



Surgery Research Day 2022

**20TH ANNUAL WILLIAM C. WOOD RESEARCH SYMPOSIUM
APRIL 14, 2022 | 7:00-11:30 AM | IN PERSON & ZOOM EVENT**

Keynote Lecture: “The Future of Surgery”
presented by Allan D. Kirk, MD

David C. Sabiston, Jr. Distinguished Professor of Surgery
Chair, Department of Surgery
Professor of Surgery
Professor in Pediatrics

Professor in the Department of Immunology at Duke University School of Medicine



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SCHEDULE OF EVENTS

- 7:00 – 8:00AM **Introduction of keynote speaker by Dr. Craig Coopersmith**
- The Future of Surgery**
Allan D. Kirk, MD
- 8:05AM **Welcome remarks by Dr. Luke Brewster**
- Oral Presentations – Session I**
Moderators: Katherine Hekman, Olamide Alabi
Judges: Kendra Grubb, Jason Sciarretta, Luke Brewster, Randi Smith, Preeti Subhedar
- 8:15AM Racial and Immunologic Disparities Impact Access to Repeat Kidney Transplantation Among Patients with Previous Failed Kidney Allograft
BP Lovasik, R Zhang, RJ Lynch, RE Patzer, AB Adams
- 8:25AM Galectin-9 Expression and Decreased Survival in Advanced Biliary Tract Cancers
JM Keilson, AN Ruggieri, J Hammons, M Yarchoan, NS Azad, HX Chen, E Sharon, CR Medin, CJ Henry, B Robinson, SK Maithel, GB Lesinski
- 8:35AM Pain Catastrophizing and Hospital Length of Stay in Colorectal Surgery Patients: A Prospective Cohort Study
A Speak, S Emani, LA Vera, PS Sullivan, CA Staley, J Sharma, VO Shaffer
- 8:45AM Mitral Valve Geometry and Remodeling in a Three-Month Swine Model of Post-Infarction Heart Failure
M Silverman
- 8:55AM Severity of Fracture Pattern Is Associated with Reconstructive Outcome in Acute Traumatic Lower Extremity Free Flap Reconstruction
O Saad
- 9:10 – 10:00AM **Poster Presentations – Basic Sciences**
Moderators: John Calvert, Raul Badell
Judges: Katherine Hekman, William Kitchens, Murali Padala, Denise Lo, Luke Brewster

Poster Presentations – Clinical Sciences*Moderators: Maggie Diller, Allison Linden**Judges: Virginia Shaffer, Raymond Lynch, Jess Harding, Randi Smith, Preeti Subhedar***Oral Presentations – Session II***Moderators: Chrystal Paulos, Onkar Khullar**Judges: Paul Ghareeb, Mike Lowe, Luke Brewster, Randi Smith, Preeti Subhedar*

- 10:00AM Impact of Medicare’s Comprehensive End-Stage Renal Disease Care Initiative on Nephrologists' Treatment of Patients with New-Onset Kidney Failure
K Drewry
- 10:10AM Gm2a: A novel regulatory pathway influencing CD8+ T cell responses in transplant and cancer
KM Baecher, K Bennion, J Bazzano, K Tong, MC Lowe, M Fribourg, P Cravedi, PS Heeger, ML Ford
- 10:20AM Optimal Closure Technique for Median Sternotomy in Elective Cardiac Surgery: A Retrospective Analysis of Rigid Fixation Compared to Cable Closure
S Tom
- 10:30AM Structured Exercise Therapy Builds Muscle Strength in Porcine Model of Ischemic Myopathy from Peripheral Artery Disease
C Hoffmann, M Sasaki
- 10:40AM The Gender Gap in Surgical Literature is Closing Over Time
CM Sharperson, DA Kooby, MM Shah
- 10:50AM **Closing remarks by Dr. Craig Coopersmith & Dr. John Sweeney**
- 11:00AM **Announcement of the symposium winners by Dr. Luke Brewster**

Adjourn

KEYNOTE SPEAKER

Allan D. Kirk, MD, PhD



Allan D. Kirk received his MD and PhD in Immunology from Duke University, where he also completed his surgery residency. He completed a multi-organ transplant fellowship at the University of Wisconsin, during which time he began his longstanding work on costimulation blockade and personalized immune management. He advanced this work as Chief of Transplant Research for the Armed Services Transplant Service in Washington, DC, and subsequently as Chief of the intramural organ transplant program at the National Institutes of Health. In 2007, he moved to Emory University, as Vice Chair for Surgical Research, and in 2014, was appointed Chair of the Department of Surgery at Duke University. Dr. Kirk is the David C. Sabiston, Jr. Distinguished Professor and holds Professorships in Surgery, Pediatrics and Immunology. He also serves as Surgeon-in-Chief for the Duke University Health System. In addition to his clinical transplant practice, he has published over 350 scientific manuscripts, and continues NIH-, DoD- and FDA-sponsored investigations in organ transplantation and immune management. He has focused increasingly on the curation and analysis of multidimensional data for use in Real World Evidence trial design, clinical decision support tool development and drug discovery. He was named an Academy of Master Surgeon Educators by the American College of Surgeons in 2019, and served as the Editor-in-Chief of the *American Journal of Transplantation* from 2010 to 2020. Dr. Kirk is also an elected member of the National Academy of Medicine.

ORAL PRESENTATIONS: SESSION I

8:15AM

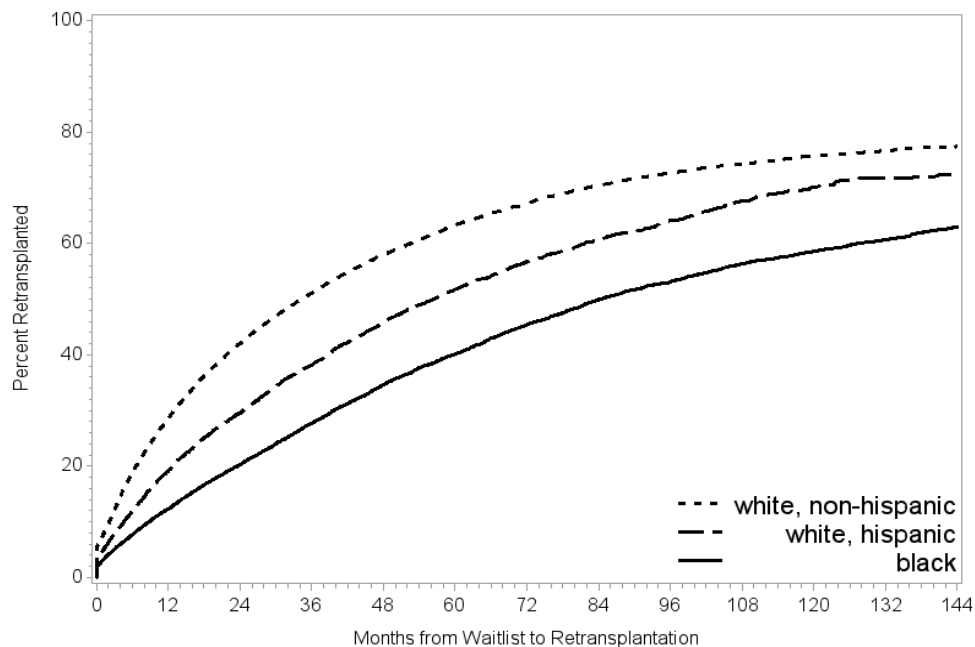
Category: Clinical Sciences

#C18 - Racial and Immunologic Disparities Impact Access to Repeat Kidney Transplantation Among Patients with Previous Failed Kidney Allograft

BP Lovasik, R Zhang, RJ Lynch, RE Patzer, AB Adams

The number of patients with a failed kidney transplant who are being considered for retransplantation is increasing steadily. However, disparities in access to repeat waitlisting and retransplant have not been well described. We examined a cohort of 81,818 patients with a failed kidney transplant in the United States Renal Data System (1995-2018), and assessed access to repeat wait-listing and repeat transplantation. Approximately half of the study population was re-listed after graft failure, including similar proportions of white (50.2%), and Black (47.6%), and Hispanic patients (49.5%); in sociodemographic/clinical adjusted analyses, there were no differences in re-waitlisting of Black patients (HR 0.98; 95% CI: 0.96, 1.01), However, white patients had a higher rate of retransplantation (30.4%) than Black (19.7%; HR 0.65, 95%CI: 0.63, 0.68) or Hispanic (25.9%; HR 0.83, 95% CI: 0.79, 0.87%) patients [Figure]. When stratified by recipient PRA, racial disparities were reduced; however, moderate and highly sensitized Black and Hispanic patients had reduced access to retransplant from the waiting list. Access to the waitlist alone does not account for racial/ethnic differences in retransplantation; policies and strategies addressing both sociodemographic and immunologic disparities that should be promoted to improve access to kidney retransplant for minority patients.

Figure 2: Time from Waitlist to Retransplantation by Race



8:25AM

Category: Basic Sciences

#B10 – Galectin-9 expression and decreased survival in advanced biliary tract cancers

JM Keilson, AN Ruggieri, J Hammons, M Yarchoan, NS Azad, HX Chen, E Sharon, CR Medin, CJ Henry, B Robinson, SK Maithel, GB Lesinski

Background: Biliary tract cancers (BTCs) are aggressive malignancies often refractory to chemotherapeutic or targeted therapies. TIM-3, a negative immune checkpoint receptor, induces immune tolerance and inhibits T-cell antitumor immunity. The role of its ligand, galectin-9 (Gal-9), in BTCs is incompletely understood.

Methods: We examined expression patterns of total Gal-9 and TIM-3 via immunoblot and soluble Gal-9 (sGal-9) via enzyme-linked immunoassay (ELISA) in a panel of human BTC cell lines. Cell viability following Ab-mediated Gal-9 neutralization was assessed via tetrazolium-based MTT assay. Pre-treatment peripheral blood was obtained from patients with metastatic BTCs (NCI10139), and sGal-9 levels were measured. Kaplan-Meier models were used to assess the association between sGal-9 levels and overall survival (OS).

Results: Human BTC cells demonstrate detectable and differential expression levels of total Gal-9 and TIM-3 proteins *in vitro* (Figure1A). sGal-9 is secreted at variable levels (Figure1B) and its neutralization does not affect cell viability. Pre-treatment peripheral blood was obtained from 73 patients (53% (n=39) intrahepatic cholangiocarcinoma, 22%(n=16) extrahepatic cholangiocarcinoma, 25%(n=18) gallbladder cancer). There was no significant difference in sGal-9 levels between disease site (p=0.08). Patients were dichotomized by low and high sGal-9 levels. High baseline plasma sGal-9 was associated with worse OS (p=0.03) (Figure1C).

Conclusion: BTCs differentially express galectin-9 and TIM-3, *in vitro*. Higher plasma levels of sGal-9 are associated with worse OS, suggesting Gal-9 expression may be related to a more aggressive disease state. Additional work is needed to better inform the mechanistic role of the Gal-9/TIM-3 axis on BTC disease progression and how best to leverage this pathway as a therapeutic target.

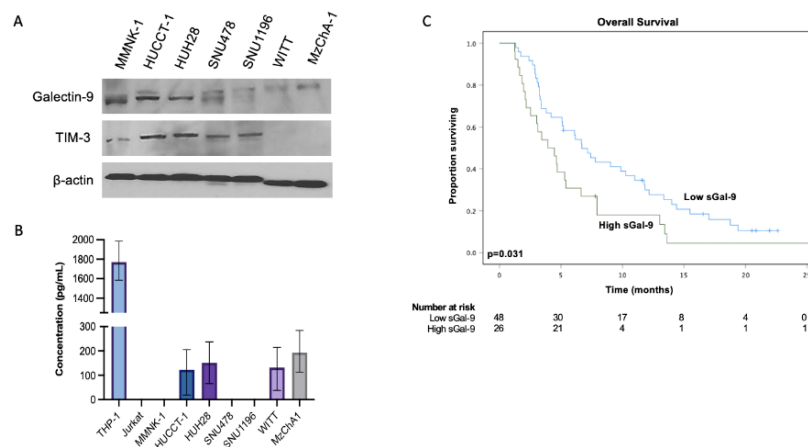


Figure 1. (A) Gal-9 and TIM-3 expression by immunoblot analysis in human BTC cell lines. B-Actin is included as a loading control. Data shown are representative of n=3 biological replicates. (B) sGal-9 concentration from human BTC cell lines based on ELISA. Error bars indicate standard error from triplicate experiments. (C) Kaplan Meier analysis evaluating overall survival for patients with low sGal-9 and high sGal-9.

8:35AM

Category: Clinical Sciences

#C34 - Pain Catastrophizing and Hospital Length of Stay in Colorectal Surgery Patients: A Prospective Cohort Study

A Speak

Introduction: Psychometrics have been used increasingly in health outcomes studies, but there is a lack of research looking at the link between preoperative psychological constructs and quantifiable short-term surgical outcomes. This study prospectively investigates whether depression, anxiety, resilience, grit and pain catastrophizing show an independent association with length of stay in patients following colorectal surgery.

Methods: The study cohort comprised 56 patients who underwent colectomies and proctectomies at Emory University Hospital from August 8, 2019 to March 10, 2020. Patients completed surveys preoperatively – the Hospital Anxiety Depression Scale, the Pain Catastrophizing Scale, the Brief Resiliency Scale and the Short Grit Scale. Patient information was then crosslinked to the American College of Surgeons National Surgical Quality Improvement Project to obtain length of stay, post-operative complications and comorbidity information.

Results: There were 27 (48.21%) female and 29 (51.79%) male participants. The mean age was 56.98 (SD=17.05) and the average length of hospital stay was 7.89 days (SD= 4.89). The rumination subscale of the Pain Catastrophizing Scale was significantly associated with hospital length of stay. The remaining survey instruments, assessing depression, anxiety, grit and resilience, were not associated with length of stay. Independent t-tests revealed that the presence of a comorbidity was not statistically correlated with differences in the survey scores.

Conclusion: Pain catastrophizing, specifically rumination, was associated with a longer length of stay. This study reinforces the contribution of psychological factors in surgical outcomes and the potential role for targeted interventions.

8:45AM

Category: Basic Sciences

#B14 - Mitral Valve Geometry and Remodeling in a Three-Month Swine Model of Post-Infarction Heart Failure

M Silverman, C King, D Onohara, D Corporan, K Sreerangathama, M Padala

Introduction: Mitral regurgitation (MR) following myocardial infarction (MI) is a known risk factor for increased hospitalizations and mortality. The longitudinal mitral valve remodeling in chronic ischemic MR (IMR) is not fully understood and a reproducible, and a large animal model is needed. In this study, we establish a swine model of chronic IMR and investigate the consequent changes in mitral valve geometry.

Methods: Yorkshire swine (n=7) were induced with an MI via targeted angiographic ethanol injection of the LCX, and were followed to 3 months. Mitral valve geometry and MR grade were investigated with epicardial echocardiography at baseline, immediately after MI induction, and 3 months post-MI (**Fig. A**).

Results: 3 months following MI, EF significantly decreased compared to baseline (47.3 ± 8.4 vs $55.3 \pm 6.5\%$, $p=.03$). Both effective regurgitant orifice area (EROA) and regurgitant volume (RV) increased compared to baseline (EROA: $12 \pm .14$ vs $.01 \pm .01\text{cm}^2$; $p=.001$; RV: 18.7 ± 21.3 vs $.14 \pm .38\text{ml}$; $p=.001$). Both tenting height and tenting area also increased compared to baseline, indicating tethering of the mitral valve. No significant differences were found in coaptation length and anterior excursion angle. Posterior excursion angle decreased at 3 months following MI, indicating restriction of posterior leaflet (**Fig. B1-B7**).

Conclusion: Our swine model of chronic IMR can be employed to study mitral valve remodeling. Significant differences at 3 months post-infarction compared to baseline were found between EF, tenting height, tenting area, and posterior excursion angle, thus resembling changes seen clinically in IMR patients.

