA) use.
Methods: A retrospective chart review was performed on all patients (n = 205) who underwent DIEP flap reconstruction from January 2023 to May 2024 at two institutions. Patients were stratified into cohorts based on presence or absence of GLP-1RA use six months before surgery. Demographics, operative courses, and postoperative complications were reviewed. Key outcomes included population characteristics, overall complication rates, and wound-related complications.
Results: 12 patients were found with preoperative GLP-1RA use six months prior to DIEP flap reconstruction. A greater percentage of GLP-1RA users carried a diagnosis of diabetes or prediabetes ($p < 0.001$), endorsed prior tobacco use ($p = 0.040$), and experienced postoperative wound complications ($p < 0.001$) than patients without GLP-1RA use. Among nondiabetic patients, 50% of GLP-1RA users and 25% of nonusers experienced postoperative wound complications ($p < 0.001$). 100% of patients with diabetes and GLP-1RA use experienced wound complications versus 35.5% of diabetics without GLP-1RA use ($p = 0.003$). Patients with GLP-1RA use demonstrated greater percentages of postoperative infections requiring antibiotics, wound dehiscence, and pulmonary embolism than nonusers.
Conclusion: Perioperative use of GLP-1RA medications appears to parallel increased rates of wound-related complications following DIEP flap reconstruction in both diabetic and nondiabetic patients. Further studies are essential to delineate the mechanisms behind these findings and better inform physicians regarding specific postoperative complication profiles of patients using GLP-1RA medications.

103. Tranexamic Acid Administration in Endoscopic Repairs of Gluteus Medius and Minimus Tears

Robert Stratta, Jr., BA John B. Hubbard, MD

Caleb D. Puckett Dr. John B. Hubbard
Clinical Science
Student
Surgery-Orthopedics

Background: Tranexamic acid (TXA) is an antifibrinolytic agent that inhibits clot breakdown and has been associated with reduced intra-operative bleeding, lower transfusion rates, and improved visualization in various surgical procedures. Experience with TXA use in arthroscopic procedures is limited but expanding. This study aims to investigate the effect of TXA administration during endoscopic gluteal tendon repair on operative time, complications, and short-term pain control.
Hypothesis: We hypothesize that intra-operative administration of TXA during endoscopic gluteal tendon repair will be associated with reduced operative time, lower complication rates, and decreased postoperative pain when compared to cases without TXA administration.
Methods: Data were retrospectively collected from patients who underwent endoscopic gluteal tendon repair between 2014 and 2025. Baseline information included demographics, intra-operative use of TXA, operative time, preoperative MRI tear characteristics, short-term pain levels, incidence of postoperative complications (deep vein thrombosis, hematoma, infection), and secondary treatments. Patients were stratified by those with and without intra-operative TXA. Student's t-test and $\chi 2$-test were used for statistical analysis.
Results: 129 patients (133 hips) across 138 endoscopic repairs were included. TXA was administered in 28 (20.3%) of cases. Mean age of the total group was 65.1 ± 11.7 years, with 28 (21.7%) males and 101 (78.3%) females. No significant differences in age, sex, or tear type were seen between cohorts according to TXA usage. Preoperative MRI imaging demonstrated 71 (51.5%), 13 (9.4%), and 54 (39.1%) tears of the gluteus medius, minimus, or both, respectively. Mean operative time was 70.5 ± 18.2 minutes. There were 10 (7.2%) repairs that had a postoperative complication, with hematoma (n=5) being the most common complication observed. No postoperative infections were reported. Short-term postoperative pain levels were collected at both 2-week and 6-week follow-up in 127 (98.4%) patients. There was no statistically significant difference in pain levels between repairs with or without TXA administration at 2 weeks ($p=0.143$) and 6 weeks ($p=0.176$). Similarly, no differences were observed in complication rates ($p=0.428$) or operative time ($p=0.536$).
Conclusions: Patients who underwent endoscopic repair of gluteus medius and/or minimus tears demonstrated comparable pain outcomes, operative times, and complication rates regardless of TXA use. Despite the lack of significant differences observed, the small TXA cohort highlights the need for future studies with larger sample sizes to clarify the role of TXA in endoscopic gluteal tendon repair.

104. Is Out-of-Sequence Kidney Allocation Out of Line?

Robert Stratta, Jr., BA Robert Stratta, MD

Christopher Webb, Arianna Cabrales, Giuseppe Orlando, Colleen Jay, Emily McCracken, Alan Farney, Rana Kumar, Robert Stratta
Clinical Science
Student
Surgery-Transplant

Introduction: With the most recent change in the Kidney Allocation System (KAS-250) coupled with implementation of new performance measures for organ procurement organizations, out-of-sequence (OOS) kidney allocation has risen nearly 10-fold in the past few years. This practice has raised concerns that OOS kidney allocation violates national policy and may contribute to inequities in access for marginalized populations. Methods: We identified patients at our center who received a deceased donor kidney transplant (KT) with a Match Run sequence number ≥100 (SN≥100) as a surrogate for OOS KT and compared this group to patients with a SN<100 (in-sequence KT) according to pre- and post-KAS-250 eras. KAS-250 allocation policy went into effect on 3/15/21. Era 1 (E1) ranged from 1/26/17 - 3/8/21 and Era 2 (E2) from 3/16/21 - 1/14/25 to achieve the same number of adult KT recipients (n=648) in each era. Results: SN≥100 (OOS) KT occurred in 517 patients (39.9%) including 251 (38.7%) in E1 vs 266 patients (41.0%) in E2 (p=0.43). Compared to in-sequence donors, OOS donors were older (38.6 ± 15.3 years in-sequence vs 48.8 ± 14.6 years OOS KTs, p<0.001) with a higher Kidney Donor Profile Index (KDPI; 51 ± 26% in-sequence vs 67 ± 23% OOS KTs, p<0.001) and had more hypertension, diabetes, donation after circulatory death (DCD) donors, pumped kidneys, imports, and longer cold ischemia times (all p<0.01). OOS recipients were older (51.0 ± 13.2 years in-sequence vs 60.0 ± 12.2 years OOS KTs, p<0.001) and more often female (45.7% in-sequence vs 51.5% OOS KTs, p<0.05) and had lower weight, BMI, fewer retransplants, shorter waiting time and dialysis duration, and more diabetes and preemptive transplants (all p<0.05). In E1, OOS allocation favored white recipients (36.8% in-sequence vs 47.8% OOS KTs, p=0.008). In E2, this difference disappeared (29.0% in-sequence vs 33.1% OOS KTs, p=0.30) and 67% of OOS KTs occurred in non-white recipients. In both eras, one-year patient and graft survival rates were comparable between in-sequence and OOS KTs, respectively.
Conclusions: In our single-center experience spanning 8 years, 1296 KTs, and 2 eras based on the KAS-250 allocation change, OOS allocation (as determined by a SN≥100) represented 40% of our deceased donor KT activity in both eras and had comparable short-term outcomes to in-sequence KTs. OOS KTs improved access for older patients, women, and minority populations (in E2) while reducing waiting time, dialysis duration and increasing preemptive KTs compared to in-sequence allocation.

105. In Vivo Model to Assess solid Tumor Treatment Efficacy via Microfluidic Primed Syngeneic Lymphocytes

Caleb Strickler Eleftherios Makris MD,PhD

Damian Hutchins, Sara Muhic Zukic, Julia Henault, Helen Bernardi Rathgeb, Tiefu Liu, Cecilia Schaaf, Konstantinos Votanopoulos, Eleftherios Makris
Basic Science
Student
Surgery-Oncology

Background: Cancer immunotherapy has enabled targeted treatments that harness the immune system to selectively eliminate malignant cells. Adoptive cellular transfer (ACT) involves reinfusing modified immune cells engineered to recognize and attack tumor-associated antigens. Tumor-infiltrating lymphocytes (TILs) have been widely explored in solid tumor immunotherapy due to their ability to recognize multiple antigens; however, their clinical utility is limited by low availability, heterogeneous antigen specificity, and challenges with expansion. To address these barriers, we developed a tumor-on-chip platform designed to utilize the near infinite supply of peripheral blood mononuclear cells to optimize immune cell priming and generate organoid-interacting lymphocytes (OILs). OILs are educated to recognize tumor cells through interactions with antigen-presenting cells within a physiologically relevant microenvironment. This strategy has already been shown to have statistically improved cytotoxicity compared to autologous TILs in patient matched primary appendiceal and mesothelioma ex vivo experiments.
Hypothesis: We hypothesize that organoid-interacting lymphocytes (OILs) generated by priming murine immune cells in a biomimetic tumor-on-chip platform will demonstrate enhanced anti-tumor activity. Our aims are to establish murine OILs

and generate an in vivo model to best assess tumor growth reduction efficacy.
Methods: Immune cells were isolated from BALB/c mouse splenocytes and circulated through a microfluidic platform containing CT26 tumor cells and antigen-presenting cells for 7 days to generate organoid-interacting lymphocytes (OILs). A control group of isolated splenocytes were expanded in vitro for comparison. All immune cell populations were subsequently expanded for 7 additional days. For in vivo studies, BALB/c mice were inoculated with fluorescent CT26 colon carcinoma cells to establish tumors. OILs were infused and tumor progression was monitored using multispectral optoacoustic tomography (MSOT).
Results: Preliminary data showcases murine OIL expansion, demonstration of cancer cell line transfection to be fluorescent, as well as tumor growth measurement success using MSOT.
Conclusions: Initial in vivo imaging suggests this new model will be able to corroborate ex vivo primary human patient sample induced cytotoxicity as well as validate safety of OIL infusion to encourage future clinical trial use. This transitioning to a genetically homogeneous murine model provides the opportunity for a systemic in vivo assessment of OIL efficacy and supports the development of next-generation, tumor-specific immunotherapies.

106. Risk Factors For Post Mastectomy Pain Syndrome

Mason Sutherland, MD Adam Katz, MD, FACS

Abigail Heilenman, Adam Katz
Clinical Science
Resident
Surgery-Plastic & Reconstructive

Background: Persistent pain following mastectomy has been reported to affect 20-50% of women with a negative effect on quality of life. Post-mastectomy pain syndrome (PMPS) is a post-surgical neuropathic condition that is defined as pain in the anterior surface of the chest, axilla, shoulder, or upper half of the arm that persists for more than three months after surgery. Although previous studies have examined the prevention and treatment of PMPS following mastectomy through modalities of physical and cognitive therapy, nerve blocks, choice of anesthesia, surgical interventions, and topical medications, there are no studies which determine the incidence of PMPS in women who have had breast reconstruction. Furthermore, there is a lack of evidence which relates the diagnosis of PMPS to breast reconstruction type (implant vs. autologous) and timing of reconstruction.
Aim: The aim of this study is to define the incidence of PMPS in women who have undergone various types and timing on breast reconstruction in comparison to post-mastectomy women without reconstruction in order to determine how different breast reconstruction modalities may affect the development of PMPS. A thorough and carefully adjusted analysis can help plastic surgeons, oncologic surgeons, and patients alike in helping the informed consent process and postoperative expectations following mastectomy and breast reconstruction, however given the elusive nature of this syndrome, a thorough review of risk factors is warranted.
Methods: A comprehensive literature review was performed to evaluate the risk factors (including pre-operative, intraoperative, and post-operative) to evaluate the development of post mastectomy pain syndrome and summarize possible avenues to reduce the incidence of this syndrome.
Conclusions: Several possible risk factors including the risk of myofascial disruption, intraoperative irritation and/or disruption of major sensory nerves were identified and are possible targets to alter surgical technique and perioperative management of patients to reduce the possible incidence of post mastectomy pain syndrome, including tissue handling, careful identification of major nerves and multimodal pain control, amongst other factors.

107. Patient Reported Long-Term Quality of Life and Symptom Resolution after First Rib Resection

Lillian Sutton Julie Ann Freischlag, MD

Linden, JF, Faber, LL, Villenthi, A, Goldman, MP, Chang, KZ, Freischlag, JA, Stutsrim, AE
Clinical Science
Student
Surgery-Vascular & Endovascular

Objectives: Thoracic Outlet Syndrome (TOS) involves compression of the neurovascular structures within the thoracic outlet including the brachial plexus (nTOS), subclavian artery (aTOS), and subclavian vein (vTOS). The aim of this study is to evaluate patient reported long-term outcomes of nTOS and vTOS patients undergoing first rib resection and anterior scalenectomy (FRRAS).

Methods: Retrospective chart review from a single institution from 2015-2025 was completed after obtaining institutional review board approval. Baseline demographic and clinical data were collected for patients who underwent surgery at least one year prior. A 5-question quality of life (QOL) survey was provided to patients via phone call or through the electronic health record querying chronic pain symptoms (frequency and severity), ongoing paresthesias (with activity, rest, or while sleeping), chronic medication use (daily, weekly, or monthly and medication type - opioid, non-steroidal, or neuropathic), ongoing therapy (physical, occupational, or massage and frequency - weekly or monthly) and lastly overall quality of life after FRRAS (improved or not). Descriptive statistics including number (%) of categorical factors or median and inner-quartile range [IQR] of continuous factors were reported. Differences between TOS subtypes were assessed using Fisher's exact test (categorical) or rank sum tests (continuous).
Results: Of the 204 patients with nTOS or vTOS who underwent FRRAS, 108 completed our survey - 57 out of 114 nTOS and 47 out of 90 vTOS. nTOS patients had significantly longer preoperative symptom duration (median [IQR] 24 [12, 60] months vs 2 [1, 10] months for vTOS, $p < 0.001$). There were no other significant differences between groups (see table 1). In nTOS, most patients (43/57, 75.4%) indicated improved QOL. While most patients did not have recurrent symptoms (32/57, 56.1%), those that did were more likely to be older (median age 39 [35, 46] years vs 27 [17, 39] years, p 0.003). 30/57 (52.6%) patients reported ongoing paresthesias, though 47/57 (82.5%) did not require chronic medications. Patients requiring chronic medication were more likely to have undergone reoperative surgery (30% vs 4.3%, p=0.033).
In vTOS, most patients (41/47, 87.2%) reported improved QOL with younger patients more likely to have improvement (median 31 [22-41] years vs 47 [44, 50] years, p=0.015). Most veins (45/47, 95.7%) were patent at time of follow-up. As in the nTOS group, most patients did not have recurrent symptoms (36/47, 76.6%), though older patients were more likely to have recurrent symptoms (median age 49 [43, 53] years vs 30 [21, 39] years, p<0.001), have paresthesias (median age 42 [31,48] years vs 30 [20,41], p=0.027 and require chronic medications (median age 52 [50, 55] years vs 32 [22, 41] years, p=0.007). Vessel patency did not affect outcomes.
Conclusion:
Patient reported long-term outcomes are favorable for nTOS and vTOS patients undergoing FRRAS. Our study highlights differences in long-term QOL by age, with younger patients having longer-term symptom free experiences. While a small proportion of patients have recurrent symptoms, most report improved QOL.