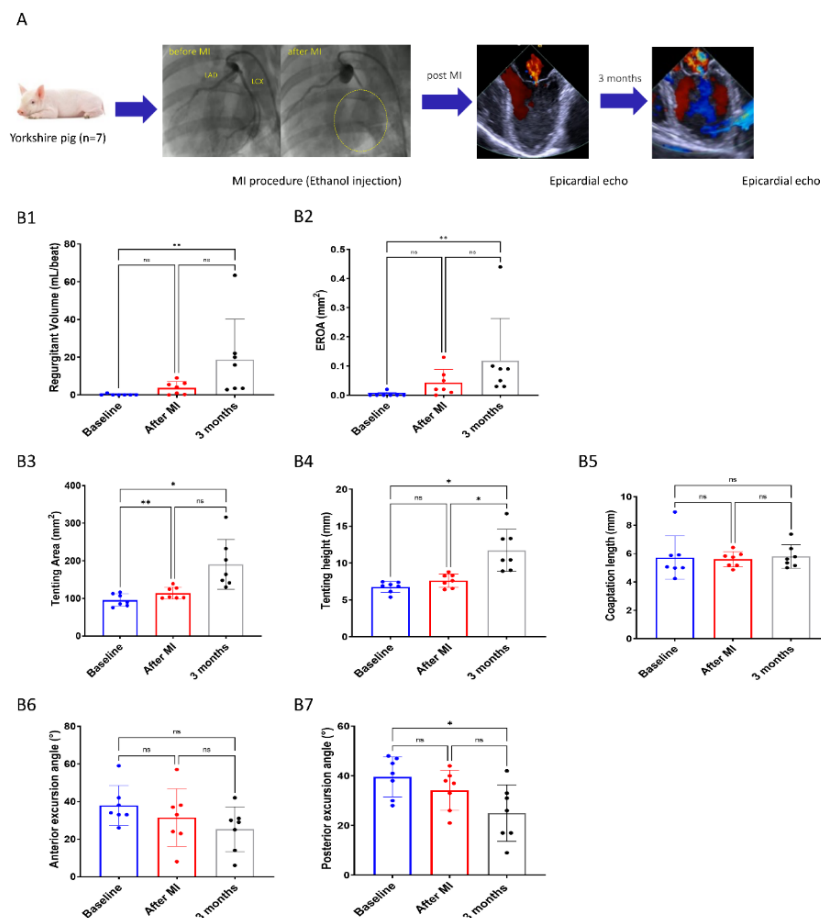


Figure. A) Experimental design with representative coronary angiogram of the left coronary artery before and after myocardial infarction by 100% ethanol injection into the left circumflex artery, and epicardial echocardiography of the mitral valve immediately following MI procedure and after 3 months, B) Quantification of mitral regurgitation (B1-2) and mitral valve geometry (B3-7) using epicardial echocardiography with mini-left thoracotomy approach. * indicates $p < .05$ and ** indicates $p < .005$

8:55AM

Category: Clinical Sciences

#C24 - Severity of Fracture Pattern Is Associated with Reconstructive Outcome in Acute Traumatic Lower Extremity Free Flap Reconstruction

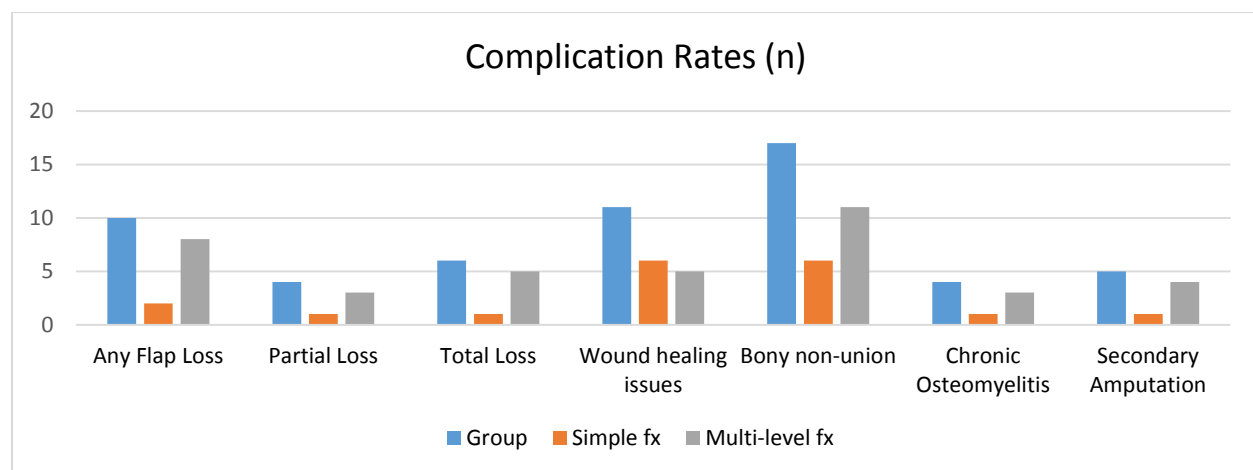
T Merceron, O Saad, C Taillon, R Fang, A Cheng, W Knaus, P Ghareeb

Objectives: Free tissue transfer is the gold standard for reconstruction of Gustillo IIIB/C open lower extremity fractures. Reconstructive failure leads to increased patient morbidity, including potential amputation of the affected extremity. The goal of this study was to determine whether severity of fracture pattern is associated with reconstructive outcome for patients undergoing lower extremity free tissue transfer.

Materials and Methods: A retrospective review of all patients undergoing acute traumatic lower extremity free flap reconstruction at a single institution between 2012-2020 was performed. Patients were divided into two groups based on fracture pattern: simple (defined as one distinct fracture of the tibia and/or fibula) versus multi-level (defined as a segmental fracture of the tibia/fibula and/or simple fracture with concurrent ipsilateral femur fracture).

Results: 24 free flaps were performed on patients with a simple fracture pattern, while 29 had a multi-level fracture pattern. The flap loss rate was significantly higher in the multi-level fracture group when compared to the simple fracture group (27.6% vs 8.3%, $p=0.024$). Total hospital length of stay and post-operative length of stay were significantly longer in the multi-level group (36.8 days vs 27.1 days ($p=0.029$) and 23.8 days vs 15.1 days ($p=0.014$), respectively).

Conclusions: Multi-level fractures of the lower extremity are associated with increased rates of reconstructive failure and longer length of stay following free tissue transfer. The reconstructive surgeon should consider the severity of the fracture pattern when counseling patients and performing free tissue transfer reconstruction of the lower extremity.



POSTER PRESENTATIONS: BASIC SCIENCE

9:10AM

#B4 – Inhibition of CD154/CD11b interaction using a novel nanotherapeutic improves allograft survival

A Bahn-Humphrey, L Zhu, D Liu, L Yang, ML Ford

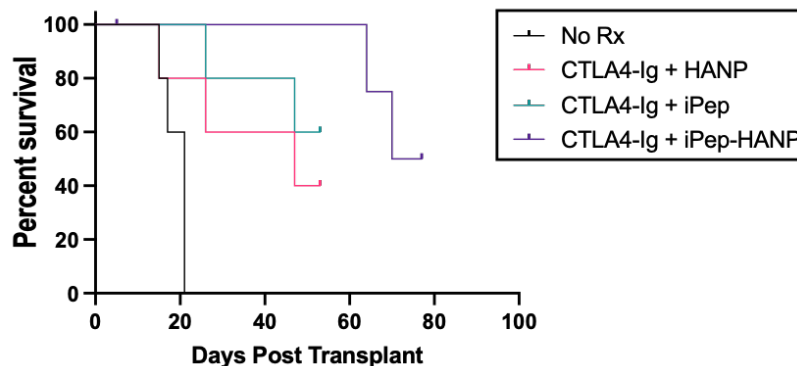
Introduction: CD154 blockade is amongst the most effective methods to prolong allograft survival in preclinical models, particularly with concurrent CTLA-4Ig therapy. However, thrombotic complications prevented clinical application of CD154 antagonists. Targeting CD40, the binding partner of CD154, failed to fully recapitulate the efficacy of CD154 blockade. Recently, we showed CD11b functions as an alternate receptor for CD154 during alloimmunity. Here, we developed a novel nanoparticle coated with a specific peptide inhibitor that prevents CD154:CD11b binding and sought to determine whether this therapeutic approach could improve allograft survival in combination with CTLA-4Ig.

Methods: Hyaluronic acid nanoparticles (HANP) labeled with a near infrared dye, NIR 830, were conjugated to the CD154:CD11b peptide inhibitor (iPep), thereby generating the CD154:CD11b-blocking nanoparticle (iPep-HANP). Murine allogeneic skin graft recipients were treated with CTLA4-Ig+NP, CTLA4-Ig+iPep, CTLA4-Ig+iPep-NP, or no treatment control on postoperative day 0/2/4/6, then q7days. Nanoparticle trafficking post-injection was assessed with serial IVIS imaging.

Results: In recipients treated with CTLA4-Ig+iPep-HANP, radiance efficiency within the graft increased on average by 2-fold at 48h post-injection, demonstrating nanoparticle localization within the allograft. Recipients treated with CTLA4-Ig+iPep-HANP exhibited superior graft survival as compared to those treated with CTLA-4Ig+HANP (MST 77d vs. 47d, n=4-5/group, p=0.0009).

Conclusions: These data demonstrate that a nanotherapeutic reagent specifically blocking the CD154:CD11b interaction effectively traffics to rejecting allografts and inhibits graft rejection. Taken together, these results illuminate the role of CD11b/CD154 interactions in promoting alloimmunity and demonstrate utilization of nanotechnology to block this pathway in synergy with blockade of the CD28 pathway improves allograft outcomes.

Fig. 1.

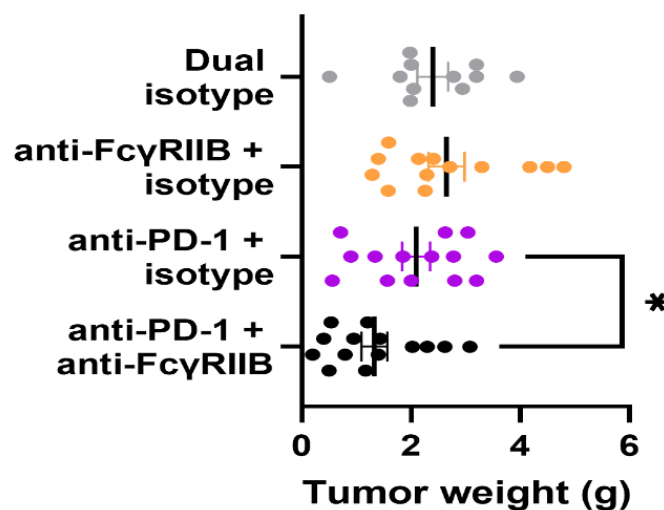


9:15AM

#B5 – FcγRIIB expressed on activated CD8+ T cells restrains T cell responsiveness to αPD-1 immune checkpoint blockade in melanoma patients

KB Bennion, M Tariq, KM Baecher, CM Paulos, R Kudchadkar, MC Lowe, ML Ford

Checkpoint inhibition using Fc-containing monoclonal antibodies has emerged as a powerful therapeutic approach to augment anti-tumor immunity. We recently showed that FcγRIIB, the only inhibitory IgG-Fc receptor, is expressed on a subset of differentiated effector CD8+ T cells in mice and humans, raising the possibility that CD8+ T-cell responses may be directly modulated by checkpoint inhibitor binding to T cell-expressed FcγRIIB. Here, we show that FcγRIIB is expressed in human CD8+ T cells in melanoma patient tumors. We show that despite exhibiting strong proliferative and cytokine responses at baseline, human FcγRIIB^{pos} CD8+ T cells exhibited reduced responsiveness to both PD-1 and CTLA-4 checkpoint inhibition as compared to FcγRIIB^{neg} CD8+ T cells. Moreover, frequencies of FcγRIIB^{pos} CD8+ T cells were reduced following treatment of human melanoma patients with nivolumab *in vivo*. This reduced responsiveness was FcγRIIB-dependent, because conditional genetic deletion of FcγRIIB on tumor-specific CD8+ T cells improved response to checkpoint blockade in a B16 mouse melanoma model. The limited responsiveness of FcγRIIB^{pos} CD8+ T cells was also dependent on an intact Fc region of the checkpoint inhibitor, in that treatment with Fc-devoid anti-PD-1 F(ab) fragments resulted in a significant increase in proliferation of FcγRIIB^{pos} CD8+ T cells, without altering the response of FcγRIIB^{neg} CD8+ T cells. Finally, blocking FcγRIIB and PD-1 decreased tumor volume by significantly improving anti-tumor CD8+ T cell responses in a B16 mouse model. These results illuminate an FcγRIIB-mediated, cell-autonomous mechanism of CD8+ T-cell suppression which limits the efficacy of checkpoint inhibitors during anti-tumor immune responses *in vivo*.



9:20AM

#B6 - Non-antibody Blockade of CD154 is Equivalent to anti-CD154 Monoclonal Antibody Based Therapies in Prolonging Survival of Pig-to-Nonhuman Primate Renal Xenografts

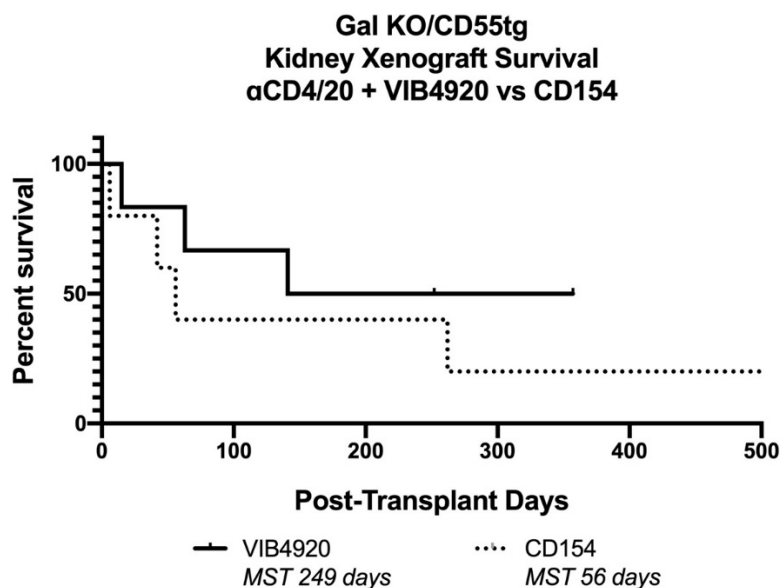
DA Faber, BP Lovasik, AJ Matar, C Breeden, SC Kim, A Stevenson, AB Adams

Introduction: CD40/CD154 blockade is highly effective in preventing rejection in pig-to-nonhuman primate (NHP) xenotransplantation models. Translation of anti-CD154 monoclonal antibodies, however, has been plagued by elevated rates of thromboembolism; accordingly, alternative blockade strategies have been developed, including a novel non-monoclonal antibody CD154 inhibitor. The aim of this study was to compare the efficacy of CD154 blockade via an anti-CD154 monoclonal antibody-based therapies with that of a novel non-monoclonal antibody inhibitor (VIB4920) in preventing rejection in a pig-to-NHP model of renal xenotransplantation.

Methods: Rhesus macaques (n=11) with low pre-transplant xenoreactive titers underwent bilateral nephrectomy and life-sustaining porcine renal xenotransplantation using GGTA1 KO/CD55 transgenic donor pigs. Animals underwent T cell depletion and were assigned to one of two maintenance treatment regimens: anti-CD154 (clone 5C8), or VIB4920; plus mycophenolic acid and steroids.

Results: Recipients treated with anti-CD154 (n=5) experienced variable survival (MST=56 days), with two recipients displaying extended survival over 250 days and one recipient surviving beyond 1100 days (262, 1169 days). Recipients treated with VIB4920 (n=6) experienced non-statistically significant prolonged survival (MST=249 days, p=0.34), including three recipients with extended survival over 250 days (252, 357, 357 days).

Conclusions: Treatment with a novel non-monoclonal antibody CD154 inhibitor results in a trend towards prolonged renal xenograft survival as compared to treatment with anti-CD154 monoclonal antibody-based therapies. These data support the importance of CD40/CD154 blockade to prolonged xenograft survival, and offer compelling data for the continued development of therapeutics that will allow prolonged graft survival without the thromboembolic effects that limit antibody-based therapies.



9:25AM

#B7 – TIGIT agonism alleviates costimulation blockade resistant rejection in a Treg-dependent manner
CR Hartigan, KP Tong, D Liu, SJ Laurie, ML Ford

Belatacept-based immunosuppression in kidney transplantation confers fewer off-target toxicities compared to calcineurin inhibitors but comes at a cost of increased incidence and severity of acute rejection, potentially due to its deleterious effect on both the number and function of Foxp3⁺ Treg. TIGIT is a coinhibitory receptor expressed on several types of immune cells, including Treg. We evaluated the use of an agonistic α TIGIT antibody to ameliorate costimulation blockade-resistant rejection in a murine model of skin transplantation. We show that TIGIT agonism, when combined with costimulation blockade by CTLA-4Ig, can prolong allograft survival in a minor antigen mismatch model of transplantation compared to CTLA-4Ig treatment alone (MST beyond 80 days compared to MST of 24 days, p value=0.0007). Further, we show that this prolongation of graft survival is accompanied by a reduction in the number of CD8⁺ T cells in the graft (p=0.03), and an increase in the frequency and number of graft-infiltrating Tregs (1.6 fold increase, p=0.0046). Through the use of Treg-specific TIGIT conditional knockout animals, we show that the TIGIT-mediated reduction in the graft-infiltrating CD8⁺ T cell response is dependent on signaling of TIGIT on Tregs. Our results highlight the therapeutic potential of TIGIT agonism to function in combination with CTLA-4Ig to optimize costimulation blockade-based immunosuppression for transplant patients.

9:30AM

#B11 - Cardiac Reshaping and Papillary Muscle Approximation to Improve Cardiac Function in Swine with Ischemic Heart Failure

CL King, M Silverman, D Onohara, D Xu, K Wong, K Sreerangathama, M Padala

Introduction: Ischemic heart failure leads to left ventricular dilation, mitral valve tethering, and mitral regurgitation (MR). Correcting regurgitation alone in these patients with mitral valve surgery or interventional therapies has not yielded a tangible benefit in improving cardiac function or survival. The goal of my project is to investigate if cardiac reshaping and papillary muscle approximation at the equatorial level of the left ventricle can correct MR and enable better ventricular function in patients with advanced heart failure.

Methods: Yorkshire swine (n=18) will be induced with a myocardial infarction via targeted angiographic ethanol injection of the left circumflex artery to develop MR. Reshaping procedure (**Figure 1**) via a left thoracotomy and transapical approach will be performed 3 months after the MI procedure once MR and heart failure have developed. Cardiac function and left ventricular mechanics will be analyzed using echocardiography at the time of the reshaping procedure and at the 6-month time period.

Results: Preliminary results from proof-of-concept surgeries (n=2) have shown a decrease in tenting height (8.55 to 5.85mm), a decrease in tenting area (167.9 to 92.9 mm²), an increase in coaptation length (5.45 to 8.85mm), and a decrease in intra-papillary muscle distance (19.3 to 12.45mm).

Conclusion: Preliminary studies have demonstrated this method is successful at improving cardiac function and left ventricular mechanics. More research is required to investigate if this method can be used to correct MR and cardiac function in an advanced heart failure animal model.