108. The Optimal Timing of Free Flap Reconstruction of Facial Gunshot Wounds: A Retrospective Chart Review

John Sykes, MD Allison Slijepcevic, MD

Erich Mildner Rebecca Walker Samuel Craig Jacob Nasser Joni Evans Jason Korn Ivo Pestana James Browne Bennett Calder Edward Teng David Fisher Jean-Francois Lefaivre Christopher Runyan Allison Slijepcevic
Clinical Science
Resident
Surgery-Otolaryngology (Dentistry)

Background
Gunshot wounds (GSWs) to the face are life-threatening injuries associated with severe functional and aesthetic morbidity. Advances in vascularized free tissue transfer have shifted reconstructive strategies toward earlier intervention, yet optimal timing of definitive free flap reconstruction remains controversial. This study compares outcomes of early (<5 weeks) versus late (>5 weeks) free flap reconstruction following facial GSWs.
Methods
A retrospective chart review was conducted at Wake Forest Baptist Medical Center and Carolinas Medical Center (2007-2024) for adults with free flap reconstruction of composite defects secondary to GSWs. Demographics, injury characteristics, reconstructive timing, surgical interventions, and post-operative outcomes were analyzed. Early and late reconstructive cohorts were compared using Fisher's exact test, t-tests, Wilcoxon rank-sum, and Kaplan-Meier analysis. Injury severity was stratified using the Comprehensive Facial Injury (CFI) score.
Results
Patients: 21. Gender: 17/21 (81%) male, 4/21 (19%) female. Average patient age: 47 ± 16.4 years old. 19/21 (90%) of injuries were self-inflicted. Osteocutaneous free flaps were used in 13/21 (62%) of patients, while the remainder received fasciocutaneous. Flap type: fibula 10/21 (48%), radial forearm 4/21 (19%), scapula 3/21 (14%). 12/21 (57%) of patients underwent at least one revision following initial reconstruction. No statistical difference was shown in revision rates between early and late reconstructive groups (p=.091).
Early Reconstruction- 6/21 (29%) patients underwent definitive free flap reconstruction within 5 weeks of injury. Early reconstructions showed a higher association with post-operative revision within 7 days (p=.0464) and a primary complication within 30 days (p=.0456). 5/6 (83%) of early reconstructions within one week required revision: arterial thrombosis 2/5

(40%), venous congestion 2/5 (40%), necrosis and abscess 1/5 (20%). Complications requiring operative revision within 30 days included: wound infection 4/6 (66%), fistula 2/6 (33%), flap necrosis 2/6 (33%), and hematoma 1/6 (16%). 5/6 patients (83%) underwent revision surgery. 2/6 (33%) patients had an explant of their original free flap. 4/6 (67%) patients had a second free flap placed for residual defects, exposed hardware, persistent fistula, flap infection, or flap explanation. 1 patient required a total of 3 free flaps.
Late Reconstruction- 15/21 (71%) underwent reconstruction later than 5 weeks. 4/15 (27%) patients undergoing late reconstruction required revision within one week: venous congestion 1/4 (25%), dehiscence 1/4 (25%), fistula 1/4 (25%), hematoma 1/4 (25%). 7/15 (47%) of late reconstructions experienced a primary complication within 30 days including: dehiscence 3/7 (43%), fistula 2/7 (29%), infection 2/7 (29%), hematoma 1/7 (14%). 7/15 (47%) patients underwent revision surgery. 1/15 (7%) underwent debridement for nonviable flap tissue, and 1/15 (7%) underwent free flap explant with a second free flap for reconstruction. The remaining patients underwent revision for cosmetic and functional deficits including nasal valve repair, oral incompetence, facial asymmetry, and ectropion.
Conclusion
Delayed free flap reconstruction by at least 5 weeks after initial gunshot injury was associated with lower rates of post-operative free flap revision and lower rates of post-operative complications.

109. Comparative Outcomes of Robotic-Assisted versus Manual Cochlear Implantation

John Sykes, MD Michele Gandolfi, MD

Dhruv Patel Michele Gandolfi Pedrom Sioshansi Eric Kraus
Clinical Science
Resident
Surgery-Otolaryngology (Dentistry)

Objective: This study compares intraoperative timing and complications, as well as postoperative outcomes and complications between robotic-assisted and manual cochlear implantation (CI) and evaluates factors influencing surgical outcomes.
Results: A total of 150 patients underwent CI, including 57 robotic assisted and 93 manual cases. Mean age of surgery (64.8 vs 64.4 years, p=0.88), history of prior otologic surgery (p=0.21), and comorbid otologic pathology (p=0.38) were comparable between cohorts. The manual cohort included a higher proportion of male patients (p=0.0008) and former or current smokers (p=0.03). Mean operative time was significantly longer for robotic-assisted cases compared to manual cases (191.8 vs 170.1 minutes, p=0.002). Within the robot cohort, mean operative time decreased over time from the initial implementation of the robotic assist as surgeon experience increased (0-6 months 202 minutes, 6-12 months 193 minutes, >1 yr 186 minutes). While these time differences are clinically significant, they were not found to be statistically different (<6m vs >6m, p=0.311; <6m vs 1yr, p=0.285; <1yr vs >1yr, p=0.300). Intraoperative robotic complications occurred in 22 (38.6%) cases, with 10 (17.5%) robotic cases converted to manual insertion, most commonly due to cochlear anatomic restrictions (n=5). An additional 12 (21.1%) robotic cases required manual insertion of the final 1-2mm of the electrode array. No statistically significant differences were observed in postoperative complications (p>0.05 for all) between robotic-assisted and manual cohorts during either the <3 month or >3-month postoperative periods. Although not statistically significant, the most frequently observed complications included dizziness (38.6% vs 31.2%) and tinnitus (29.8% vs 20.4%).
Conclusions: Robotic-assisted CI demonstrated a comparable postoperative safety profile to manual implantation, with no significant differences in short or long term complication rates. Although robotic cases were associated with longer operative times and occasional need for conversion to manual insertion, the overall intraoperative and postoperative risk remained low. These findings support the feasibility and safety of robotic-assisted CI, while highlighting opportunities for further refinement and efficiency improvement with increased surgical experience.

110. Attenuated Levels of Renin, Angiotensin II and Aldosterone May Contribute to Postcardiotomy-Associated Vasoplegia

Spencer Tingey, BS Bartlomiej R. Imielski, MD

Benjamin I. Schachner Kendra N. Wright Jake W. DuPlooy Jorge S. Seoane Ashish K. Khanna Mark C. Chappell Bart R. Imielski
Basic Science
Student
Surgery-Cardiothoracic

Introduction
Vasoplegia occurs in up to 20% of patients following cardiopulmonary bypass (CPB). Previous studies in CPB patients have reported elevated levels of renin and angiotensin II (Ang II) despite decreased ACE activity; however, these investigations did not differentiate patients based on vasoplegia status. We hypothesize that vasoplegic patients exhibit a dysfunctional renin-angiotensin-aldosterone system (RAAS) after CPB, which fails to maintain adequate blood pressure and tissue perfusion.
Methods
Blood and serum samples were collected at four time points: pre-CPB, immediately after separation from CPB, and at 24 and 48 hours postoperatively. Samples were assayed for Ang II, active renin, ACE, and ACE2, with all measurements corrected for hematocrit to account for hemodilution. Patients were categorized as vasoplegic (N=11) or non-vasoplegic (N=37) based on vasopressor requirements and cardiac index. Changes in RAAS components between cohorts over time were analyzed using two-way ANOVA and Tukey's post-hoc test.
Results
Baseline levels of renin, Ang II, ACE, and ACE2 were similar between cohorts. In non-vasoplegic patients (N=37), renin increased 5.3-fold (20.2 [9.4, 31.0] vs. 106.4 [46.4, 166.2]) and Ang II increased 2.3-fold (36.0 [28.0, 44.0] vs. 83.5 [40.3, 126.6]) immediately after CPB; both remained elevated at 48 hours. In contrast, vasoplegic patients (N=11) showed no significant change in renin at separation from CPB or at 24 hours, with an increase only observed at 48 hours, while Ang II levels remained attenuated throughout. ACE levels declined post-CPB in both groups (non-vasoplegic: 235.4 [205.5, 265.3] vs. 203.0 [175.0, 230.9]; vasoplegic: 241.2 [192.9, 289.6] vs. 197.8 [138.3, 257.3]), whereas ACE2 levels markedly increased immediately post-CPB (non-vasoplegic: 1.19 [0.61, 1.78] vs. 9.66 [4.23, 15.09]; vasoplegic: 1.34 [0.01, 2.68] vs. 9.50 [0.34, 24.11]).
Conclusion
Non-vasoplegic patients demonstrate a robust RAAS response to CPB, consistent with prior studies. In contrast, vasoplegic patients exhibit a blunted RAAS response characterized by attenuated renin and Ang II levels, potentially impairing blood pressure and tissue perfusion. The mechanism underlying this suppression remains unclear, as factors inhibiting renin release appear to override known stimuli such as hypotension, low Ang II, and sympathetic agonist therapy. Renin and Ang II status may benefit vasoplegic patients by Ang II administration to restore circulating levels and support hemodynamic stability.

111. Targeting CD47-regulated metabolic rewiring in the glioblastoma tumor microenvironment results in the loss of glioblastoma metabolic plasticity and enhances microglia-mediated cytotoxicity

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

Mitra Kooshki, Jamie J Sagastume, Pin-Yuan Chen, Jian-Ying Chuang, Tsung-I Hsu, Shay Soker, Glenn J. Lesser, David R. Soto-Pantoja
Basic Science
Student
Cancer-Biology

Introduction: Glioblastoma (GBM) is the most malignant brain tumor. The current standard treatment and immunotherapy have shown little efficacy, likely due to the high occurrence of drug resistance and significant immunosuppressive microenvironment. The CD47/SIRPα interaction drives immune escape by limiting innate immune cell-mediated killing. More than just a don't eat me signal, CD47 regulates its intracellular signaling, including cancer metabolism. Metabolic plasticity plays an important role in GBM progression and immune cell function. However, the role of CD47 regulated cellular metabolism in GBM tumor microenvironment (TME) is still unclear.
Methods: Patient biopsy slides were used to examine the expression of CD47 in GBM tissue. Stably CD47 overexpressed and knockout, and established TMZ resistant GBM murine cell line CT2A were used for in vitro experiments. RNA-seq was applied to stably CD47 overexpressed and knockout cell line to analyze the gene enrichment of CD47 intracellular signaling. Paired GBM patients RNA-Seq, shared by Yu-Ting Tsai, Pin-Yuan Chen, Jian-Ying Chuang, and Tsung-I Hsu's previous publication, was applied to investigate the gene expression change between primary and recurrent GBM tissue. Seahorse mitochondrial respiration assay was applied to investigate CD47 regulated mitochondria-metabolism. Agilent ACEA xCELLigence RTCA Real-Time Cell Analyzer was used to measure cell migration and microglia-mediated cell killing. GBM organoid model was performed to evaluate the effect of targeting CD47 in GBM.
Results: Patient biopsy data revealed strong immunoreactivity to CD47 in GBM compared to normal adjacent tissue. Furthermore, high CD47 expressions in GBM resulted in poor survival. RNA-Seq data of established murine GBM CD47 overexpressed and knockout cell lines suggested that CD47 highly regulates mitochondrial-related metabolism, including Oxidative phosphorylation and fatty acid (FA) metabolism. Our data shows that CD47 knockdown in GBM cells

decreases the key FAO mediators CPT1A and reduces FAO-dependent mitochondrial respiration. The Gene Ontology analysis showed that CD47-upregulated genes exhibit a strong enrichment in phospholipid synthesis. Interestingly, lipidomics revealed CD47 overexpression upregulates cardiolipin, a crucial phospholipid in the inner mitochondrial membranes that stabilizes mitochondrial function and resistance to treatment induced apoptosis. In addition, paired treatment-resistant GBM patient RNA-Seq and established TMZ resistant GBM cell line both show increased FAO, cardiolipin synthesize, and cardiolipin remodeling enzyme expression. Our data suggested that CD47 may regulate TMZ resistance in GBM by cardiolipin upregulation, further stabilizing the increased FAO and mitochondrial respiration, and prevent TMZ induced apoptosis. On the other hand, blocking CD47 on microglia showed an opposite result from cancer cells, with increasing mitochondrial respiration and FAO. Initial shows differential responses may be due to the engagement of CD47 recruited G-couple protein. Furthermore, blocking CD47 on microglia increased immune cell mediated GBM cell cytotoxicity. The GBM cells and microglia cocultured organoid model showed a perspective potential of targeting CD47 in the GBM TME.
Conclusion: Targeting CD47-regulated metabolic rewiring in GBM could improve immune adaptive responses and reduce the tumor metabolic plasticity in the TME.

112. Human Liver Tissue Equivalent (hLTE) Models for Studying the Safety and Efficacy of AAV-based Gene Therapy for Patients with Hemophilia A

Sarah Wachtman, BS Graça Almeida-Porada, MD, PhD

Ritu M. Ramamurthy, Jonathan H. Diaz, Anthony Atala, Christopher B. Doering, H. Trent Spencer,Christopher D. Porada, Graça D. Almeida-Porada
Basic Science
Student
Wake Forest Institute Regenerative Medicine (WFIRM)

Gene therapy (GT) promises long-term-treatment for hemophilia A (HA), a bleeding disorder caused by various mutations in the F8 gene. Ongoing clinical trials with AAV-based GT in adults showed that most patients experienced unexpected hepatoxicity and required subsequent immunosuppression with FVIII levels dropping over time, forcing patients to revert to factor replacement. These data underscore key differences compared to data from pre-clinical animal models and emphasize the need for more accurate models enabling the assessment of the safety and efficacy of GT products in a fully human system. To investigate the impact recipient age has on these variables and whether GT could be safely extended to younger populations, we developed human liver tissue equivalent (hLTE) models to test the efficacy and potential toxicity of AAV-mediated GT at different ages. Using adult-derived hLTE, we have previously shown impaired self-aggregation of hLTE, and a significant dysregulation of genes involved in hepatotoxicity and inflammation. Here, we used pediatric human donors' hepatocytes and stromal cells (Kupffer, stellate, and sinusoidal endothelial cells) to develop a 2000-cell organoid that recapitulates the structure, biology, and functions of the native liver. The cells were transduced using AAV5 or AAV6 encoding GFP in suspension and were plated in U-bottom 96-well plates to self-aggregate into hLTEs, alongside non-transduced (NT) controls. The hLTEs were monitored for 10 days; GFP expression was monitored daily via fluorescence imaging, DNA and RNA were collected on days 5 and 10 for dPCR, viability assays (Live/Dead, ATP) were performed on days 5 and 10, a functionality assay (CyP450) was performed on days 7-10, and media was collected on days 5-10 to perform ELISAs for urea, albumin, transaminases (ALT, AST), and Alpha-1 antitrypsin (AAT). Data from 3 biological replicates of pediatric hLTEs indicate transduction with AAV5 or AAV6 had no significant impact on hLTE function or viability as determined by Live/Dead, ATP, and Cyp450 assays when compared to NT groups. Fluorescence imaging of the GFP transgene demonstrated a continuous increase in GFP signal in both AAV5 and AAV6, with significantly higher levels of GFP expression in AAV6 beginning on day 4 post-transduction. dPCR results indicated significantly higher levels of GFP mRNA in the AAV5-transduced hLTEs compared to AAV6. Interestingly, there was no significant difference in transgene DNA copy number between transduced groups. No significant differences in urea and albumin production were found; however, we observed a large variation in AST and ALT levels between biological replicates, indicating that patient profile plays a significant role in transaminase response to transduction. Additional comparison studies using adult hLTEs to define the impact of recipient age on efficacy and hepatic response to GT are currently underway.