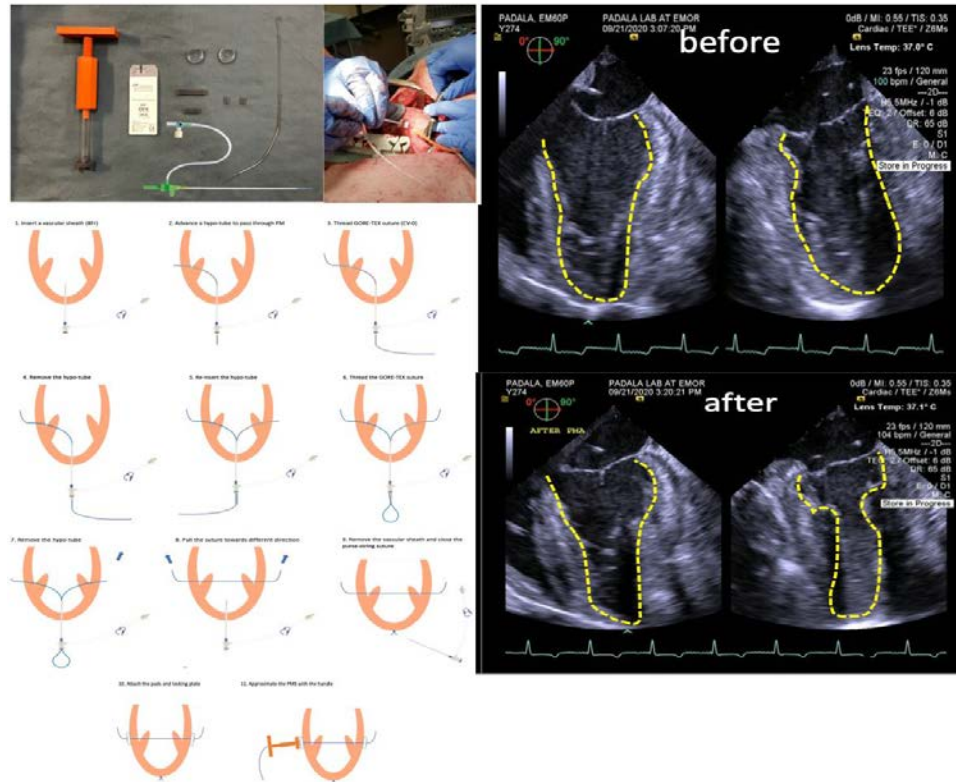


Figure 1: Top left: device equipment and implementation in swine surgery. **Bottom left:** Step-by-step guide of performing the reshaping surgery. **Right:** echocardiographic imaging before and after the reshaping surgery.

9:35AM

#B12 – Optimizing Arterial Storage to Preserve Vascular Function in Ex Vivo Murine Model

D McLaughlin

Introduction: Real time testing of vascular function is the gold standard of testing arterial physiology. However, this is time consuming and difficult to arrange immediately after vessel harvest. In preparation for establishing a protocol for delayed testing of human arteries, the objective of this study was to test various storage conditions on murine artery function.

Methods: Descending thoracic aortas were obtained from 10–12-week-old C57/Bl6J mice and were either tested immediately after harvest or stored for 24 hours in the following conditions: 37°C or 4°C Opti-MEM, 4°C Krebs-HEPES with 1.8mM or 2.5mM calcium, or 4°C Wisconsin (WI). Vascular function was evaluated by isometric force testing. Contraction was measured using potassium chloride (KCl) or phenylephrine (PE). Endothelium-dependent relaxation (EDR) was measured by PE precontraction with addition of methacholine. Endothelium-independent relaxation (EIR) was measured by PE precontraction with addition of sodium nitroprusside. Statistical analysis included repeated one-way-ANOVA.

Results: WI or 37°C Opti-MEM storage preserves EDR ($p > 0.95$); however, Krebs-HEPES or 4°C Opti-MEM storage decreases EDR ($p < 0.01$). All storage conditions preserve EIR ($p > 0.15$) and contractility in

response to KCl and PE. WI and 37°C Opti-MEM storage preserves maximum force of contraction to KCl ($p > 0.999$) and PE ($p > 0.9$) whereas Krebs-HEPES or 4°C Opti-MEM storage decreases force of contraction to KCl ($p < 0.05$) but not PE ($p > 0.05$).

Conclusion: Arterial storage in WI or Opti-MEM at 37°C preserves EDR and force of contraction. EIR and smooth muscle cell contractility are less dependent on storage conditions. For murine arteries, WI or 37°C Opti-MEM storage are adequate for delayed testing.

9:40AM

#B13 – High-Risk Gene Expression in Colorectal Liver Metastases: Potential for Novel Therapies

CR Medin, MK Turgeon, JM Keilson, B Dwivedi, C Herting, SK Maithel, GB Lesinski

Background: Immunotherapy currently has a limited role in colorectal cancer liver metastases (CRCLM) due to poor efficacy. We sought to identify high-risk CRCLM gene profiles to define the tumor immune microenvironment for development of augmented immunotherapeutic strategies in this population.

Methods: Fifty-three FFPE CRCLM samples from patients who underwent complete metastatectomy from 2009-2017 were examined. NanoString Immuno-Oncology (IO360) 750-gene expression profiling was performed on extracted RNA. High expression was defined as absolute log 2-fold change ≥ 1.5 and p -value ≤ 0.05 . Patients were analyzed by extremes of outcomes: lowest-quartile survival (high-risk) versus alive at last follow-up (low-risk).

Results: Thirty patients were included in final analysis. Median age was 58-years (IQR 20.5); 27% were female. Nine were high-risk, with median survival of 15 months. Twenty-one survivors had a median follow-up of 49 months. Expression of C7, IL6R, MGMT, CXCL2, PCK2, CSF1 and LILRB4 was higher among those with poor survival relative to surviving patients (Figure 1A). The association of IL6R expression with survival is illustrated in Figure 1B.

Conclusions: We demonstrate differential gene expression associated with poor survival among patients with resected CRCLM. Genes of interest include IL6R, MGMT, CSF1 and LILRB4. IL6R affects tumor proliferation via tumor-associated macrophages, myeloid-derived suppressor cell (MDSC), and T-cell signaling. MGMT repairs alkylating DNA damage and is implicated in carcinogenesis and chemotherapy response. CSF1 promotes M2-macrophage differentiation, suppressing inflammation and anti-tumor defenses. LILRB4 activation via MDSCs leads to T-cell inhibition. These suggest a myeloid-dominant tumor immune microenvironment and potential therapeutic targets. Validation with immunohistochemistry is currently underway.

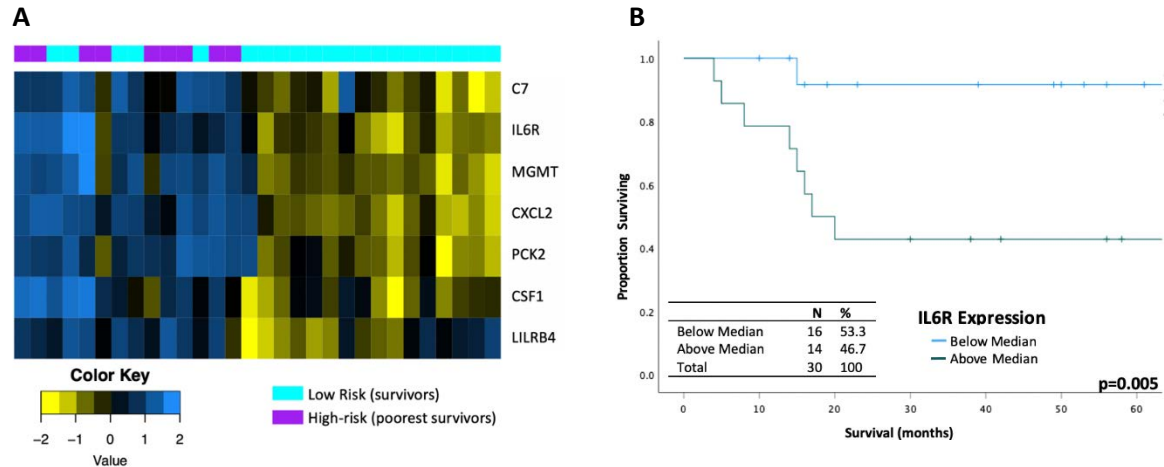


Figure 1. Differential Gene Expression Associated with Survival with Heat Map (Panel A) demonstrating gene expression profiling and Kaplan-Meier Survival Curve (Panel B) demonstrating poor survival associated with above-median IL6R expression.

9:45AM

#B15 - Chronic Ethanol Exposure Prolongs Murine Allograft Survival

D Swift, M Ford, W Kitchens

Alcoholic cirrhosis is the leading indication for liver transplantation in the United States, and patients are increasingly transplanted without the traditional six-month period of pre-transplant sobriety. As chronic alcohol consumption significantly impacts the immune system, we sought to evaluate its impact on transplant rejection using murine skin graft models.

C57BL/6 (B6) mice were randomized to receive ethanol (20%) or water over a 12-week period. We utilized two different murine skin graft models, a minor antigen-mismatched model (male=>female B6) and a clinically-relevant fully allogeneic model (BALB/c=>B6 under CTLA-4-Ig + anti-CD154 immunosuppression). To evaluate mechanisms of immunomodulation, alcohol-treated and control BALB/c=>B6 recipients were sacrificed on POD14 and splenocytes were phenotyped by flow cytometry.

Chronic ethanol exposure significantly prolonged allograft survival in both male=>female [median survival time (MST) of >60 vs. 35.5 days, $p=0.041$] and BALB/c=>B6 skin grafts [MST 29 vs. 21 days, $p=0.028$]. The impact of ethanol-exposure on graft survival was transient, as graft survival approached controls after ethanol-treated mice had a two-month alcohol-free washout period prior to transplant (MST=21 vs. 24.5 days, $p=0.952$). Ethanol exposure significantly increased the frequency of FoxP3+ Tregs (16.7% vs. 6.4% of CD4+ T cells, $p=0.001$).

Chronic alcohol use prolongs murine skin graft survival, potentially due to graft-protective Treg expansion. Given the increasing prevalence of transplant patients with recent chronic heavy alcohol use, this finding is clinically significant because it may justify targeting lower levels of clinical immunosuppression in these patients, especially if alcohol is found to inhibit not only alloresponses but also protective immunity.

POSTER PRESENTATIONS: CLINICAL SCIENCE

9:10AM

#C37 – Understanding the Modification of Eplet Mismatch Risk by Immunosuppression Regimen

AC Johnson, J Zhang, L Gragert, CP Larsen

Purpose: Solid organ transplant donor-recipient eplet mismatch has been correlated with subsequent donor specific antibody (DSA) formation, antibody mediated rejection, and overall rejection rates. However, studies have been predominantly in patients on tacrolimus-based immunosuppression regimens. Evidence indicates patients on belatacept have lower rates of DSA formation, suggesting mediation of immunogenicity of human leukocyte antigen (HLA) polymorphisms. Using eplet risk stratification to compare rates of immunologic events between immunosuppression regimens will provide additional insight into the risks and benefits of these medications.

Methods: Adult kidney transplant recipients at Emory University between 01/2009 and 10/2021 were considered for inclusion. EBV seronegative, and HIV positive patients were excluded. Maintenance immunosuppression consisted of mycophenolate mofetil, prednisone, and either tacrolimus (n=790) or belatacept (n=2,442). Cohorts were propensity-score matched by age, gender, race, and donor type using optimal 1:1 selection. Low/intermediate-resolution HLA typing and patient ethnicity were used as input for 9-locus high-resolution HLA imputation. Eplet mismatch was calculated with HLAMatchMaker version 2.0 reference tables applied using hlaR. Risk stratification was determined by single molecule DR/DQ eplet mismatch. Endpoints were DSA formation, acute rejection, and eGFR.

Results: Belatacept (n=790) and tacrolimus (n=790) cohorts were propensity-score matched with standardized difference < 0.1 for all variables. In both groups, mean age was 50 years, 62% of patients were male, and 32% received a kidney from a living donor. Median follow-up was 36 months. Single molecule eplet risk level was associated with DSA formation and acute rejection for both groups. The reduced DSA rate in belatacept patients was most pronounced for the intermediate-risk group. Conversely, the increased acute rejection rate in belatacept patients was confined to the high-risk group. Notably, mean eGFR was higher in belatacept patients (low-risk: 53.9, intermediate/high-risk: 52.5 ml/min/1.73m²) than tacrolimus (low-risk: 47.9, intermediate/high-risk: 47.3 ml/min/1.73m²) over the first three years post-transplant regardless of eplet risk stratification (p<0.01).

Conclusion: Single molecule HLA-DR/DQ eplet mismatch from imputed HLA typing successfully stratifies the risk of immunologic events for historical belatacept and tacrolimus patients. Additionally, eplet risk stratification identifies subgroups of patients for whom particular risks and benefits of immunosuppressants are more pronounced. Analysis of eplet mismatch burden may be a useful adjunct in determining the most beneficial immunosuppression agents for individual patients.

9:15AM

#C9 – Pre-existing Systolic Dysfunction is the Most Powerful Predictor of Failed Arteriovenous Fistula Maturation

CC Faaborg-Andersen, CR Ramos, K Minton, J Benarroch-Gampel, VJ Teodorescu, RR Rajani

Introduction: Patients requiring hemodialysis access creation often have significant comorbid conditions which may impact access maturation. Underlying cardiac dysfunction likely plays an important role in the maturation of arteriovenous fistulae (AVF). The effect of specific parameters of cardiac function on successful AVF creation has not previously been explored.

Methods: A retrospective chart analysis of patients undergoing first-time AVF creation at a single center was performed. Patients with a transthoracic echocardiogram within the 12 months prior to surgery were included. Standard demographic variables were collected, in addition to echocardiographic and vascular mapping data. The primary outcome was access maturation, defined as use of the access site for hemodialysis at 3, 6, and 12 months after surgery.

Results: 121 patients met inclusion criteria with a cumulative AVF maturation rate of 57% (69/121) in this select population. Patients with pre-existing systolic cardiac dysfunction were more than five times less likely to see their AVF mature by one year post-surgery (OR = 0.17, p=0.018). Perioperative venous diameter, access site location, and the type of fistula did not differ significantly between patients with and without systolic dysfunction. Selection of the cephalic vein as the venous anastomosis and diastolic dysfunction (\geq Grade 2) were also associated with lower rates of access maturation.

Conclusions: Systolic cardiac dysfunction is the most important non-modifiable variable associated with failed AVF maturation. Patients requiring hemodialysis with significant pre-existing cardiac dysfunction may not be appropriate for permanent access creation and long-term catheter use should be seriously considered as an alternative.

Table 1. Multivariable analysis of factors associated with AVF maturation.

| <u>Covariate</u> | Access maturation by \leq 6 months after DOS | | Overall access maturation (at any time) | |
|---|---|-------------|---|-------------|
| | OR (95% CI) | P-value | OR (95% CI) | P-value |
| Systolic dysfunction, any | 0.02 [0.002-0.22] | .001 | 0.17 [0.04-0.74] | .018 |
| Venous anastomosis; Basilic (vs. Cephalic) | 2.57 [0.51-12.97] | .254 | 5.79 [1.03-32.53] | .046 |
| Diastolic dysfunction, \geq Grade 2 | 0.41 [0.14-1.22] | .109 | 0.33 [0.12-0.88] | .026 |

DOS, date of surgery.

9:20AM

#C14 – Early stoma closure in very low birth weight neonates with spontaneous intestinal perforation is associated with earlier independence from parenteral nutrition

A Howk, J Pothen, A Bhatia

Objective: To determine whether timing of stoma closure (early versus late) affects feeding outcomes in infants who have undergone enterostomy for spontaneous intestinal perforation (SIP).

Methods: A single center retrospective review of neonates with diagnosis of SIP that underwent stoma creation between February 2008 and July 2020 (n=90) was performed. Neonates that underwent stoma closure at < 8 weeks (early) were compared to those undergoing procedure at >8 weeks (late).

Primary outcomes were time to full enteral feeds and total parenteral nutrition (TPN) days. Student's t-tests of means were used to compare patient demographics and outcomes across the early closure and late closure groups. Linear and logistic regression models were fitted to further examine these relationships while controlling for gestational age. Negative binomial regression were estimated for linear outcomes to account for non-normal distributions.

Results: Neonates in the early group had a significantly higher average birth weight (975.3 vs 753.1 grams, $p < 0.01$) and gestational age (27 vs 25 weeks, $p < 0.01$). There was no significant difference in preoperative TPN requirement between groups; (early: 26.5% vs. late: 39.3% ($p = 0.21$)). Time to reach full enteral feed volumes following stoma reversal did not differ between groups ($p = 0.28$). The early closure group had fewer TPN days (92 vs 125 days, $p < 0.01$) and shorter lengths of stay (119 vs. 151, $p < 0.01$); both remained significant after controlling for gestational age (IRR 0.93, $p < 0.01$; IRR 0.84, $p < 0.01$; respectively). After controlling for gestational age, there was no significant difference in infectious complications ($p = 0.08$), postoperative necrotizing enterocolitis ($p = 0.29$), need for recurrent surgical interventions ($p = 0.2$), or ventilator days ($p = 0.35$) between groups.

Conclusion: Early stoma reversal in neonates with SIP is safe with a reduction in total parenteral nutrition days and length of stay.

9:25AM

#C17 - Environmental Chemicals and their Association with Hyperparathyroidism

JL McMullin

Background: The incidence of primary hyperparathyroidism has increased in the past few decades. Previous work from our institution detected environmental chemicals including polychlorinated biphenyls (PCB) and pesticides within hyperplastic parathyroid tumors. The National Health and Nutrition Examination Survey (NHANES) is a dataset that includes measurements of environmental chemicals within laboratory serum specimens. Our aim was to determine if there are any environmental chemicals associated with elevated parathyroid hormone (PTH) levels in NHANES.

Methods: NHANES was queried from 2003-2006 (PTH data only included in these years). Subjects with elevated PTH and normal Vitamin D levels were identified. Student's T-Tests were used to analyze levels of environmental chemicals with elevated PTH in a univariate analysis. Categories of environmental chemicals included pesticides and insecticides, PCB, flame retardants, dioxins, furans, and environmental phenols. All environmental chemicals with $p < 0.05$ were then included in separate multivariate models adjusting for serum vitamin D and creatinine.