113. Malignancy Rates and Management Strategies After Negative Molecular Testing in Indeterminate Thyroid Nodules

Rebecca Walker, BS Allison Slijepcevic, MD

Pearce Hyatt, Jane Cleland, Allison Slijepcevic, Matthew Gorris
Clinical Science

Student
Internal Medicine-Endocrinology & Metabolism

Background:
Thyroid nodules are common and fine-needle aspiration (FNA) is frequently used to assess malignancy risk. However, 34-65% of FNAs yield indeterminate results (Bethesda III or IV), a proportion that continues to increase. Molecular testing, such as ThyroSeq, can further risk-stratify these nodules. When no molecular alterations are found, the malignancy risk is reported to be comparable to benign cytology. Nonetheless, long-term outcomes of these "molecularly benign" nodules remain underreported, especially with newer testing platforms. There is also limited guidance on optimal ultrasound surveillance strategies for these patients.
A 2025 study by Nachum et al. found that among indeterminate nodules with negative molecular testing, 10% underwent surgery (with a 20% malignancy rate), 57% had ultrasound surveillance, and 33% received no follow-up. Ultrasound intervals varied widely (3-60 months), and other studies have found non-zero malignancy rates in similarly tested nodules. Additional data are needed to guide follow-up and determine which nodules may still warrant closer monitoring.
Hypothesis:
Among patients with biopsy-indeterminate thyroid nodules and negative molecular test results, a clinically significant proportion will be found to have malignancy or non-invasive follicular thyroid neoplasm with papillary-like nuclear features (NIFTP) upon surgical resection.
Methods:
We retrospectively reviewed adult patients at Atrium Health Wake Forest Baptist Hospital (June 2017-August 2023) with Bethesda III/IV nodules and negative ThyroSeq v3 results. We analyzed demographics, management (surgery vs. surveillance), and pathology outcomes.
Results:
Of 70 patients, 10 (14%) underwent immediate surgery, 10 (14%) had delayed surgery after a period of surveillance, and 35 (50%) were managed with ultrasound surveillance alone. Among the 20 patients who underwent surgery (immediate or delayed), 8 (40%) were found to have malignancy or NIFTP on final pathology, corresponding to 11% of the total cohort. 9 (26%) of the patients undergoing ultrasound surveillance alone demonstrated greater than 50% growth of the nodule.
Conclusion:
These findings suggest that even nodules with negative molecular testing may carry a non-negligible risk of malignancy. Further analysis of ultrasound surveillance intervals is needed, as reliance on negative molecular results alone may underestimate malignancy risk.

114. Development of Decellularized ECM-based 3D Bioprinted Muscle Constructs with Dual Growth Factors Delivery for Repairing Volumetric Muscle Loss (VML) Injury

Furman (Gresham) Wall Young Min Ju, PhD

Olivia Clemensen, Erika Billman, Siyuan Li, Ji Hyun Kim, James Yoo, Young Min Ju
Basic Science
Student
Wake Forest Institute Regenerative Medicine (WFIRM)

The reconstruction of extensive muscle loss resulting from traumatic injury or tumor ablation presents significant clinical challenges due to the limited treatment options available, which include allogenic tissue rejection and donor/host muscle transplantation. To address these critical obstacles, we propose the development and evaluation of a cell-free functionalized bioink composed of decellularized muscle extracellular matrix (dmECM) with uniformly sized (50 μm) decellularized muscle fiber fragments (dMFFs). The primary objective of this study is to facilitate in situ muscle tissue regeneration through the utilization of a dECM bioink incorporating dMFFs, myogenic (IGF-I), and angiogenic (VEGF) factors to promote the functional recovery of extensive muscle loss. To prepare dmECM, we treated pig thigh muscle tissue with various concentrations of solutions such as Triton-X, sodium dodecyl sulfate (SDS), and DNase. Methacrylated-dmECM (dmECM-MA) was achieved by protein digestion, dissolution in acetic acid, achieving a pH between 8 - 9, adding methacrylic anhydride, precipitating, and dialysis. For the preparation of dMFFs, pig thigh muscle tissue was obtained and cryosectioned at 50 μm. The printability test with various concentrations of dECM-MA bioink with dMFFs mixture and in vitro cell characterizations was performed. We successfully obtained dmECM biomaterials with complete removal of cellular components and intact tissue-specific ECMs. We prepared the photo-crosslinkable dmECM bioink and confirmed the formation of a white-colored hydrogel from the UV-treated dmECM-MA. A bioprinting protocol was successfully established for fabricating transplantable muscle constructs using dMFF-laden dmECM-based bioink and a gelatin-based sacrificial bioink.

115. Risk of Major Adverse Limb Events is Higher in the Non-White Peripheral Artery Disease Population

Katherine Welch-Mabon, MD Matthew P. Goldman, MD, MS, FACS

Nancy C. Edwards, Crystal Diaz, Reid Christensen, Anna Kuzma, Timothy Craven, Akalya Vilenthi, Zoë S. Terwilliger, Ashlee E. Stustrim, Joseph M. McClung, Matthew P. Goldman
Clinical Science
Resident
Surgery-Vascular & Endovascular

Background: Chronic limb threatening ischemia (CLTI) carries high risk of amputation. This study examines the interaction of race and amputation risk across CLTI grades and ankle brachial index (ABI) levels.
Methods: Retrospective review of patients with peripheral artery disease (PAD) or abnormal ABI at a single academic institution from 2017-2023 was completed. The primary outcome was major adverse limb events (MALE), defined as above ankle amputation. Wound, ischemia, foot infection (WIFi) grade was calculated using lowest ABI or toe pressure (TP). Logistic regression methods evaluated risk of MALE based upon CLTI grade, ABI (quintiles), and TP (quintiles). Interaction terms were created testing whether the effect of race on MALE was dependent on PAD severity and testing whether the relationship between race and MALE changed across different levels of PAD severity.
Results: 3669 patients with PAD or abnormal ABI were included (39.4% female; 27.4% non-white, 72.6% white). 281 (7.6%) experienced MALE. Non-white patients experienced higher rate of MALE (11%) when compared to white patients (6.4%;p<0.001). Amputation patients were younger (65 vs 68; p<0.001), male (39.4% vs 59.6%, p<0.001), more frail (p=0.039), had lower ABI (0.74 vs. 0.77; p=0.003) and more comorbidities. Non-white patients had higher MALE rates with WIFi 0, 2, and 3 (2.916; 95% CI 1.625-5.194) compared to white patients. Non-white patients had higher risk of MALE at higher ABI (5th quintile) (3.193, 95% CI 1.904-5.329) and at the lowest quintile of TP (1.19 95% CI 1.198-2.832). Interaction terms between race and the predictor variables were not significant, suggesting that the effect of race on amputation risk is relatively consistent between severity levels and that WIFi grade is not a modifier of racial disparities for MALE.
Discussion: Race was independently associated with increased risk of amputation even when adjusting for WIFi score and ABI, suggesting that these variables are not modifiers of MALE racial disparities.