Results: There were 14,681 subjects analyzed, and of these 9.4% (1,377) had elevated PTH (>65 pg/mL) and normal Vitamin D (>30 ng/mL). Calcium was elevated >10.2 mg/dL in 2.8% (359) of subjects. Eighteen PCBs were found to be associated with elevated PTH (all $p < 0.05$). Additionally, the pesticides dimethylphosphate, transnonachlor, hexachlorobenzene, oxychlorodane, heptachlor, and dichlorodiphenyldichloroethylene (DDE) were also associated with elevated PTH ($p < 0.05$).

Conclusion: In NHANES, twenty-four environmental chemicals were found to be associated with elevated PTH. These chemicals may lead us towards a causal link between environmental factors and

the development of hyperparathyroidism and future studies should evaluate chemical levels within specimens.

9:30AM

#C21 – Outcomes and survivability in adult trauma patients undergoing ultra-massive transfusion
CH Meyer, C Ward, M Sanders, A Thompson, VJ Muralidharan, J Gichoya, C Coopersmith, C Dente, J Lyons, RN Smith

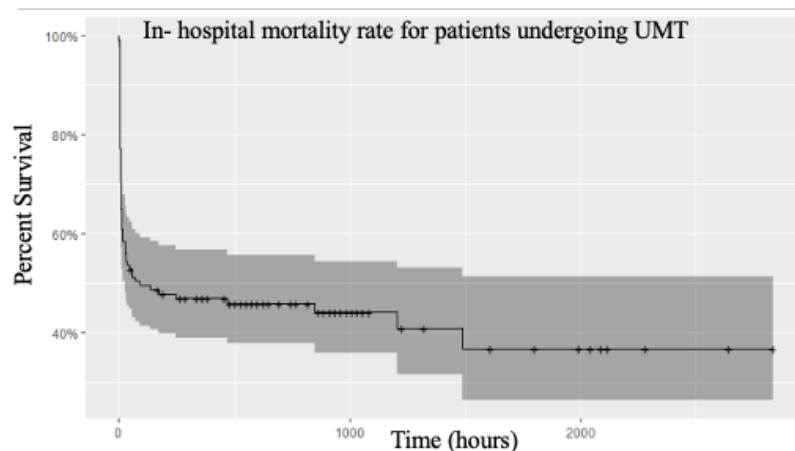
Background: The objective of this study was to determine our institutional efficacy of ultra-massive transfusion (UMT) and to analyze factors associated with outcomes and survivability.

Methods: A retrospective analysis of adult trauma patients undergoing UMT at a Level I trauma center from March 2018-December 2020 was conducted using trauma registry and blood bank databases. UMT was defined as ≥ 20 units of red blood cell products in 24hrs. Patient demographics, clinical presentation, transfused blood products, complications, and outcomes were compared between trauma patients who survived UMT and those who did not.

Results: Over the study period, there were 14,291 trauma activations. 830 patients required massive transfusion protocol, of which, 123 (14.8%), met criteria for UMT. The in-hospital mortality rate was 56.1% and median survival time was 91.0 hours for those undergoing UMT. There were no significant differences in gender, age, race or pre-existing comorbidities between surviving and deceased patients. The patients who died were more unstable at presentation, with lower mean SBP (81.50 vs 99.41, $p=0.031$), HR (81.23 vs 125.2, $p<0.001$), and GCS (6.14 vs 10.48, $p<0.001$), respectively. The deceased cohort received more total blood products (91.20 vs 70.83, $p=0.007$) with significantly higher rates of pRBCs (42.28 vs 37.70, $p=0.044$) and FFP (37.14 vs 25.72, $p<0.001$).

Discussion: For trauma patients undergoing UMT, higher rates of transfusion did not correlate with higher rates of survival, but rather indicated prolonged time to hemorrhage control. With blood as a limited resource, it is prudent to identify which patients will benefit most from this therapy.

Figure 1.0: Kaplan Meir survival curve for adult trauma patients undergoing ultra-massive transfusion (UMT)



9:35AM

#C22 – MRCP in the Evaluation of Concomitant Suspected Choledocholithiasis and Acute Cholecystitis: Worthwhile Necessity or Costly Redundancy?

F Mustansir, MR Jajja, SO Nadeem, JF Sweeney, JK Srinivasan, DR Elwood, J Sharma, E Lin, JM Sarmiento

BACKGROUND: Patients with acute cholecystitis (AC) with laboratory and imaging findings suspicious for coexisting choledocholithiasis (CDL) require further investigation with magnetic resonance cholangiopancreatography (MRCP), endoscopic retrograde cholangiopancreatography (ERCP) or intraoperative cholangiogram (IOC). Literature regarding cost and necessity of MRCP in this scenario is limited.

METHODS: Patients undergoing cholecystectomy between 2011-2019 for AC according to Tokyo Guidelines were included. Clinical and cost data were analyzed across clinical decision pathways based on whether patients underwent MRCP, ERCP/IOC, both or proceeded to cholecystectomy without MRCP and/or ERCP/IOC (i.e. no investigations).

RESULTS: 1877 patients underwent cholecystectomy, 547 with AC were included. 124 underwent MRCP, 97 underwent ERCP/IOC and 377 had no investigations. 41% of patients undergoing MRCP had follow-up ERCP/IOC while 79% of patients with CDL on MRCP underwent subsequent ERCP/IOC. Patients with MRCP as initial investigation had greater length of hospital stay, time from admission to surgery and mean total cost ($p < 0.001$) than those with ERCP/IOC as initial investigation and no investigations. Patients with ERCP/IOC after MRCP compared to those with MRCP only had significantly higher liver enzymes. Overall mean cost for cholecystectomy admission was \$10,451 ± \$8,424. When comparing MRCP only patients to those with no investigations, the addition of MRCP led to increased total costs (\$15,975 vs \$8,456, $p < 0.001$).

CONCLUSIONS: MRCP did not significantly alter the management of patients with AC who were either high risk or low risk for CDL. The addition of MRCP in the workup of patients undergoing cholecystectomy for AC increased hospital costs, length of stay and time to surgery.

| | MRCP first | ERCP/IOC first | No investigation | p-value | MRCP only | No investigation | p-value | MRCP only | MRCP + ERCP/IOC | p-value |
|---|---------------|----------------|------------------|---------|--------------|------------------|---------|--------------|-----------------|---------|
| Biliary dilation on radiology, n (%) | 59 (48) | 14 (30) | 19 (5) | <0.001* | 28 (38) | 19 (5) | <0.001* | 28 (38) | 31 (61) | 0.014* |
| LoS, days, mean ± SD | 5.8 ± 4.3 | 3.3 ± 3.0 | 1.7 ± 2.5 | <0.001* | 5.0 ± 4.3 | 1.7 ± 2.5 | <0.001* | 5.0 ± 4.3 | 6.7 ± 4.2 | 0.088 |
| Time to surgery, days, mean ± SD | 3.2 ± 3.1 | 1.3 ± 1.7 | 0.6 ± 1.0 | <0.001* | 2.8 ± 3.4 | 0.6 ± 1.0 | <0.001* | 2.8 ± 3.4 | 3.7 ± 2.6 | 0.195 |
| Liver function tests, mean ± SD | | | | | | | | | | |
| TB, mg/dl | 2.1 ± 2.8 | 1.7 ± 1.6 | 0.8 ± 0.6 | <0.001* | 1.5 ± 1.5 | 0.8 ± 0.6 | <0.001* | 1.5 ± 1.5 | 3.1 ± 3.9 | 0.011* |
| AST, u/L | 160.5 ± 233.4 | 104.3 ± 140.0 | 46.1 ± 83.3 | <0.001* | 97.3 ± 176.8 | 46.1 ± 83.3 | 0.018* | 97.3 ± 176.8 | 249.7 ± 273.2 | <0.001* |
| ALT, u/L | 144.5 ± 181.0 | 106.8 ± 156.2 | 40.0 ± 68.3 | <0.001* | 88.5 ± 139.3 | 40.0 ± 68.3 | 0.005* | 88.5 ± 139.3 | 222.3 ± 203.8 | <0.001* |
| ALP, u/L | 129.3 ± 99.0 | 142.4 ± 98.0 | 85.0 ± 40.8 | <0.001* | 98.1 ± 61.9 | 85.0 ± 40.8 | 0.09 | 98.1 ± 61.9 | 174.2 ± 123.0 | <0.001* |
| Cost, USD (\$), mean ± SD | | | | | | | | | | |
| Total | 18503 ± 10031 | 12872 ± 7188 | 8456 ± 6989 | <0.001* | 15975 ± 9481 | 8456 ± 6989 | <0.001* | 15975 ± 9481 | 21775 ± 9904 | 0.01* |
| OR | 5697 ± 2787 | 5633 ± 1956 | 4458 ± 1845 | <0.001* | 5217 ± 2670 | 4458 ± 1845 | 0.073 | 5217 ± 2670 | 6318 ± 2852 | 0.084 |
| PO | 10128 ± 7513 | 5608 ± 5231 | 3692 ± 5214 | <0.001* | 8930 ± 6754 | 3692 ± 5214 | <0.001* | 8930 ± 6754 | 11678 ± 8238 | 0.110 |
| Rad | 903 ± 783 | 499 ± 467 | 148 ± 278 | <0.001* | 835 ± 943 | 148 ± 278 | <0.001* | 835 ± 943 | 992 ± 510 | 0.385 |
| IR | 1001 ± 1657 | 1132 ± 1579 | 69 ± 879 | <0.001* | 120 ± 331 | 69 ± 879 | 0.705 | 120 ± 331 | 2141 ± 1973 | <0.001* |

*Statistically significant p-value

LoS: length of stay; TB: total bilirubin, AST: aspartate aminotransferase; ALT: alanine aminotransferase; ALP: alkaline phosphatase; OR: operating room; PO: postoperative ward; Rad: radiology; IR: interventional radiology

9:40AM

#C27 - Process Evaluation of the ASCENT Study: A Hybrid Type 1 Effectiveness-Implementation Trial of a Multi-level Intervention to Improve Dialysis Provider Knowledge of Kidney Allocation Policy Changes and Increase Transplant Waitlisting

MA Urbanski, H Lee, C Escoffery, L Plantinga, SO Pastan, RE Patzer

Background: Kidney transplant is the optimal treatment for end-stage kidney disease, yet only a fifth of patients are on the waitlist and inequities in access persist. The Allocation System for Changes in Equity in Kidney Transplantation (ASCENT) study tested a multicomponent intervention aimed at improving dialysis provider knowledge of kidney allocation policy and waitlisting among dialysis facilities with low waitlisting. The intervention included staff and patient education videos, webinar, and a transplant performance feedback report.

Methods: To assess intervention implementation, a process evaluation guided by RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance) was conducted. RE-AIM dimensions were assessed via survey with intervention group facilities (n=334) and interviews with staff (n=6). High implementation was defined as using 3-4 components and low implementation was defined as using 1-2 components.

Results: Results revealed moderate fidelity to the intervention. Among participating facilities (n=331), 189 (57%) were high implementers, 103 (31%) low implementers, and 39 (12%) non-implementers. The staff education video was used most (n=213, 64%) and the webinar was used least (n=123, 37%). Dose response analysis showed higher fidelity was associated with increased provider knowledge of policy changes, but not increased waitlisting. Interviews revealed that intervention components were shared selectively by dialysis staff, and that the intervention helped facilities prioritize transplant education and increased staff confidence in transplant education.

Conclusion: The findings can inform future effectiveness-implementation studies in dialysis settings aimed at improving transplant waitlisting and serve as a guide of best implementation practices for future dissemination of the ASCENT intervention.

9:45AM

#C2 – Association between healthcare utilization and vascular evaluation prior to major lower extremity amputation among Veterans

S Beriwal

Introduction: Presently, the extent to which healthcare utilization is associated with Veterans receiving aggressive vascular care prior to major lower extremity amputation is unknown.

Methods: We analyzed a national cohort of Veterans who underwent non-traumatic, major lower extremity amputation using the Veterans Affairs Corporate Data Warehouse (3/1/2010-2/28/2020) and categorized healthcare utilization by the number of primary and medical specialty care clinic visits in the year prior to amputation. The main outcome was PAD treatment intensity: a vascular assessment or revascularization procedure in the year prior to amputation. Multivariable logistic regression was used to assess the association between patient and facility characteristics and PAD treatment intensity.

Results: Among 19,396 Veterans, 8% had no primary care visits in the year prior to amputation. Compared to Veterans with 4-11 clinic visits in the year prior to amputation, those with fewer visits underwent less aggressive PAD treatment (1-3 visits: OR 0.70 [95% CI 0.65-0.77]; 0 visits: OR 0.41 [0.36-0.46]). Those with over 11 visits had 20% greater odds of receiving PAD treatment prior to amputation (OR 1.20 [1.09-1.32]). Relative to Veterans who lived <7 miles from the closest primary care facility, those living 13-23 miles away (OR 0.86 [0.78-0.95]) or >23 miles away (OR 0.84 [0.76-0.93]) received less intense PAD treatment.

Conclusion: We found that healthcare utilization and distance to primary care are associated with PAD treatment intensity before amputation. This information can be used to identify Veterans at greatest risk of suboptimal PAD outcomes and design targeted interventions focused on improved limb salvage.

ORAL PRESENTATIONS: SESSION 2

10:00AM

Category: Clinical Sciences

#C8 - Impact of Medicare's Comprehensive End-Stage Renal Disease Care Initiative on Nephrologists' Treatment of Patients with New-Onset Kidney Failure

K Drewry

Introduction: Medicare's Comprehensive ESRD Care (CEC) Initiative, tested 2015-2020, provided financial incentives for provider groups to reduce costs of all inpatient and outpatient care for Medicare beneficiaries receiving maintenance dialysis. Kidney failure care costs are high in part because fewer than 15% of patients receive cost-efficient treatments (i.e., kidney transplantation or home dialysis vs. in-center hemodialysis) during their first year of kidney failure care. This study evaluates the impact of the CEC Initiative on nephrologists' use of lower-cost renal replacement therapies among patients with incident kidney failure.

Methods: We used difference-in-difference estimations to compare changes in the use of pre-emptive kidney transplantation, home hemodialysis, and peritoneal dialysis among incident kidney failure patients served by CEC participating nephrologists between baseline (January 2013-December 2014) and intervention periods (January 2016-December 2017) relative to patients treated by nephrologists who did not participate in the CEC Initiative. We controlled for physician, patient, and facility characteristics, as well as time and ESRD Network geographic fixed effects.

Principal Findings: Relative to the comparison group (n=182,653 patients assigned to 6,366 nephrologists), beneficiaries treated by CEC-participating nephrologists (n=39,794 patients assigned to 1,251 nephrologists) were nearly 38% less likely to receive a pre-emptive kidney transplant and 21% less likely to receive peritoneal dialysis within 5 months of initiating kidney failure treatment.

Conclusions: The CEC Initiative may have unintentionally incentivized treatment patterns that are costlier long-term by deferring or delaying use of lower-cost kidney failure treatments.

10:10AM

Category: Basic Sciences

#B3 - Gm2a: A novel regulatory pathway influencing CD8+ T cell responses in transplant and cancer

KM Baecher, K Bennion, J Bazzano, K Tong, MC Lowe, M Fribourg, P Cravedi, PS Heeger, ML Ford

Background: Therapeutic manipulation of CD8⁺ T cell responses can limit unwanted alloimmunity and bolster anti-tumor immunity. However, not all patients respond to immunomodulation. We sought to identify novel pathways that impact responsiveness to immunotherapy and discovered a role for the ganglioside processing enzyme Gm2a in modulating CD8⁺ T cell responses in mice and humans.

Methods: Transcriptomic profiles were assessed in PBMC obtained from the CTOT-09 trial, in which patients were weaned off tacrolimus immunosuppression (n=14) and in CD8⁺ T cells isolated from melanoma patients that were either responsive or non-responsive to PD-1 checkpoint inhibition (n=48). *Gm2a*^{-/-} mice and WT controls received allogeneic skin grafts or melanoma inoculations, and immune responses were assessed.

Results: *Gm2a* was upregulated in PBMC isolated from stable vs. rejecting transplant patients. CellCODE deconvolution bioinformatic analysis revealed this upregulation was associated with CD8⁺ T cells. In melanoma patients, RNA sequencing data revealed that *Gm2a* is significantly higher in CD8⁺ T cells isolated from anti-PD-1 non-responders than responders (p=.0035). In mechanistic experiments, *Gm2a*^{-/-} mice exhibited accelerated allograft rejection vs. WT counterparts (MST 22.0 days vs 29.0, n=40, p=0.0108). Similarly, *Gm2a*^{-/-} mice treated with PD-1/CTLA-4 blockade demonstrated improved tumor control by d21 post-inoculation as compared to WT controls (p=.0283). Mechanistically, CD8⁺ T cell-specific *Gm2a*^{-/-} co-adoptive transfer studies revealed that *Gm2a*^{-/-} CD8⁺ T cells possess a competitive advantage over WT CD8⁺ T cells (p=0.0079).

Conclusions: These findings illuminate a novel, cell-intrinsic regulatory mechanism by which Gm2a regulates CD8⁺ T cell responses in transplantation and cancer, in both mice and humans.

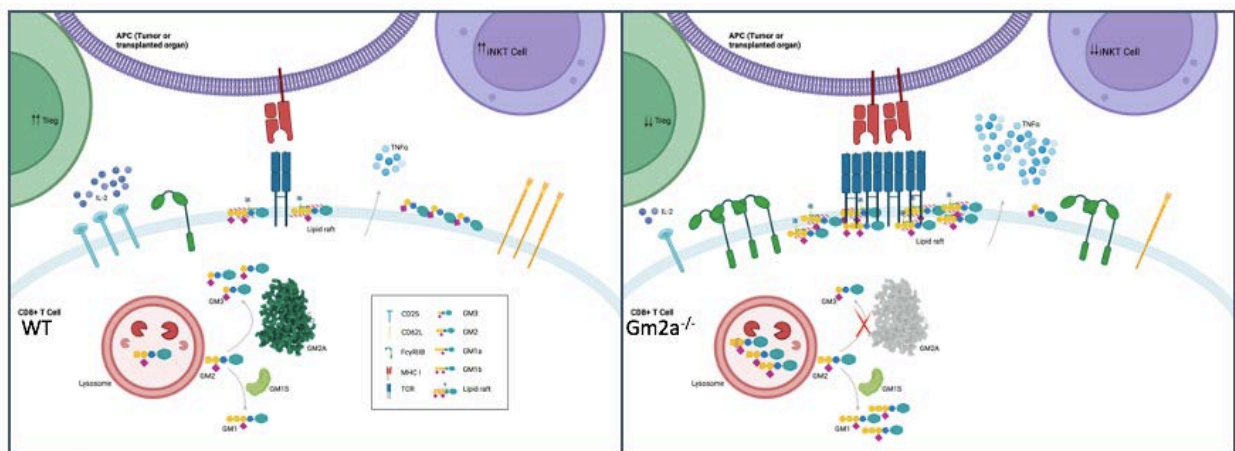


Figure 1. Schema representing proposed functionality of GM2a in CD8⁺ T cell regulation.

10:20AM

Category: Clinical Sciences

#C36 – Optimal Closure Technique for Median Sternotomy in Elective Cardiac Surgery: A Retrospective Analysis of Rigid Fixation Compared to Cable Closure

JM Wright, S Tom, AK Kohl, JR Trivedi, B Ganzel, KJ Grubb

Purpose: Postoperative sternal wound complications are devastating and costly. The benefits of rigid sternal fixation (RSF) over wire cerclage have been shown in patients undergoing cardiac surgery via median sternotomy. Evidence lacks in the comparison of RSF to cable closure after elective cardiac surgery.

Methods: A single-center, retrospective, review of patients who underwent median sternotomy for non-emergent cardiac surgery from October 2013 to February 2016 to was completed. Patients underwent propensity score matching to control for high-risk patient factors and were followed out to 1 year. Primary outcomes were incidence of postoperative deep and superficial sternal wound infection. Secondary outcome included initial hours spent in the ICU post-operatively. Statistical analysis was performed using non-parametric tests.

Results: A total of 262 patients were identified and propensity matched, with 189 having complete 1-year data, RSF (n=82) and cables (n=107): average age 60.8+/-11 vs 62.2+/-10, and 69% were male, 30% had a prior MI. The patients represented a population at high-risk for sternal complication: average BMI 32, diabetes mellitus 53% vs 46.2%, lung disease 49% vs 43.4%, comparing the RSF to cable cohorts. Most of the patients underwent surgical revascularization 82% vs 83% and 25% vs 27% had valve surgery, RSF vs cables. At one year, all cause mortality was similar between RSF and cables patients, 3.5% vs 4.7%, p=0.9. There was no difference in primary outcomes of superficial wound infection between RSF or cables, 2.4% vs 0.9%, p=0.3, or deep sternal wound infections, 1.2% vs 0.9%, p = 0.8. The average initial hours spent in the ICU post-operatively was also not different. (Table 1)

Conclusions: Rigid sternal fixation and cable closure both demonstrate excellent outcomes with low postoperative wound complication rates. This data further supports the use of advanced closure techniques in challenging patient populations. Further study with a larger number of patients could help to understand cost benefits or implications of these techniques.

10:30AM

Category: Basic Sciences

#B8 - Structured Exercise Therapy Builds Muscle Strength in Porcine Model of Ischemic Myopathy from Peripheral Artery Disease

C Hoffmann, M Sasaki, J Call, F Li, D McLaughlin, A Ismaeel, P Koutakis, L Brewster

Introduction: Structured exercise therapy (SET) is first line therapy for patients with peripheral artery disease (PAD). The mechanism by which SET exerts its benefits is unclear. We hypothesize that SET improves muscle strength in ischemic muscles and tested this in our animal model of ischemic myopathy due to PAD.

Methods: Seven swine at skeletal maturity were included. Three animals served as the control group, and four underwent SET using a staged treadmill protocol three times weekly for four weeks. All underwent hindlimb ischemia as we have previously published. Blood flow and limb strength were assessed weekly and mitochondrial bioenergetics was assessed in hindlimb myofibers. Data was analyzed with two-way ANOVA and Student's T-test where appropriate with an alpha set at 0.05.

Results: Ankle-ankle indices remained decreased but was not different between groups. Arteriogenesis was increased in the control (58%±28%, p=0.05) and SET (39%±13%, p=0.005) groups but was not different between groups (p=0.4). SET animals had increasing maximal walking distances (331, 839, 1,654, and 1,972 meters for weeks 1-4). Exercise animals had increased control and ischemic limb strength while control animals demonstrated decreased strength in the ischemic limb (figure 1). Control animal myofibers had decreased oxygen consumption while SET animals showed increased oxygen

consumption in control and ischemic limbs. Control animals had increased ischemic limb reactive oxygen species (ROS) production while exercised animals had decreased ROS production.

Conclusion: We have successfully incorporated SET into our large animal model of ischemic myopathy. Our findings support that SET improves ambulatory function, limb strength, and mitochondrial bioenergetics.

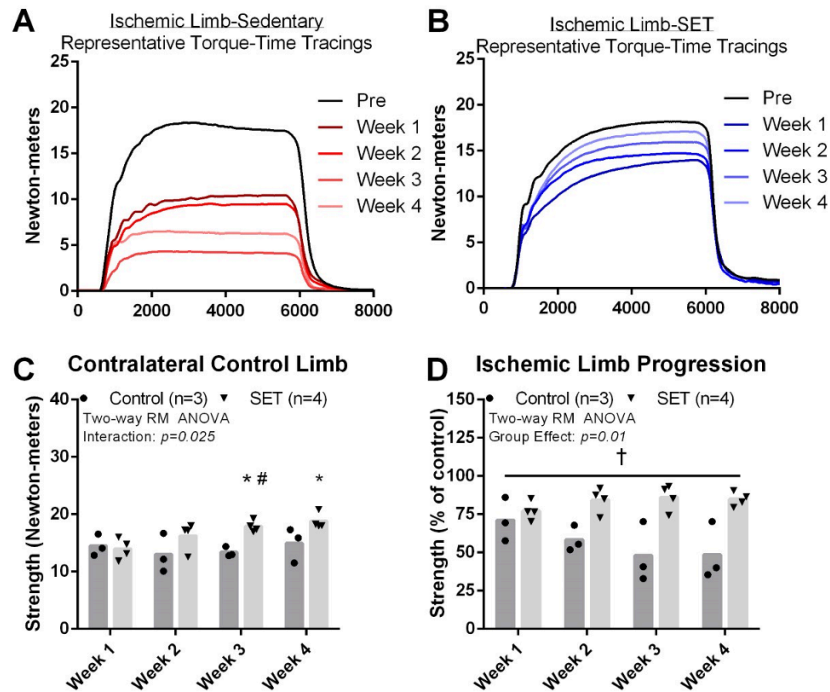


Figure 1. Changes in hindlimb strength over time.

A. Representative torque-time curves from a single sedentary pig demonstrate the ischemic limb pathology over 4 weeks. **B.** Representative torque-time curves from a single SET pig demonstrate the effects of SET over 4 weeks. **C.** Progression of control limb strength over time demonstrating significantly increased peak-isometric torque in SET animals ($n=4$) at weeks 3 (+28%) and 4 (+34%) compared to week 1 and increased torque in SET over sedentary animals ($n=3$) at week 3. **D.** Progression of the ischemic limb over time demonstrating greater peak-isometric torque as a percentage of contralateral torque in the SET arm compared to sedentary animals, independent of time (Group Effect: 83% vs 56%, respectively).

10:40AM

Category: Clinical Sciences

#C31 - The Gender Gap in Surgical Literature is Closing Over Time

CM Sharperson, DA Kooby, MM Shah

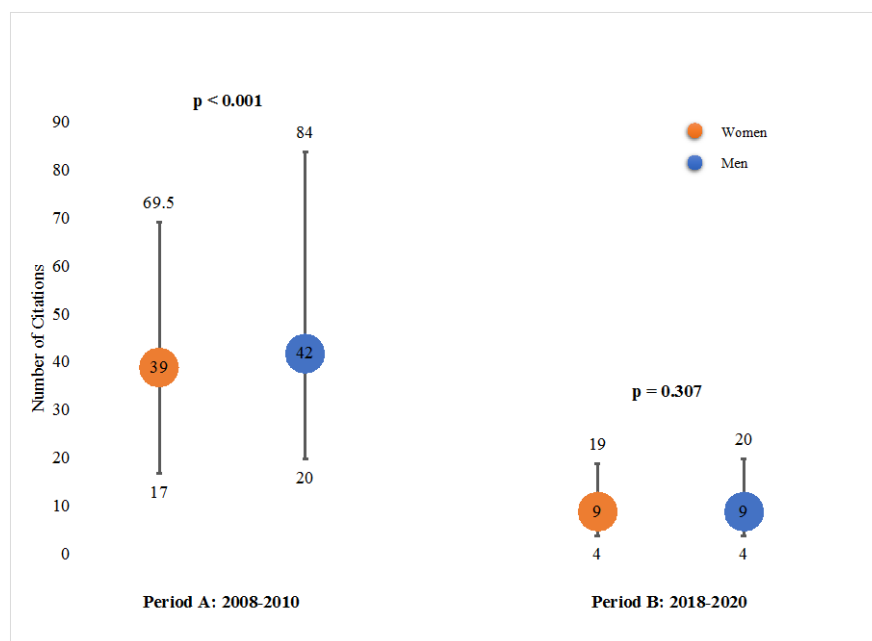
Objective: We assessed gender disparity authorship trends in General Surgery publications in premier surgical journal over time.

Methods: In this bibliometric analysis on original research articles from 4 high impact surgical journals (*Annals of Surgery, JAMA Surgery, Surgery, Journal of American College of Surgeons*) from 2008-2010 (period A) and 2018-2020 (period B), the gender of primary and senior authors were assigned by Genderize.io and the number of citations per article was identified via Web of Science. Number of citations by gender of primary and senior author were compared over two time periods a decade apart.

Results: Of the 3,575 articles, 962(26.9%) had women as primary authors and 590(17.2%) as senior authors. Over time, there was a significant increase in women primary and senior authorship respectively from 22.8% to 31.7% ($p < 0.001$) and 13.9%[254/1,1915] to 21%[336/1,660]; ($p < 0.001$). Articles with women as primary authors had fewer median (interquartile range, IQR) citations than articles with men as primary authors at period A (39[17-69.5] vs. 42[20.0-84.0]; $p = 0.005$). Gender parity was noted in period B (9[4-19] citations vs. 9[4-20] citations; $p = 0.307$). Articles with women as both primary and senior authors had approximately 33% less median (IQR) citations compared to men authorship pairs (16[6-34.5] vs. 24[9-57]); $p < 0.001$.

Conclusion: Over time the proportion of women primary and senior authors in leading academic surgery journals has significantly increased. Articles written by women primary authors had fewer citations, particularly when both primary and senior author were women. Overall, gender authorship and citations parity are improving in high impact General Surgery literature.

Figure 1. Median Number of Citations of by Primary Author Gender and Time Period



ABSTRACTS

#B1 – Protective Immunity Against a Murine Epstein-Barr Virus Homolog is Preserved During CD11b-CD154 Blockade

K Alexander

CD154 pathway antagonism has shown to be a promising target for inducing long-term graft survival, in some cases showing efficacy that is superior to anti-CD40. It has recently been shown that CD11b is an alternate receptor for CD154. In recently published work, we showed that a peptide mimetic of the CD154-binding domain on CD11b (cM7) improved long-term graft survival. However, the impact of CD154:CD11b blockade on protective immunity is not known. The goal of this study was to determine the effects of the CD154:CD11b specific peptide inhibitor on protective immunity to a murine Epstein-Barr virus (EBV) homolog (MHV68). Mice treated with cM7 had significantly higher numbers and frequencies of total CD8+ T cells compared to untreated mice ($p=0.0317$) at 10 days post-infection in the blood. cM7-treated mice had significantly lower frequencies of short-lived effector cells ($p=0.0159$) and significantly higher frequencies of memory precursor effector cells ($p=0.0159$) in the spleen 14 days post-infection. cM7-treated mice were found to have significantly lower frequencies of CD3-CD19+ B cells in the spleen ($P=0.0317$) but significantly higher levels in the mLNs ($p=0.0079$). Importantly, when viral burden was analyzed using a YFP-expressing virus, MHV68-YFP, there was no significant difference in the frequency of YFP-expressing infected B cells in the spleens and mLNs of cM7-treated mice as compared to PBS-treated controls. These data suggest despite its ability to impair CD8+ T cell trafficking into allografts, CD154:CD11b blockade does not negatively impact protective immunity to a murine EBV homolog. Targeting this pathway could hold promise for transplant immunosuppression.

#B2 - IL-6 producing CD8+ T cells are necessary for improved survival during CD28 agonism in septic immunologically experienced mice

JC Anyalebechi, Y Sun, C Coopersmith, ML Ford

We recently showed that treatment with the agonist α CD28 Ab in septic immunologically experienced mice improved mortality and was associated with enhanced production of IL-10 from regulatory T cells (Tregs). Thus, we hypothesized that Tregs were necessary for this mortality benefit. To test this, Tregs were depleted in the setting of CD28 agonism in septic mice (induced by cecal ligation and puncture [CLP]). However, there was no difference in mortality between the depleted group or control group ($p=0.617$). The same was true after depleting CD4+ T cells ($p=0.663$). Both results indicated that neither Tregs nor CD4+ T cells were necessary for the survival advantage seen with CD28 agonism. Therefore lastly, we hypothesized that CD8+ T cells were necessary for the mortality benefit seen. Thus, CD8+ T cells were depleted in septic mice in the setting of α CD28 administration. 7-day survival was significantly worse in the CD8+ T cell depleted group (20% vs. 55%, $p=0.024$). To then elucidate the mechanism by which CD8+ T cells confer this effect, we delivered α CD28 Ab in septic mice. Flow cytometry performed 24h post-operatively demonstrated a significant increase in size of the CD8+ T cell compartment with CD28 agonism ($p=0.017$). Furthermore, these CD8+ T cells displayed increased production of IL-6 (1.5% vs. 1.1%, $p=0.011$) and the T cell growth factor, IL-2 (11.3% vs. 6.58%, $p=0.040$). Taken together, these

data illuminate that the improved sepsis survival induced by pharmacologic CD28 agonism in immunologically experienced mice is mediated by the activation of memory CD8⁺ T cells.

#B16 - Fcyr2B/Fgl2 as a Driver of CD8⁺ T Cell Loss in Septic Cancer Mice

JC Williams, M Xue, CM Coopersmith, ML Ford

The presence of cancer increases the expression of surface T cell co-inhibitory receptors resulting in T cell dysfunction and exhaustion. Likewise, the upregulation of T cell co-inhibitory receptors during sepsis results in immunosuppression and T cell apoptosis. We recently demonstrated that the inhibitory receptor Fcyr2B is upregulated on a subset of activated CD8⁺ T cells during cancer, and that Fcyr2B ligation with the inhibitory cytokine Fgl2 results in CD8⁺ T cell apoptosis. Here, we sought to determine if the Fcyr2B/ Fgl2 pathway contributes to the immune dysregulation of sepsis in the presence of cancer.

Mice were injected with Lewis lung carcinoma and observed for three weeks to undergo cecal ligation and puncture. Splenocytes were harvested for immune phenotyping and serum analyzed for Fgl2.

The presence of cancer induced increased expression of Fcyr2B⁺ on both CD4⁺ and CD8⁺ T cells ($p=0.004$ and $p=0.010$ respectively) as compared to non-cancer controls. Sepsis resulted in an increase in serum concentration of Fgl2 ($p=0.01$). This increase in serum Fgl2 was associated with a decrease in the frequency of Fcyr2B⁺ CD8⁺ T cells in septic cancer mice as compared to non-septic cancer mice ($p = 0.01$).

These studies reveal that in contrast to either cancer alone or sepsis alone, the combination of cancer and sepsis uniquely results in the upregulation of both the Fcyr2B inhibitory receptor on CD8⁺ T cells and its ligand Fgl2. The increased expression of both receptor and ligand was associated with a significant loss of Fcyr2B⁺ CD8⁺ T cells in cancer sepsis.

#C1 – Timing is Everything: Surgical Outcomes for COVID-19 Positive Patients

R Archer

Background: A debate remains on how long to postpone surgery after testing positive for COVID-19. We aimed to determine surgical outcomes at different time points after COVID-19 positivity.

Methods: This retrospective cohort study included non-preoperative ICU adult surgical patients from 5/2020-5/2021. We compared COVID-19 positive patients within 50 days prior to surgery to COVID-19 negative surgical patients within the same period. Demographics, comorbidities, surgical variables, and outcomes were directly abstracted from the EMR. Stratum were created by timing of COVID-19 positivity prior to surgery in days (<14, 14-30, >30). Outcomes were compared between strata and against COVID-19 negative controls. A multivariable model was built to determine the association that timing of COVID-19 positivity has on the odds of a major complication.

Results: The COVID-19 cohort had 245 patients compared to 1,840 COVID-19 negative patients. When stratified by positive test days prior to index surgery there were 145 (<14), 38 (14-30), and 64 (>30) patients in each stratum. The COVID-19 positive group were younger (55.8 vs 59.3), had a higher incidence of comorbidities (86.9% vs 57.2%) and underwent more emergent surgery (45.7% vs 9.3%). The odds of major complication were 2.01 (1.21, 3.35) in the < 14-day group, 0.35 (0.08, 1.60) in the 14–

30-day group, and 1.09 (0.50, 2.37) in the 30–50-day group compared to COVID-19 negative surgery patients when controlling for other variables.