116. Pre-Injury Exposure to Angiotensin Converting Enzyme Inhibitors or Angiotensin II Type 1 Receptor Blockers in Injured Patients Receiving Blood Transfusions is Associated with Improved Early Mortality

Hope Werenski, MD Gregory Stettler, MD

Debra I. Diz, Mark C. Chappell, J. Jason Hoth, Andrew M. Nunn, Gregory R. Stettler
Clinical Science
Resident
Surgery-Trauma

Introduction: Inhibition of the renin-angiotensin-aldosterone system (RAAS) by angiotensin II type 1 receptor blockers (AT1R or ARBs) or angiotensin-converting enzyme inhibitors (ACEIs) is associated with improved mortality rates in sepsis. Early blood transfusions following injury are also associated with improved patient outcomes; however, while animal models of hemorrhage have suggested a benefit of RAAS modulation, the influence of ACEI or ARB medications has yet to be established in injured patients receiving blood transfusions. The objective of this study is to determine the effects of pre-injury ACEI or ARB treatment in patients receiving blood transfusions following injury.
Methods: Patients exposed to pre-injury ACEI or ARB medications who received blood product transfusion as part of their resuscitation were compared to those not taking RAAS blockers. Demographics, complication rates, blood product transfusion volumes, and mortality were evaluated. Univariate and multivariable analyses were conducted to identify independent predictors of mortality.
Results: During the study period, 1013 patients received a transfusion as part of their resuscitation. Of these, 220 patients (21.7%) were taking ACEI or ARB medications prior to the injury. Patients who were exposed to an ACEI or ARB exhibited a lower 24-hour mortality rate compared to those not exposed (10% vs 17.9%, p=0.01). After adjusting for imbalances in age, blunt mechanism, SBP, HR, INR, and ISS, pre-injury use of an ACEI or ARB remained an independent predictor of improved early mortality (OR 1.0, 95% CI 0.19-0.65). Pre-injury ACEI or ARB use was, however, associated with an increased risk of developing acute kidney injury (AKI, OR: 2.57, 95% CI: 1.29-5.12).
Conclusion: Pre-injury use of RAAS blocking medications in patients requiring blood transfusion after trauma is associated with improved short-term outcomes but a higher incidence of AKI.

117. Compassionate Use of Skin Cell Suspension Autografts in Major Burns: A Single-Center, US Experience

Hope Werenski, MD James H. Holmes, MD

Jeffrey E. Carter, Anju B. Saraswat, John K. Bailey, James H. Holmes IV
Clinical Science
Resident
Surgery-Trauma

Introduction
Split-thickness autografts (STAG) remain the standard for closure of deep burns but are constrained by limited donor skin. At an expansion ratio of 80:1, non-cultured, autologous, skin cell suspension autografts (SCSA) allow for grafting with a reduction in donor skin. We report our single-center experience with SCSA as an adjunct to STAG in major burns.
Methods
From 2014-2018, under an FDA-approved compassionate use (CU) protocol, 17 adults (≥40% TBSA) and 13 children (≥20% TBSA) were treated with SCSA at an ABA-verified burn center. SCSA was sprayed over widely meshed STAG and donor sites. Outcomes for treated adults were compared to controls from our Burn Registry, while treated children were compared to controls from the Burn Care Quality Platform (BCQP). Primary outcomes included length of stay (LOS) normalized to %TBSA and number of operations.
Results
Seventeen adults (mean age 37 y, mean burn size 60% TBSA) and 13 children (mean age 3.5 y, mean burn size 39% TBSA) were treated under the CU SCSA protocol, with no deaths. Mean inpatient LOS per %TBSA was significantly reduced in adults treated with SCSA compared to controls (1.1 ± 0.6 d/%TBSA vs 1.9 ± 0.7 d/%TBSA, p=0.001), while there was no observed difference for children. Notably, ~60% of our CU SCSA pediatric cases involved abuse/neglect or had other non-burn care issues requiring intensive social services that extended LOS beyond medical need. Finally, pediatric patients treated with SCSA underwent significantly fewer burn operations compared to controls (3 ± 2 vs 8 ± 8, p=0.0001), while there was no observed difference for adults.
Conclusions
In major burns, SCSA was feasible, safe, and associated with reduced LOS in adults and fewer operations in children. These findings support further study of SCSA as an adjunct to STAG in resource-intensive burn care.

118. Comparing Electronic Cognitive Health Index Before and After Major Surgery

Jennifer Wylie, MD Dr. Fabian Johnston MD, MHS, FACS, FSSO

Paul Yelton, Dr. Jeff Williamson, Jennifer Wiles, Dr. Fabian Johnston
Clinical Science
Resident
Surgery-General

Introduction: Patients diagnosed with mild cognitive impairment (MCI) are at increased risk for developing dementia and other Alzheimer's related diseases. A machine learning algorithm, the electronic cognitive health index (eCHI), uses readily available data from the electronic health record (EHR) to identify patients at risk of developing MCI. Validation studies recommend cognitive screening studies for patients with a 3-year predicted risk > 5% (eCHI ≥ 0.05). However, this tool has not yet been studied in the perioperative setting. This study aims to evaluate the impact of major surgery on eCHI and subsequent risk for developing MCI.
Methods: We conducted a retrospective cohort study using structured EHR data to calculate pre- and post-operative eCHI scores for patients undergoing major surgery at Atrium Health Wake Forest Baptist Medical Center between January 1 and December 31, 2024. Major surgeries included esophagectomy, gastrectomy, pancreatectomy, colectomy, abdominal aortic aneurysm (AAA) repair, carotid endarterectomy (CEA), lower extremity revascularization, lower extremity amputation, coronary artery bypass grafting (CABG), aortic valve replacement or repair, mitral valve replacement or repair, pneumonectomy, lung resection, cystectomy, and hip replacement. Descriptive statistics were used to compare means, and paired t-tests were used to compare pre- and post-operative eCHI scores. An eCHI ≥ 0.05 was the threshold used to indicate increased risk of developing MCI over the subsequent 3 years.
Results: A total of 5,609 patients aged ≥45 years underwent major surgery during the study period. Only patients undergoing CEA had a mean pre-operative eCHI above the risk threshold (0.0727). Across all major surgeries, the mean post-

operative eCHI was significantly increased (p = 0.0034). Notably, patients undergoing pancreatectomy, AAA repair, lower extremity revascularization, or hip replacement had a mean eCHI rise from below to above the 0.05 risk threshold after surgery. Overall, the mean eCHI for all major surgeries reached the threshold for increased predicted 3-year risk of MCI post-operatively.
Conclusion: The eCHI may be a useful tool for identifying patients at increased risk of developing MCI in the perioperative setting who may benefit from formal cognitive screening and follow-up. Overall, major surgery appears to negatively impact eCHI, indicating an increased risk for MCI. Further research is warranted to evaluate the use of the eCHI in the perioperative period and assess the association with post-operative and long-term cognitive outcomes.