Conclusion: Timing of COVID-19 positivity prior to surgery has an impact on major complications. It may be appropriate to postpone surgery 14 days after COVID-19 positivity in certain cases.

#C3 - Close the GAPS: A Standardized Perioperative Protocol Reduces Breast Reconstruction Implant Infections

OH Brown, D Danko, J Emefiele, M Arguello-Angarita, N Baker, SL Muret-Wagstaff, VJ Muralidharan, MS, PW Thompson

Background: Implant-based breast reconstruction (IBBR) is a complex, multi-step process with significant variability amongst providers. Infections following IBBR are associated higher rates of readmission, reoperation, reconstructive failure, and increased cost of care. To reduce process variability and postoperative infections, we implemented a standardized protocol for implant-based breast reconstruction.

Methods: An evidence-based, standardized protocol that was applied to all patients undergoing IBBR a single institution between December 2019 and February 2021. Intraoperative protocol compliance and infection events were recorded. Infection events were considered minor (managed with outpatient antibiotics) or major (managed with intravenous antibiotics or reoperation). A historic control group was retrospectively analyzed for comparison.

Results: There were 69 patients (120 breasts) in the protocol group compared to 159 (269 breasts) in the retrospective group. There were no differences in group demographics (age, BMI, Type II diabetes, smoking, previous XRT) or type of reconstruction (TE vs. implant). Intraoperative protocol compliance was 80.51% (STD=13.89%). Overall infection rate was significantly lower in the protocol group vs controls (8.70% vs 16.98%, $p < 0.05$). Protocol patients had a lower rate of both minor (2.90% vs 5.66%, $p=0.99$) and major (5.80% vs 11.32%, $p=0.09$) infections. The rate of reconstructive failure secondary to infection was significantly lower in the protocol group (4.35% vs. 8.81%, $p<0.05$). Among protocol patients, those without infection had significantly higher protocol compliance (82.21% vs 72.22%, $p < 0.05$).

Conclusions: A standardized peri-operative protocol for implant-based breast reconstruction reduces process variability and significantly decreases rate of overall infections. Higher protocol compliance correlated with lower incidence of infection.

#C4 - Safety and Efficacy of Liposomal Bupivacaine Supraclavicular Nerve Blocks in Open Reduction Internal Fixation (ORIF) of Distal Radius fractures (DRF): Implementation of a Standardized Protocol

CA Brown, A Ghanouni, R Williams, SH Payne, PA Ghareeb

Introduction: Distal radius fractures (DRF) are among the most common fractures requiring surgical intervention. The literature varies regarding narcotic prescribing habits, narcotic consumption, and post-operative pain scores. We hypothesized that pre-operative administration of an Exparel (long-acting liposomal bupivacaine) supraclavicular nerve block would reduce post-operative pain and narcotic consumption.

Methods: A standardized protocol was implemented at a single institution from July 2021 to January 2022 following open reduction internal fixation (ORIF) of DRF. Protocol elements (Table 1) included a preoperative Exparel supraclavicular nerve block and a multimodal post-operative pain regimen. Primary clinical outcomes included post-operative pain scores and number of narcotic tablets consumed.

Results: 16 patients received an Exparel supraclavicular nerve block prior to surgical fixation. The average age was 57.4 years (range 26-75). The mean number of oxycodone tablets consumed was 4.8 (median 2.5) and the mean VAS pain score at the first post-operative clinic follow-up was 2.6. No patients had unscheduled contact with the Emergency Department due to uncontrolled pain. Two patients (12.5%) requested a refill of their narcotic pain medication. When compared to an institutional historical control, opiate prescription quantity was reduced by nearly 66% (23 verse 8 tablets).

Conclusion: Exparel supraclavicular nerve blocks are both safe and efficacious in the treatment of post-operative pain following ORIF of DRF. On average, patients consumed <5 oxycodone 5mg tablets, which is lower than reported rates in literature, with low pain scores (2.6/10). To our knowledge, this is the first study demonstrating the utility of Exparel in this clinical setting.

Table 1. Perioperative Pain Management Protocol

| Pre-operative Component | Post-operative Component |
|--|---|
| - Liposomal bupivacaine (Exparel) Supraclavicular nerve block | - Post operative multimodal pain prescriptions: 1. Oxycodone 5mg PRN, 8 tablets 2. Gabapentin 300 mg TID, 15 tables 3. Ibuprofen 600 mg QID, 15 tables |

#C5 - Association of Race and Age on Transplant Waitlisting Among Patients Undergoing Dialysis

J Buford

Background: Racial disparities exist at all steps of the kidney transplant process, but it is unknown whether racial disparities in waitlisting differ by age. We examined whether age modifies racial disparities in placement on the national transplant waitlist.

Methods: Non-Hispanic White (NHW) and non-Hispanic Black (NHB) adults that initiated ESKD treatment between 1/1/2015 and 12/31/2020 were identified from the US Renal Data System. Age was categorized as 18-30, 31-50, and >50. The incidence of waitlisting overall and by race and age was calculated. Age and race stratified waitlisting were compared using multivariable-adjusted Cox proportional hazards models, and respective 95% confidence intervals (CI).

Results: Overall, 19% of patients were waitlisted, including 18% NHB and 19% NHW patients. Waitlisting was highest among younger patients (49% overall; 58% NHW vs. 38.5% NHB). For patients >50, 14.6% were waitlisted overall, including 15.06% of NHW and 13.5% of NHB. Overall, in unadjusted analysis, NHB patients have lower rates of waitlisting compared to NHW patients (HR: 0.690, 95% CI, 0.683, 0.697; $P < .0001$). After stratifying by age and the competing risk of death, NHB patients had significantly lower waitlisting rates than their NHW counterparts between 18-30 years (aHR: 0.749, 95% CI, 0.699, 0.802), 31-50 (aHR: 0.898, 95% CI, 0.870, 0.927), and >50 (aHR: 0.912, 95% CI: 0.890, 0.934); $p < .001$ for interaction terms.

Conclusions: Overall, racial disparities in waitlisting exist between NHB and NHW adult patients with incidence ESKD undergoing dialysis treatment. However, this disparity is more pronounced among the youngest age group and less evident among those >50.

#C6 - Pediatric Lower Extremity Vascular Injuries Managed at a High-Volume Level I Adult Trauma Center

KL Chow, D Koganti, AA Grant, RN Smith, C Ramos, J Benarroch-Gampel, JD Sciarretta

Introduction: Pediatric vascular injuries comprise less than 2% of all traumatic pediatric injuries. Limited data results in significant variability in treatment and outcomes. We hypothesize that limb salvage following emergent revascularization is feasible in adult trauma centers following pediatric lower extremity vascular injuries (PLEVI).

Methods: A retrospective cohort analysis of traumatic PLEVI was performed by querying the Trauma Registry from January 2009 to January 2021 at Grady Memorial Hospital, a high-volume level I adult trauma center in Atlanta, Georgia. Patient demographics, clinical presentation, surgical procedures, and outcomes were analyzed. Surgical data included vessel injury, management, complications, and outcomes.

Results: There were 1122 pediatric trauma activations, 37 (3.3%) of which had PLEVI. Nineteen (51.3%) had concomitant arterial and venous injuries. The median (IQR) age was 16 (2) with 34 males (91.9%). Arterial interventions included 5 (14.7%) primary repairs, 17 (50.0%) interposition grafting, and 8 (23.5%) ligations. Four patients (11.8%) had temporary arterial shunts. Of the 23 who underwent attempted revascularization, 2 (8.7%) required amputation, which were related to significant soft tissue injury. Three patients (8.9%) required re-intervention related to their vascular repair. There was one mortality who arrived in cardiac arrest and underwent temporary arterial shunting. The overall survival rate was 97.3%.

Conclusion: The management of PLEVI at our high-volume level I trauma center resulted in successful limb salvage and survival when managed in a multidisciplinary approach with trauma, vascular, and orthopedic surgeons. Amputations were typically related to soft tissue injury rather than complications from revascularization.

Table 1. Results

| Patients (N=37) | Number | Percentage |
|-----------------------------------|-------------------|------------|
| Age, median (IQR) | 16 (2) | |
| Sex | | |
| Male | 34 | 91.9 |
| Female | 3 | 8.1 |
| Mechanism | | |
| Penetrating - GSW | 31 | 83.8 |
| Blunt | 6 | 16.2 |
| MVC | 4 | 10.8 |
| Fall | 2 | 5.4 |
| ISS, mean (SD), [range] | 13.4 (9.6) [1-41] | |
| AIS Extremity, mean (SD), [range] | 3.2 (0.8) [2-4] | |

| | | |
|--------------------------------------|----------------------|------|
| Admission Vitals, mean (SD), [range] | | |
| HR | 93.6 (37.7) [0-161] | |
| SBP | 107.3 (42.3) [0-160] | |
| DBP | 64.3 (28.1) [0-110] | |
| MAP | 81.3 (30.8) [0-121] | |
| GCS | 13.5 (3.5) [3-15] | |
| Vascular Injury | 37 | 100 |
| Artery Alone | 15 | 40.5 |
| Venous Alone | 3 | 8.1 |
| Concomitant Arteriovenous | 19 | 51.3 |
| Arterial Interventions | | |
| Total Arterial Injuries | 34 | 100 |
| Revascularization | | |
| Primary Repair | 5 | 14.7 |
| Interposition Graft | 17 | 50.0 |
| RSVG | 15 | 44.1 |
| PTFE | 2 | 5.9 |
| Shunt Utilized | 4 | 11.8 |
| Ligation | 8 | 23.5 |
| Femoral Branch | 3 | 8.9 |
| Infra-popliteal | 5 | 14.7 |
| Endovascular Embolization | 1 | 2.9 |
| Non-operative | 5 | 14.7 |
| Venous Interventions | | |
| Total Venous Injuries | 22 | 100 |
| Primary Repair | 8 | 36.3 |
| Interposition Graft | 3 | 13.6 |
| PTFE | 3 | 13.6 |
| Ligation | 11 | 50.0 |
| Femoral | 6 | 27.3 |
| Popliteal | 4 | 18.1 |
| Infra-popliteal | 1 | 4.5 |
| Associated Fractures | 17 | 45.9 |
| Fasciotomies | 17 | 45.9 |
| Amputations | 2 | 5.4 |
| Arterial Re-interventions | 3 | 8.9 |
| Length of Stay, mean (SD), [range] | | |
| ICU Days | 3.8 (5.3) [0-27] | |
| Total Length of Stay | 13.8 (15.5) [1-68] | |
| Mortality | 1 | 2.7 |
| Overall Survival | 36 | 97.3 |

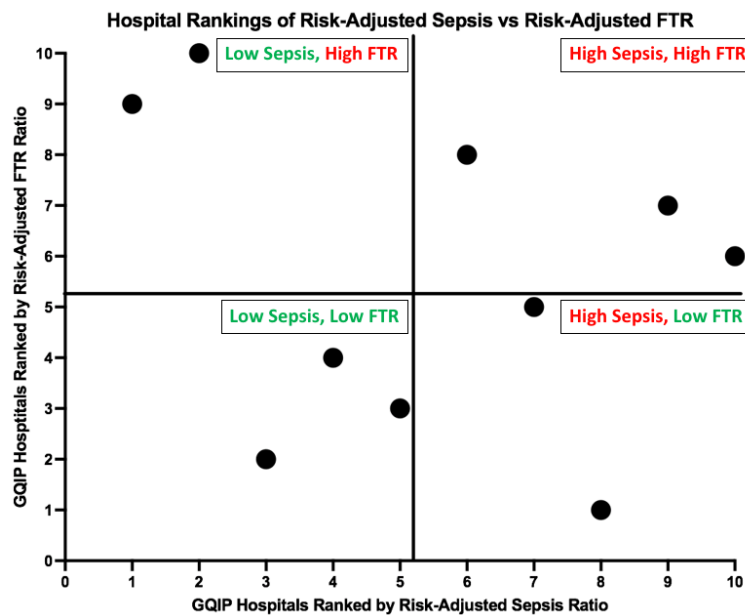
#C7 - Improving Postoperative Sepsis Performance Measurement Using Hospital Risk-Adjustment and Concomitant Monitoring of Prevention and Rescue Within a Statewide Surgical Collaborative

J Codner

Background: The Georgia Quality Improvement Program (GQIP) surgical collaborative has had consistent poor performance in postoperative sepsis compared to national benchmarks in NSQIP. We aimed to evaluate additional quality metrics along the surgical care pathway by calculating risk-adjusted postoperative sepsis rates as well as sepsis prevention and mortality rescue for GQIP hospitals. **Methods:** The cohort included intra-abdominal general surgery patients across 10 collaborative hospitals from 2015-2020. ACS-NSQIP data were utilized to train and validate a multivariable risk-adjustment model with postoperative sepsis as the outcome. This model was used to rank GQIP hospitals by risk-adjusted postoperative sepsis rates. Failure to prevent (FTP) was calculated by dividing postoperative sepsis occurrences by combined postoperative infectious complications. Failure to rescue (FTR) was defined as mortality after postoperative sepsis. Crude and risk-adjusted FTR were calculated. Complication management quality metrics were compared to risk-adjusted postoperative sepsis rankings.

Results: The study included 20,314 patients with 595 cases of postoperative sepsis. Crude postoperative sepsis risk among hospitals ranged from 0.81 to 5.11. When applying the risk-adjustment model which included: age, ASA class, case complexity, preoperative pneumonia/UTI/SSI, admission status, and wound class, 9 of 10 hospitals were re-ranked. FTP rates trended upward and correlated with risk-adjusted sepsis rankings. Crude and risk-adjusted FTR did not correlate with sepsis prevention or risk-adjusted postoperative sepsis rankings.

Conclusions: Postoperative sepsis complication management quality metrics are important to present. They do not always correlate and provide important benchmarks along the surgical care pathway to guide more precise targets for quality improvement.



#C10 – Outcomes in Patients with Pelvic Fracture Undergoing Dual Angiography

D Koganti, Z Grady, K Archer-Arroyo, D West, J Sciarretta, R Smith, K Williams, K Udobi, R Sola, S Busby, C Butler, SR Todd, J Nguyen, AA Grant

Background: Patients with severe pelvic fracture may have other non-pelvic sources of hemorrhage and could potentially benefit from “dual angiography,” or angiography of a non-pelvic site along with pelvic angiography. We sought to review the role of pelvic angiography alone and dual angiography in patients with blunt pelvic fractures.

Methods: Patients with blunt pelvic fractures who underwent angiography January 2014 - March 2019 were reviewed. Standard demographic, clinical, radiographic, injury data, and outcomes were obtained.

Results: 147 patients with blunt pelvic fractures underwent angiography. 92 had pelvic angiography alone & 55 had dual-angiography. Compared to pelvic angiography patients, dual-angiography patients had a significantly increased injury severity score (32.2 vs 38.3, $p < 0.05$), lower systolic blood pressure (113.4 vs 101, $p < 0.05$), lower mean arterial pressure (87.4 vs 77.4, $p < 0.05$) and increased heart rate (98.7 vs 111.5, $p < 0.05$). The most common sites of non-pelvic angiography: lower-extremity (18%), spleen (18%), kidney (16%), and liver (14%). 12 dual-angiography patients underwent embolization in two sites: a pelvic and non-pelvic vessel. The most common non-pelvic sites embolized were the spleen (33%), liver (25%), & lumbar vessels (25%). Despite these differences between pelvic-angiography & dual-angiography patients, no significant difference was found between length-of-stay (Hospital: 22 vs 26.5, $p = 0.26$; ICU: 13.8 vs 16.3, $p = 0.34$) or mortality (14.8% vs 15.3%, $p = 1.0$).

Conclusion: Despite patients undergoing dual-angiography presenting with significantly worse vital signs and ISS compared to pelvic-angiography patients, their outcomes were not significantly different. These findings may suggest that dual-angiography should be considered in select patients undergoing pelvic angiography.

#C11 – Gender Disparities in Kidney Transplantation Referral Vary by Age and Race in the Southeast US

L Smothers, RE Patzer, SO Pastan, D DuBay, J Harding

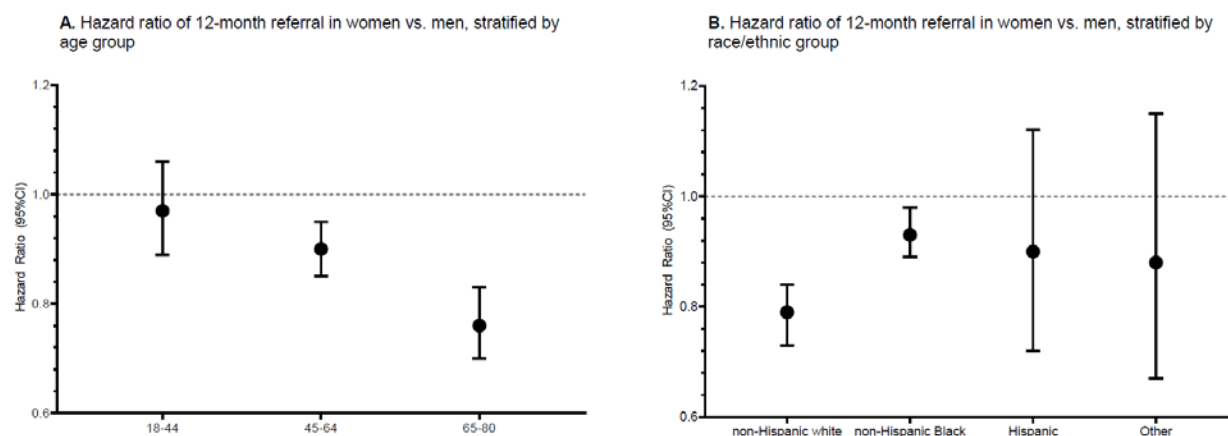
Background: Men (vs. women) are more likely to be waitlisted or receive a kidney transplant. Whether gender disparities exist in earlier transplant steps (*i.e.*, referral) is unknown. Here, we describe gender disparities in transplant referral and determine the effect of age, race, or obesity, on gender disparities.

Methodology: Adults (18-80 years; $n = 39,923$) initiating dialysis in Georgia, North Carolina, or South Carolina (2012-2016) from the US Renal Data System were linked to the Early Transplant Access Registry, through December 2017. Using a mixed-effects Cox Proportional Hazards model adjusted for several patient characteristics, we assessed the association between gender and referral within 12 months, including interaction terms for age, race/ethnicity, and obesity.

Results: Overall, 29.1% and 33.8% of women and men, respectively, were referred within 12-months. In fully adjusted models, women (vs. men) were 12% less likely to be referred (HR: 0.88; 95% CI: 0.84–0.91). Women (vs. men) aged 45-64 and 65-80 years were 0.90 (0.85–0.95) and 0.76 (0.70–0.83) less likely to be

referred (**Figure**). Women (vs. men) of non-Hispanic white and non-Hispanic Black race were 0.79 (0.73–0.84) and 0.93 (0.86–0.98) less likely to be referred. For other race (Hispanic, other), age (18-44), and all obesity subgroups, no gender differences in referral rates were observed.

Conclusions: In the Southeast US, women are less likely to be referred for a transplant and this disparity is specific to older and non-Hispanic Black and white women. These findings have important implications for the design of interventions to reduce gender disparities in transplant.



#C12 - Resident and Fellow Attitudes and Experiences Discussing COVID-19 Vaccination with Patients *CS Shreckengost, K Baecher, A Hatcher, JM Hinman, J Srinivasan*

INTRODUCTION: Healthcare providers have been challenged to integrate COVID-19 vaccination conversations into routine practice despite evolving guidelines and political controversy. Graduate medical trainees are frequently charged with this communication. We sought to identify trainee attitudes and experiences discussing COVID-19 vaccination with patients.

METHODS: An anonymous survey was distributed to Emory University graduate medical trainees via the Graduate Medical Education Office email newsletter weekly between December 23, 2021, and January 22, 2022. Program directors were given electronic flyers to display during educational sessions. Free-text responses were reviewed, and quantitative data were analyzed in R.

RESULTS: Of the 116 total respondents, 64% were female and the median age was 30 years (range 26-40). All respondents were at least partially vaccinated, though 13% reported hesitancy about initial vaccination and 8% indicated hesitancy about receiving a booster dose. Nineteen percent disclosed a history of COVID-19 infection, among whom 45% reported infection post-vaccination. While 90% of respondents strongly agreed that all eligible patients should be vaccinated against COVID-19, only 54% strongly confirmed encouraging all their patients to be vaccinated. Forty-seven percent identified time constraints as a barrier, and 44% reported feeling too burned out to discuss vaccination.

CONCLUSIONS: Vaccination remains the most effective way to reduce risk of severe illness from COVID-19. However, graduate medical trainees perceive barriers to discussing vaccination with patients, most frequently citing lack of time and burnout. Addressing these barriers to promoting vaccination will be essential to population health as COVID-19 shifts from a pandemic to an endemic burden.

#C13 - Vascular Surgery is the Most Commonly Consulted Specialty for Immediate and Emergent Operative Trauma

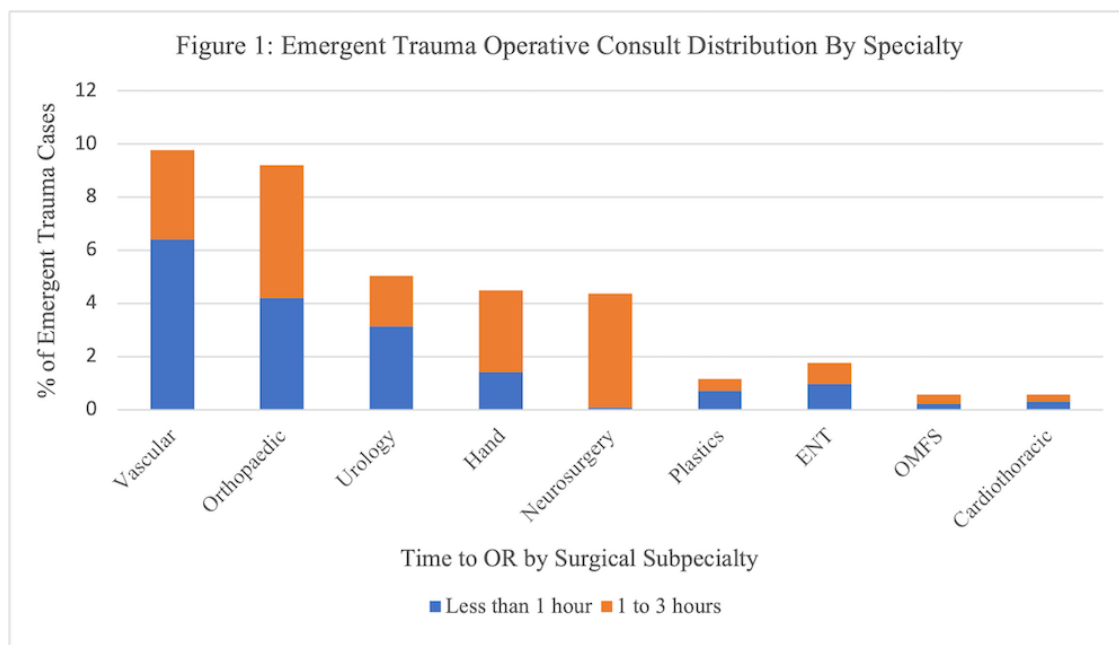
A Hatcher, A West, R Rajani, C Ramos, J Benarroch-Gampel

INTRODUCTION: Despite an increasing rate of intraoperative trauma consultation of vascular surgery (VS), VS is not one a subspecialty required for American College of Surgeons (ACS) Level I trauma center verification. We assessed rates and patterns of emergent operative VS consultation compared to other surgical subspecialties (OS) in the trauma setting.

METHODS: A retrospective analysis was performed on patients who presented with traumatic injuries requiring emergent surgical operations (<3hrs) from 2015 to 2019 at a level I trauma center. Patient demographics, injury characteristics, and consulted surgical specialties data were collected. The primary outcome measured was the rate of intraoperative consultation to VS and OS.

RESULTS: 2,265 patients were identified, with 221 emergent operative consults to VS and 507 to OS. After VS (9.8%), the most common subspecialties consulted were orthopedics (9.2%) and urology (5%). Overall, VS was more likely to be consulted in immediate trauma operations (<1hr) (65.6% vs. 38.1%, $P<.0001$), penetrating injuries (73.3% vs. 47.9%, $P<.0001$) and at night (60.6% vs 51.9%, $P=.02$) compared to OS. Time from admission to operation was shorter when VS was involved compared to OS (54.1±40.4 vs 80.6±47.9 min, $P<.0001$). In a multivariable logistic regression model predicting immediate trauma operations (<1hr), VS was 43% more likely to be involved compared to OS (OR=1.43; 95%CI=1.05–1.95).

CONCLUSIONS: Vascular surgeons are consulted intraoperatively to assist with emergent trauma at a greater rate compared to specialties required for Level I trauma center verification. Current ACS verification processes and site-specific policies should be reevaluated to reflect these findings.



#C15 - Implementation of Enhanced Recovery Protocols Reduces Opioid Use in Pediatric Laparoscopic Heller Myotomy Surgery

OA Keane, G Dantes, S Emani, JM Garza, KF Heiss, MS Clifton

Background: Enhanced recovery protocols (ERPs) are effective means of standardizing and improving the quality of surgical care in adults. Our purpose was to retrospectively compare outcomes before and after implementation of ERPs in children undergoing laparoscopic Heller myotomy for achalasia.

Methods: A pediatric-specific ERP was used for children undergoing laparoscopic Heller myotomy starting July 2017 at two pediatric surgery centers within a single metropolitan healthcare system. A retrospective review of 8 patients undergoing Heller myotomies between July 2014 and July 2017 was performed as a control. This cohort was compared to 14 patients managed post-ERP implementation (2017-2020). Outcomes of interest investigated included opioid use during admission, narcotics at discharge, time to regular diet, length of stay (LOS), and readmissions.

Results: There was a significant decrease in opioid use both while in the hospital and at time of discharge. Mean morphine equivalent use was 4.50 mg in the pre-ERP cohort and 1.97 mg in the post-ERP cohort. Furthermore, 8 out of 14 (57%) patients in the post-ERP cohort received no opioids during the admission compared with only 2 out of 8 (25%) patients in the pre-ERP cohort. Only 1 out of 14 (7.14%) patients in the post-ERP cohort was discharged with a prescription for opioid medication while 6 out of 8 (75%) in the pre-ERP cohort were discharged with an opiate prescription.

Conclusions: The use of ERP in children undergoing laparoscopic Heller myotomy surgery is safe and effective and leads to a reduction in opioid use during admission and at discharge.

#C16 - Deep Space Odontogenic Infections are More Frequent during COVID-19 Pandemic

A Lazar, TM Austin, JB Karlik, D Amin, S Abramowicz, SJ Drew

Introduction: The COVID-19 pandemic created a decrease in access and delivery of routine healthcare especially during surges in the disease. Unclear and inconsistent quarantine regulations, loss of employment, lack of health insurance, and patient's fear of contracting COVID-19 from visiting the health care provider caused a delay in treatment for various medical and dental problems.

Methods: Our service had perceived an increase of admissions for deep space neck infections (DSNI) of odontogenic origins since the pandemic began. This retrospective cohort study reviews the admissions and treatment of DSNI by our service during the time period of March 1, 2018 to March 28, 2021 to determine the extent of the increase numbers and explore any differences in characteristics including severity and patient demographics.

Results: When taking pre- and post-lockdown temporal trends into account, there was a decrease in the number of cases being performed after the introduction of the lockdown (-4.43 cases/month, 95% CI: -7.79 to -1.08, p-value = 0.003). In addition to this decrease in cases, an approximately 3-fold increase in the positive trend on top of the background occurred after the start of the lockdown (0.55 cases/month, 95% CI: 0.17 to 0.92, p-value = 0.006).

Conclusion: During the initial 7 months of COVID pandemic, there was a decrease in number of cases overall, including infection cases. Eventually there was a 3-fold increase in the number of odontogenic infections. There was no difference in characteristics or severity of the cases.

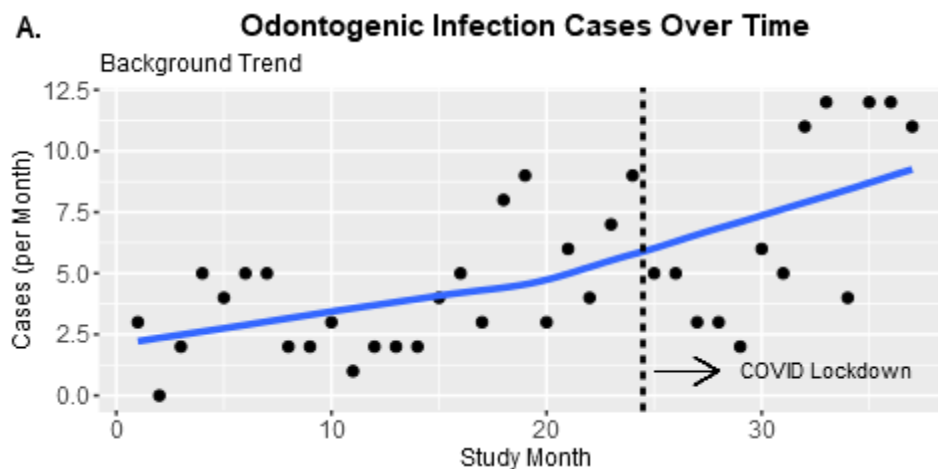
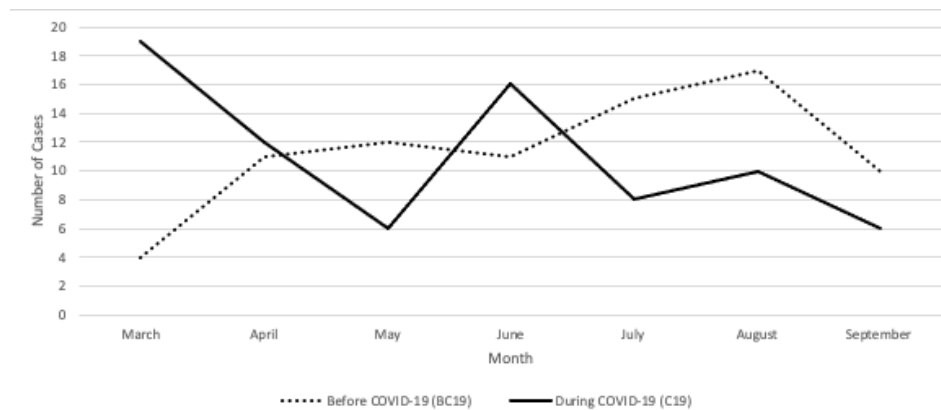


Figure: Number of odontogenic infection cases per month over the study period. A. Scatterplot with a smoothed loess line (dark blue) signifying the overall relationship between cases and time. The black vertical dashed line represents the approximate COVID pandemic time.

#C19 – Profile of Head and Neck Burns During COVID-19 Pandemic

D Amin, AJ Manhan, S Abramowicz, R Mittal

Coronavirus disease 2019 (COVID- 19) affected daily activities since December 2019. Burn injuries to head and neck can result in cosmetic and functional deformities. The purpose of this study was to characterize patients with burns to head and neck during the COVID- 19 pandemic. This cross-sectional study reviewed patients in Burn Care Quality Platform Registry (BCQP). Patients were included if they were age 18 years of age or older, sustained burns to head and neck, and were included in the BCQP. Patients were stratified according to date of injury into one distinct time period: (1) March 13 to September 13, 2019 (i.e., before COVID-19 pandemic, BC19) or (2) March 13 to September 13, 2020 (i.e., during initial 6 months of COVID-19 pandemic, C19). March 13, 2020 was chosen because (1) COVID-19 was announced as a national emergency on that date and (2) it was the last day of in-person schools in state of Georgia. Data collection included patient demographics, admission details, burn details, and hospital related variables were documented. During the study period, 157 patients had burn to head and neck (BC-19; 70, C-19; 71). Our data showed a 375% increase in March following the announcement of the pandemic (BC19; 4, C19;19). Admissions from another facility were statistically more than in C19 group ($p < 0.0001$). For C19 group, there were 53% more admissions from ED than BC19 ($p = 0.001$). Additionally, in BC19 group patients presented with concomitant inhalation injuries significantly more than C19 group ($p = 0.04$). In conclusion, the total number of burns is the same during BC and C19, however there was a significant spike in number of cases in March 2020.

Figure1. Head and Neck Burns by Months

#C20 - Geographic Differences in Racial Disparities in Access to Kidney Transplantation

L McPherson, M Di, S Pastan, RE Patzer

Introduction: It is unknown whether disparities across geographic region, race, and ethnicity in access to the kidney transplant waitlist have persisted after the implementation of the 2014 Kidney Allocation System. We examined whether racial and ethnic disparities varied across US Organ Procurement and Transplantation Network (OPTN) regions among a recent cohort of patients with end stage kidney disease (ESKD).

Methods: Using the US Renal Data System, our cohort consisted of 456,591 adult, ESKD patients [white (57%), Black (28%), and Hispanic (15%)] who initiated dialysis on or after 1/1/2015 followed through 3/13/2020. Patients were assigned an OPTN region via residential zip code. Weighted cox regression was used to compare racial and ethnic differences in kidney transplantation across OPTN regions.

Results: The cohort was majority male (58%) with a mean age of 63 years. Approximately 16% of patients were waitlisted, including 16% Black, 16% white, and 19% Hispanic over the 1.8 years median follow-up. The overall adjusted hazard of waitlisting among Black patients was 0.92 (95% CI: 0.90-0.94) and Hispanic patients was 1.05 (95% CI: 1.01-1.10) vs white patients. Hazard ratios for Black patients were consistently lower across almost all regions (HR range: 0.83-1.11) compared to Hispanic patients. Hispanic (vs white) patients were more likely to be waitlisted in nine of the eleven OPTN regions.

Conclusion: In the post-KAS era, racial and ethnic disparities in access to the waitlist among patients who start on ESKD as their first therapy are more modest than prior eras, but still remain in some geographic regions.

#C23 – The Role of Vascular Surgeons as Intra-Operative Consultants

EG Rooney, DK McLaughlin, WD Jordan Jr.

Introduction: Vascular surgeons often participate as co-surgeons for other surgical disciplines. However, the need for emergency vascular surgery expertise may stress components of the health care system including the operating room and ICU. We aim to understand the scope of vascular surgeons as operative consultants in the planned and unplanned setting, and the clinical results for patients who undergo these operations.

Methods: We performed a retrospective analysis of patients in two hospitals in our healthcare system who underwent an operation with a non-vascular surgeon as primary, and a vascular surgeon as secondary surgeon between September 1, 2018, and June 30, 2021. Demographics, comorbidities, procedure details, and postoperative outcomes were identified. We compared patients who underwent planned combined operations to those who received unplanned intraoperative consultations. We used chi-square analysis and unpaired t-tests to assess the significance of the results.