119. Outcomes in patients with pelvic anastomosis during cytoreductive surgery and hyperthermic intraperitoneal chemotherapy with and without diverting ostomy

Jennifer Wylie, MD Dr. Perry Shen, MD, FACS, FSSO

Dr. Audry S. Sebikali-Potts, Greg B. Russel, Dr. Nancy C. Edwards, Dr. Thomas J. Atchison, Dr. William N. Butler, Dr. Brooke E. Nunn, Dr. Konstantinos I. Votanopoulos, Dr. Edward A. Levine, Dr. Fabian Johnston, Dr. Perry Shen
Clinical Science
Resident
Surgery-General

Introduction: The need for diverting ostomy in patients undergoing pelvic anastomosis during cytoreductive surgery and hyperthermic intraperitoneal chemotherapy (CRS/HIPEC) remains debated. This study compares patient characteristics and postoperative outcomes between those with and without protective ostomies to clarify the role of diversion in this population.
Methods: We conducted a retrospective chart review of patients who underwent CRS/HIPEC with pelvic anastomosis at a single academic institution. Preoperative and intraoperative variables were analyzed using descriptive statistics to compare outcomes between patients with and without ostomies.
Results: From January 2012 to June 2025, 95 of 490 patients underwent CRS/HIPEC with pelvic anastomosis (19.4%). Of these, 74 (78%) received protective loop ileostomy or colostomy. No significant differences were found in age, sex, race, pre-operative BMI, albumin, hemoglobin, performance status, neoadjuvant therapy, or history of diabetes, heart disease, lung disease, or tobacco use. Intraoperative factors, including Peritoneal Cancer Index, resection status, splenic flexure mobilization, number of anastomoses, timing of pelvic anastomosis relative to chemotherapy perfusion, leak test results, and intraoperative transfusion requirements, were also similar. However, patients with ostomies had higher mean blood loss (1117.9 vs 753.6 mL, p=0.025) and longer operative times (629.3 vs 553.3 minutes, p=0.078). Patients without ostomies had increased hand-sewn pelvic anastomoses (29% vs 8%, p=0.023), rates of reoperation prior to discharge (24% vs 3%, p=0.0053), anastomotic leaks (20% vs 3%, p=0.027), and Clavien-Dindo grade IV/V complications (p=0.0087). No differences were observed in overall complication rates, ICU or hospital length of stay, or 30-day readmission rates. Overall survival was similar between groups. However, patients who underwent ostomy reversal (63%) experienced significantly longer median survival (47.4 vs 16 months, p<0.001). Preoperative chemotherapy was associated with lower reversal rates (p=0.01).
Conclusions: In patients undergoing pelvic anastomosis during CRS/HIPEC, diverting ostomy is associated with reduced rates of anastomotic leak, reoperation, and severe post-operative complications, without affecting overall mortality. Neoadjuvant therapy reduced ostomy reversal rates, which were linked to survival. Thus, patient selection is key when considering protective ostomy.

120. Plasmid Transfection of Urine-Derived Stem Cells with Pigment Epithelium-derived Factor for Renal Fibrosis Treatment

Tarek Zaho, MD Yuanyuan Zhang, MD, PhD

Shaelyn Walker, Adam Goff; Jay Ma, David Ornelles, Anthony Atala, and Yuanyuan Zhang
Basic Science
Fellow
Wake Forest Institute Regenerative Medicine (WFIRM)

Chronic kidney disease (CKD) often progresses to renal fibrosis, a devastating condition characterized by inflammation, scarring, and eventual kidney failure. Current therapeutic options are limited, highlighting the urgent need for innovative

approaches. Our previous research demonstrated the potential of human urine-derived stem cells (hUSCs) to regenerate kidney tissue. Concurrently, we identified a correlation between decreased pigment epithelium-derived factor (PEDF) levels and impaired renal repair. PEDF is a multifunctional protein known for its anti-inflammatory, antioxidant, and anti-fibrotic properties. This study aimed to develop a novel therapeutic strategy by combining the regenerative capacity of hUSCs with the protective effects of PEDF. We hypothesized that hUSCs, efficiently transfected with a PEDF-encoding plasmid, could serve as a potent, virus-free cell-based therapy to combat renal fibrosis. To optimize transfection efficiency, cell viability, and PEDF expression, we initially transfected hUSCs with an enhanced green fluorescent protein (eGFP) reporter plasmid using Lipofectamine. Western blot analysis confirmed significantly higher PEDF levels in hUSCs transfected with the PEDF-encoding plasmid compared to controls. While a transient decrease in total cell number was observed post-transfection, cell viability assays demonstrated that transfected cells remained healthy. Overall, we established an efficient protocol for transfecting hUSCs with PEDF-encoding plasmids using Lipofectamine, providing a foundation for a potentially safe and effective, virus-free cell therapy for renal fibrosis. Future studies will compare plasmid DNA and mRNA transfection for PEDF delivery and explore methods for large-scale production of transfected hUSCs for evaluation in animal models of renal fibrosis.

121. Emergency Preparedness for Dermal Filler Complications: Gaps in Hyaluronidase Access and Protocols

Daniel Zaki, MD Christopher Runyan, MD, PhD

Abigail Heilenman, Anna A. Stipe, Christopher Runyan, Lisa David
Clinical Science
Resident
Surgery-Plastic & Reconstructive

Introduction: Hyaluronic acid (HA) filler use continues to rise globally, paralleling increased reports of complications such as vascular occlusion, tissue necrosis, and vision loss. Timely management depends on immediate access to hyaluronidase (HYAL), yet variability in availability, training, and emergency protocols may jeopardize patient safety. This study aimed to evaluate HYAL accessibility and preparedness for filler-related complications across diverse healthcare settings.
Materials and Methods: A telephone-based survey was administered to 574 facilities, including emergency departments, urgent care centers, private practices, MedSpas, and specialty clinics. Survey content included HYAL availability, clinician familiarity, training in management of vascular occlusion, and presence of formalized protocols. Responses were analyzed for trends across practice settings.
Results: Providers surveyed ranged from physicians to nurses and physician assistants, reflecting the diversity of injectors. Most facilities reported frequent filler use (54% daily, 38% weekly, 8% monthly). Familiarity with HYAL was reported by 67% of respondents, while only 54% had the medication consistently available, typically two to twenty vials. Private practices reported the highest rates of complication management (63%), whereas urgent care centers and emergency departments demonstrated limited awareness of both recognition and intervention for occlusions. Formal treatment protocols were in place at only 44% of sites. Ultrasound and structured approaches, such as Delorenzi's protocol, were infrequently reported. Several respondents noted HYAL use more commonly for elective filler dissolution than emergency intervention.
Conclusions: This analysis highlights significant gaps in preparedness for filler-related complications, including inconsistent HYAL access, lack of standardized protocols, and limited provider training. As the number and diversity of injectors grow, broad implementation of standardized education, improved HYAL accessibility, and clear emergency algorithms are essential to reducing risks associated with dermal filler use.

122. Road to academic surgical oncology: a bibliometric study of complex general surgical oncology (CGSO) fellowship graduates

Hui Zheng, MD Perry Shen, MD

Rui Zheng-Pywell, Audry Sebikali-Potts, Edward Levine, Perry Shen
Educational Science
Fellow
Surgery-Oncology

Introduction: The path to academic surgery is a difficult and arduous one. The objective of the current study is to elucidate factors associated with leading an academic surgical oncology career, particularly those productive with research publications.

Methods: Bibliometric and professional profiling of applicants to our CGSO fellowship program from 2017 to 2021 who matched and graduated from an accredited program were included were performed. Data were obtained from publicly available sources. Impact factors were adjusted for authorship position and type of publication.
Results: Among 233 surgical oncologists included, 106 (54.5%) were female, 118 (50.6%) currently hold faculty positions at a university-based flagship hospital (UBFH), 123 (52.8%) has at least one publication during independent practice. The median years in independent practice is 3 years (range 1-5 years). In univariate analysis, faculty members at UBFH had higher number of total publications (37.8 vs 19.9, $p<0.001$), first author publications (14.3 vs 7.2, $p<0.001$), and adjusted total impact factors (274.4 vs 113.9, $p<0.001$). Faculty members at UBFH also have higher research productivities before, during, and after fellowship. Female surgical oncologists had lower number of publications (24.6 vs 30.8, $p=0.01$), first author publications (9.0 vs 11.6, $p=0.03$), and adjusted total impact factors (161.2 vs 205.1, $p=0.05$) compared to their male colleagues. No difference was found between UBFH and non-UBFH surgical oncologists between gender groups (48.7% vs 41.8%, $p>0.05$). Binomial logistic regression found fellowship size to be the only significant factor associated with being a faculty member at UBFH (Estimate 1.19, 95% CI 1.02 - 1.41). In ANOVA, being a faculty member at UBFH (B=3.60, 95% CI 0.95 - 6.26), the number of publications before (B=0.11, 95% CI 0.03 - 0.19) and during fellowship (B=0.42, 95% CI 0.23 - 0.62) were associated with more publications during independent practice.
Conclusion: Academic surgical oncologists are associated with higher research productivities. Larger fellowships are associated with academic surgical oncology careers. This is likely due to their robust research infrastructure to support sustained research effort and effective mentorship. Differences in research productivity may exist between genders. Continued promotion and support of women in academic surgical oncology is needed to achieve gender equity in research productivity.

123. Mesothelioma of the Testis: A Case Series of a Very Rare Condition

Hui Zheng, MD Edward Levine, MD

Queena Chen, Ronald Davis, Edward A. Levine
Clinical Science
Fellow
Surgery-Oncology

Introduction: Mesothelioma is an uncommonly encountered malignancy arising from mesothelial cells lining serosal surfaces of the pleura, and less frequently in the peritoneum. However, it rarely occurs at other anatomic sites including the tunica vaginalis testis.
Methods: Chart review of 4 additional cases of mesothelioma of the tunica vaginalis testis (MTVT) from a major peritoneal mesothelioma center over the course of 15 years.
Results: All 4 cases were men with a median age of 64 (range 35 to 87), who initially presented with hydroceles. The diagnosis of mesothelioma was all made after hydrocelectomy. None had a history of industrial asbestos exposure. The subtypes included one epithelioid, two biphasic and one not specified. All patients were treated with radical orchiectomy. Extra-testicular diseases were evaluated by imaging for 3 patients and laparoscopic exploration for one. The 35-year-old case with epithelioid subtype has been followed up with no evidence of disease. Known recurrence was found in one of the biphasic and the non-specified case. The 66-year-old case with biphasic subtype developed multi-organ recurrence was the only one who received adjuvant chemotherapy, immunotherapy and radiation with continued disease progression. The only known mortality was the 87-year-old case with unclassified subtype. The cause of death was not directly related to MTVT.
Conclusions: MTVT is an exceptionally rare clinical entity with unclear optimal treatment strategy. The prognosis appears to be somewhat better than pleural and peritoneal mesothelioma, which are the more commonly encountered sites of origin. We recommend radical orchiectomy and laparoscopic evaluation to evaluate for occult peritoneal disease. Referral to experienced academic medical centers and reporting experiences in the literature are recommended.

124. Next generation sequencing identifies key targetable mutations in the treatment of appendiceal neoplasms

Rui Zheng-Pywell, MD Edward Levine, MD

Rui Zheng-Pywell, Salvatore J. Lumia, Lance D. Miller, Daniel J. Gironda, Edward A. Levine
Clinical Science
Fellow
Surgery-Oncology

BACKGROUND: Appendiceal neoplasms are a group of rare, heterogeneous tumors that exhibit varying malignant potential. Systemic treatment options for disseminated appendiceal cancer are limited. We sought to review rates of mutations that may indicate potential roles for routine next generation sequencing to identify targetable therapies.
METHODS: An analysis of 916 appendiceal tumor samples (appendiceal adenocarcinoma, goblet cell adenocarcinoma, mucinous adenocarcinoma, signet ring cell adenocarcinoma, and low-grade appendiceal mucinous neoplasm (LAMN)) submitted to AACR GENIE consortium was performed to compare patient demographics and the rates of mutations that may confer drug susceptibility.
RESULTS: LAMNs exhibited lower mutation counts than other appendiceal tumors (4.5 ± 4.6, $p = 0.01$), a higher percentage of KRAS mutations (88.9%, $p < 0.01$), and were associated with a significantly higher number of living patients (85.2%, $p < 0.01$). In KRAS-mutated LAMNs, 92% occur at codon G12, with 56.5% being G12V and 39.1% involving G12D. Comparatively, 5.7%, 29.7%, 53.0%, and 71.8% of goblet cell adenocarcinoma, signet ring cell adenocarcinoma, appendiceal adenocarcinoma, and mucinous adenocarcinoma respectively had KRAS mutations. Collectively, only 7.0% of samples had a drug targetable mutation at KRAS G12C followed by 26.4% with a GNAS mutation, 6.9% with PIK3CA mutation, and finally 3.5% with DNA mismatch repair genes (MLH1, MSH2, MSH6, and PMS2) mutations across 33 samples. The prevalence of other therapeutically targetable mutations remained low (<3%) with minimal overlap. Collectively, 21.5% of appendiceal cancer cases were associated with at least one or more gene mutations with drug targeting potential, and 4.3% of cases had multiple targetable mutations.
CONCLUSIONS: While mutations suggesting available drug targeting occur at low frequency in appendiceal tumors, minimal overlap of these mutations results in a sizeable subpopulation of patients that may benefit from targeted therapies. Next-generation sequencing may enable tailored therapeutic approaches for a minority of patients with disseminated appendiceal cancer.

125. HIPEC in Colorectal Cancer Patients with Peritoneal Surface Disease and Hepatic Metastases: Near 30 year Experience

Rui Zheng-Pywell, MD Perry Shen, MD

Rui Zheng-Pywell, Greg Russell, Kathleen Perry, Konstantinos Votanopoulos, Edward Levine, Perry Shen
Clinical Science
Fellow
Surgery-Oncology

INTRODUCTION: Cytoreductive surgery (CRS) and Hyperthermic Intraperitoneal Chemotherapy (HIPEC) has been shown to improve survival in patients with peritoneal surface disease (PSD) from metastatic colorectal cancer (mCRC). The outcomes of patients with simultaneous PSD and hepatic metastases (HM) treated with CRS+HIPEC are not well defined. We have previously published our early experience with these patients undergoing CRS+HIPEC. Herein we present our updated analysis comparing outcomes to patients with PSD only.
METHODS: A retrospective analysis of a patient database from 1991 to 2020 revealed 292 patients with mCRC who underwent CRS+HIPEC with optimal cytoreduction (R0/R1/R2a): 23 patients had simultaneous HM and PSD, and 269 patients had PSD only. Post-CRS+HIPEC survival was compared between the two groups.
RESULTS: Overall survival (OS) between groups was 26 months for the PSD only group and 19 months for the PSD/HM group ($p=0.11$). The median peritoneal cancer index (PCI) did not differ between the two groups (9 vs 9, $p=0.85$). When stratified by resection status, R0/R1 patients in the PSD group had a higher median OS than patients in the PSD/HM group (34 months vs 19 months, $p = 0.03$). No OS difference was seen in R2a resections (16 months vs 15 months, $p=0.91$). On multivariate analysis of the PSD/HM group, neither the number (HR 1.17, 0.69-1.98, $p=0.56$) and size (HR 0.87, 0.65-1.16, $p=0.35$) of liver metastases, nor PCI (HR 1.10, 0.65-1.16, $p=0.22$) and resection status ($p=0.56$) were predictors of OS.
CONCLUSIONS: With optimal cytoreduction, OS was similar between colorectal cancer patients with simultaneous PSD and HM compared to PSD only patients undergoing CRS+HIPEC. However when stratified by resection status, R0/R1 resection resulted in significantly longer survival in PSD only patients. Given these findings, careful patient selection is warranted when considering CRS+HIPEC in the setting of PSD with concurrent HM.

Wake Forest University
School of Medicine

Surgical Sciences
Medical Center Boulevard
Winston-Salem, NC 27157