Results: We identified 227 patients, including 172 who underwent planned combined cases and 55 who received unplanned intraoperative vascular surgery consults. Vascular surgeons were involved in cases with cardiothoracic surgery, general surgery, gynecology, urology, surgical oncology, neurosurgery, abdominal organ transplant surgery, otolaryngology, and plastic surgery. Malignancy was more common in patients who received unplanned consults ($p < 0.001$). Planned combined cases were more likely to involve cardiothoracic surgery (76%, $p < 0.001$), and unplanned consults were more likely to involve urology (24%, $p < 0.001$) and surgical oncology (18%, $p = 0.005$). Unplanned consultations had higher rates of intraoperative hypotension and pressor use, were more often complicated by intraoperative bleeding and ischemia, and were more often approached open versus endovascular methods ($p < 0.001$). There was no difference between groups for intraoperative fluid resuscitation and blood transfusion, ICU length of stay, postoperative renal replacement therapy, and infectious complications. There was a higher rate of ventilator use > 48 hours postoperatively ($p = 0.013$) and a longer length of stay ($p = 0.048$) among unplanned consults. There was no difference in 30-day mortality between groups.

Conclusions: In non-trauma hospitals, vascular surgery remains part of planned and unplanned operations with multiple surgical subspecialties. The planned participation of vascular surgeons is associated with improved surgical outcomes for patients requiring vascular intervention.

| | Planned combined cases (n=172) | Unplanned intra-operative consults (n=55) | P-Value |
|---|--------------------------------|---|------------------|
| Intraoperative Factors | | | |
| Bleeding complication | 3.5% | 34.5% | <0.001 |
| Ischemia complication | 5.2% | 36.4% | <0.001 |
| PRBC transfusion (mean number of units) | 2.4 | 1.5 | 0.375 |
| Open approach | 45.3% | 83.6% | <0.001 |
| Pressor use | 48.5% | 80% | <0.001 |
| Postoperative Factors | | | |
| ICU Length of stay (mean) | 6.3 days | 8.4 days | 0.256 |
| Postoperative renal replacement | 15% | 27% | 0.059 |
| Postoperative ventilator >48 hours | 14.6% | 36.4% | 0.013 |
| Overall length of stay (mean) | 11.9 days | 16.6 days | 0.048 |
| 30-day mortality | 13.4% | 14.5% | 0.825 |

#C25 - Carpal Tunnel, Cubital Tunnel, and Sleep: Preoperative Sleep Disturbance Scores and Correlation between Sleep Disturbance and Pain, Quality of Life, and Functional Ratings

E Smearman-Chahal, B McGinley, K Cuneo, O Omole, J Hurt, A Dawes, R Tolston, E Wagner, M Gottschalk

Introduction: Carpal tunnel (CTS) and Cubital tunnel (CuTS) are two of the most common nerve compression conditions. While sleep disturbance is commonly reported for CTS, there is limited research on CuTS and sleep, and no study to our knowledge has compared sleep across CTS and CuTS. Our study compares sleep across these conditions, and explores whether sleep disturbance correlates with other patient-rated questionnaires on pain, quality of life, and function.

Materials & Methods: Patients with CTS and CuTS with planned decompressive surgery were prospectively administered validated questionnaires where higher scores represent more of the measured concept. Questionnaires include PROMIS Sleep Disturbance; PROMIS Pain Interference; European Quality of Life Questionnaire (EuroQOL), and Single Assessment Numeric Evaluation (SANE) of the affected extremity.

Results: A total of 199 patients (43% males, age 57 +/- 15.3) were included. There were 108 patients with CTS, 36 with CuTS, and 55 with both. For CTS, average preoperative sleep score was 54.8 +/- 8.5, falling within a high-normal range. For CuTS, average was 57.2 +/- 10.2, showing mild disturbance. For dual CTS-CuTS, average score was 56 +/- 10.5, also mild disturbance. The scores were not statistically different between groups ($p=0.17$). Across the sample, higher sleep disturbance correlated with higher pain, lower quality of life, and reduced extremity function (Table 1).

Conclusions: Sleep disturbance was not significantly different between CTS and CuTS, and fell in the high-normal to mild disturbance range. However, reports of greater sleep disturbance correlated with greater pain, and reduced quality of life and function.

| Table 1. Correlation between PROMIS Sleep Disturbance and Preoperative Self-Reported Questionnaires among Patients Planning to Undergo Carpal or Cubital Tunnel Release | | |
|---|-------------|---------|
| Patient Reported Outcome | Correlation | P-Value |
| Pain Interference T-Score | 0.60 | <0.001* |
| EuroQOL Score | -0.48 | <0.001* |
| Affected Extremity SANE Score | -0.22 | 0.023* |
| Pearson correlations. * $p<0.05$. | | |

#C26 - Pediatric Dog Bites to the Face Were More Severe During COVID 19 Pandemic

JQ Taylor II, R Krieger, R Blanco, TA Austin, S Abramowicz

The objective of this study was to determine the severity of dog bite injuries to the face in children during the first year of the COVID-19 pandemic. This was a retrospective cohort study of children with dog bites to the face who presented to Emergency Department at Children's Healthcare of Atlanta from March 2019 to March 2021. Medical records were reviewed to document variables: demographic information, bite locations, treatment/sedation. The outcome variable of the study was the severity of the dog bite which was approximated by the level of sedation needed to repair the dog bite injury. Bites that occurred prior to the COVID-19 shutdown (pre) were separated from the bites following the covid shutdown period. A two-sample t-test was used to determine differences between the two cohorts. There was no statistically significant difference noted between the number of dog bites during

the pre-COVID shutdown period (31.8 cases/month) compared to the period following the COVID shutdown period (27.6 cases/month). There was an observed increase level of sedation needed to repair the dog bite injuries during the post-COVID-19 shutdown when compared to the pre-COVID-19 shutdown period. The increased level of sedation was most likely due to the higher level of bite severity requiring a longer anesthetic for wound repair (Table 1). In conclusion, dog bite injuries in children during pandemic were more severe due to the increased level of sedation required to repair the injury secondary to the severity of the dog bite.

Table 1. Patient Demographics and Characteristics

| | Pre-Lockdown (n = 381) | Lockdown (n = 331) | P-value* |
|-----------------------------------|---------------------------|-----------------------|----------|
| Age (Years) | 6.1 ± 4.1 | 6.8 ± 5.4 | 0.12 |
| Gender (Male) | 194 (50.9%) | 176 (53.2%) | 0.60 |
| Ethnicity | | | 0.18 |
| White/Caucasian | 211 (55.7%) | 197 (59.9%) | |
| Black/African American | 108 (28.5%) | 90 (27.4%) | |
| Hispanic | 34 (9.0%) | 33 (10%) | |
| Asian | 15 (4.0%) | 7 (2.1%) | |
| Other | 4 (1.1%) | 1 (0.3%) | |
| Decline | 7 (1.8%) | 1 (0.3%) | |
| Home Pet (Yes) | 246 (64.6%) | 202 (61%) | 0.35 |
| Sedation/GA Required (Yes) | 67 (17.6%) | 119 (31.2%) | <0.001 |

Abbreviations: GA = General Anesthesia. Data presented as count (percentage) or median [25% percentile, 75% percentile].

*Based on two-sample Student's t-test or Fisher's Exact Test based on the distribution of the data. P-value < 0.05 considered statistically significant.

#C28 - Impact of preoperative beta-blockade on Major Adverse Cardiovascular Events Following the Surgical Treatment of Atherosclerotic Disease

AB West, AJ Hatcher, RR Rajani, CR Ramos, J Bennaroch-Gampel

Introduction and Objectives: Beta-blockers (BB) are integral to treating many cardiovascular diseases however studies of their potential perioperative benefit remain mixed in their findings. The objective of this study was to determine the impact of preoperative beta-blockade on rates of major adverse cardiovascular events (MACE) in patients undergoing surgery to treat atherosclerotic disease.

Methods: The National Surgical Quality Improvement Program (NSQIP) targeted dataset was queried for patients undergoing elective carotid, supra- and infra-inguinal revascularizations between 2011-2019. Rates of MACE (a composite of myocardial infarction, stroke, and death) were compared between

patients with and without preoperative BB use. Multivariable logistic regression models predicting MACE were created to adjust for differences in baseline characteristics between cohorts.

Results: Of the 79,717 patients included, 56% used BB. BB use has decreased from 59% in 2011 to 53% in 2019 ($p<0.001$). Patients receiving BB were more likely to have diabetes (44% vs 31%, $p<0.001$), heart failure (3.0% vs 0.8%, $p<0.001$), and hypertension (93% vs 69%, $p<0.001$). MACE occurred more frequently in the BB group (4.0% vs 2.6%, $p<0.001$). In multivariable logistic regression models, BB was associated with MACE in the overall study population (OR=1.27, 95%CI=1.17-1.27), as well as in the carotid (OR=1.33, 95%CI=1.17-1.52), supra-inguinal (OR 1.32, 95%CI=1.08-1.62), infra-inguinal (OR 1.21, 95%CI=1.06-1.38), and open subgroups (OR=1.29, 95%CI=1.17-1.41), but not the endovascular subgroup (OR=1.17, 95%CI=0.97-1.42).

Conclusion: Preoperative beta-blockade is associated with MACE following common vascular surgery procedures, even after controlling for baseline health, which affects over half of patients undergoing surgery to treat atherosclerotic disease.

#C32 – Female Patients Are More Likely to Have Symptomatic Carotid Disease but Do Not Have Increased Adverse Events Following Combined Carotid and Cardiac Operations

SG Bennett, S Banskota, Y Dayal, C Hoffmann, M Chang, MD Clark, Y Duwayri, T Dodson, GC Escobar, C Lewinstein, T Liang, A Mahajan, MJ Mittenthal, JM Rheudasil, V Teodorescu, JI Zarge, JS Miller, PB H'Doubler, W Jordan Jr., L Brewster

Introduction: Despite reports that female patients experience more adverse events following many vascular operations, the impact of gender on adverse outcomes following combined carotid and cardiac operations has not been reported. We hypothesized that women undergoing combined operations would have more adverse events compared to men.

Methods: Utilizing our IRB approved database (2007-2020) we identified patients who underwent carotid endarterectomy (CEA) and cardiac operations within 30 days of each other. We captured patient demographics and adverse events at hospital discharge, and late deaths from the National Death Index. Fisher's exact test with a $P<0.05$ was utilized to test for significance based on patient gender.

Results: 134 patients were identified who underwent CEA and a cardiac operation within 30 days of each other. Most of the cardiac operations (105) were CABG, 16 were CABG + valve, and 13 were valve operations. Despite similar demographics, women were more likely to present with symptomatic carotid disease ($P<0.05$; Table). There was 2 MI (1M/1F); neither resulted in death. There were 2 strokes (2M/0F), both were following staged cardiac operations; neither involved CEA distribution. There were 5 deaths (3M/2F) in the perioperative period; all related to the cardiac operation. There were 14 late deaths (8M/6F).

Conclusion: Women comprised ~40% of our patients. Despite a higher incidence of symptomatic carotid disease in females, females did not have a greater risk of MI, stroke, or death (perioperative and late) compared to men. Ultimately, CEA can be performed safely; with no increased risk of adverse events owing to female gender.

#C29 – What is Idiopathic Macroglossia? A Case Series and Review of Literature

J Xu, SM Roser, JC Melville, D Amin

Purpose: Macroglossia is a pathological condition which resulted in hypertrophy of tongue muscles. Idiopathic macroglossia (IM) is tongue hypertrophy without systemic or genetic causes. Guidelines regarding treatment for IM are scant. The purpose of this project was to present diagnosis and management of a series of patients with idiopathic macroglossia.

Patients & Methods: This was a retrospective case series of patients with IM treated by Oral and Maxillofacial Surgeons (OMS) at Emory University and University of Texas in Houston from 2019 to 2021. Inclusion criteria were patients 18 years or older, who presented with IM, managed with surgery, and negative for COVID-19. Patients were excluded if macroglossia is due to an underlying etiology. Study variables were patient demographics, medical and social history, clinical presentation, imaging characteristics, pathological findings, and management. The outcome variables were normalization of tongue size, return of parenteral nutrition, and able to maintain airway.

Results: Five patients with IM were included. All patients had history of hypertension, cerebral vascular disease, and prolong intubation. All patients presented to OMS clinic with tracheostomy for airway, and percutaneous endoscopic gastrostomy (PEG) for feeding. Partial glossectomy was performed to all patients. All achieved clinical resolution, 80% of the patients had tracheostomy decannulation and PEG removal.

Conclusion: Management of macroglossia requires multidisciplinary approach. Rarely macroglossia are permanent are require partial glossectomy. Glossectomy offers the best functional and cosmetic results and minimizes morbidity. In the case of IM, management should involve tracheostomy and PEG for the initial stabilization followed by glossectomy for functional improvement.

#C30 - Periareolar Skin Sparing Mastectomy and Immediate Implant-Based Reconstruction: A Reappraisal

M Zarej, GW Carlson

Introduction: Skin sparing mastectomy (SSM) is often used when tumor location prohibits performing a nipple sparing mastectomy (NSM), however at the cost of loss of breast shape and projection. A square shaped excision of the nipple-areolar complex (NAC) and a X-shaped purse string closure is examined after implant-based reconstruction.

Methods: A retrospective review was performed of patients undergoing periareolar SSM and immediate implant-based reconstruction from January 2015 through June 2021 to identify patients undergoing a square shaped NAC excision and skin closure.

Results: Twenty-three patients met the inclusion criteria. They underwent 43 periareolar SSM and immediate implant-based reconstruction (bilateral 20, unilateral 3). Indications for surgery were: cancer 25 and prophylactic 18 (2 patients had bilateral cancer). Reconstructive methods included: tissue expander (TE) 31 (72.1%) and direct to implant (DTI) 12 (27.9%). Preoperative breast MRI was performed in every patient. On final pathological examination, 8 cases (32%) had tumor involvement of the NAC. Six of the eight (75%) had breast MRI that showed enhancement extending to the NAC. Overall wound complications occurred in 8 (18.6%) of breasts. This included: mastectomy skin flap necrosis

(MSFN) 5 (11.6%) and infection 3 (7.0%). Four cases of MSFN healed with local wound care. One required operative debridement. One infection necessitated implant removal.

Conclusion: The square shaped NAC excision and closure minimizes the surgical incisions after implant reconstruction with acceptable complication rates. It is useful in small to moderate sized breasts with mild ptosis in patients who are not candidates for nipple sparing mastectomy and allows preservation of the breast shape and projection.

#C33 - Application of Enhanced Recovery After Surgery (ERAS) Elements to Acute Care Surgery Patients *D Hanos, D Koganti, K Williams, R Smith, SR Todd, JD Sciarretta*

Introduction: Enhanced Recovery After Surgery (ERAS) protocols are increasingly employed to decrease postoperative physiological dysfunction and perioperative stress in the elective surgery setting. The goal of these protocols is to standardize care, improve outcomes, and lower healthcare costs for facilities and patients. We hypothesize that individual ERAS components can be tailored to and utilized in Acute Care Surgery (ACS) patients with acute intestinal pathology resulting in similar outcomes to those who completed a full ERAS protocol.

Methods: The NSQIP database was queried over a 3-year period for emergency ACS patients who received partial or complete ERAS elements and underwent laparoscopic surgery during their hospitalization. Demographics, preoperative diagnosis, surgery type, length of stay, complications, and mortality were reviewed. Patients who completed a celiotomy or elective laparoscopic procedure for intestinal pathology were excluded.

Results: 29 ACS cases with intestinal pathology were identified during the study period. Median age was 63±15 years, 65.5% were male. Mean intraoperative fluid volume was 1,600cc. Mean LOS was 4±1 days. All patients received components of ERAS; however, complete compliance included multimodal pain control, antibiotic usage, and early mobilization. There appeared to be few differences in outcomes between the two groups when comparing components of ERAS as listed in table 1. Carbohydrate loading and mechanical bowel prep were the most frequently incomplete elements, 66% and 36% respectively.

Conclusion: Utilization of ERAS elements is a viable and cost-effective option in selective patients with acute operative intestinal pathologies. Despite a small sample size, our results are comparable to those reported in elective ERAS programs.

Table 1. Characteristic Variables Total, n=29 patients

| | ERAS complete N = 13 | ERAS incomplete, N = 16 | p-value |
|---|-------------------------|----------------------------|---------|
| Characteristics Quantitative Variables | | | |
| Age (years) | 66.76 (42-82) | 60.81 (26-86) | 0.2 |
| IVF | 2046.15 (1200-4100) | 1600 (600-2500) | 0.105 |
| ASA | 2.41 (2-3) | 2.87 (2-4) | 0.08 |
| Total OR time | 149.6 (0 – 277) | 103.1 (0-225) | 0.18 |
| EBL | 53.4 (0-200) | 35.65 (5-150) | 0.305 |
| UOP | 306.9 (60-900) | 280.62 (50-650) | 0.71 |
| ICU LOS | 0 | 0.125 (0-1) | 0.16 |

| | | | |
|--|------------|-------------|---------------|
| LOS | 3.61 (2-6) | 3.5 (1-6) | 0.82 |
| Characteristics Qualitative Variables | | | |
| MBP with ABX | | | 0.0006 |
| N | 0 (0) | 11 (68.75%) | 0.0006 |
| Y | 13 (100%) | 5 (31.2%) | 0.0006 |
| Gatorade | | | 0.0001 |
| N | 0 (0) | 14 (87.5%) | 0.0001 |
| Y | 13 (100%) | 2 (12.5%) | 0.0001 |
| CHG | | | 0.019 |
| N | 1 (7.6%) | 9 (56.25%) | 0.019 |
| Y | 12 (92.3%) | 7 (43.7%) | 0.019 |
| IV ABX | | | 0.5 |
| N | 0 | 0 | Na |
| Y | 13 (100) | 16 (100%) | Na |
| Multimodal pain | | | 0.5 |
| N | 0 | 0 | Na |
| Y | 13 (100) | 16 (100%) | Na |
| Toradol | | | >0.99 |
| N | 8 (61.5%) | 9 (56.2%) | >0.99 |
| Y | 5 (38.4%) | 7 (43.7%) | >0.99 |
| Exparel equivalent | | | 0.04 |
| N | 5 (38.4%) | 13 (81.2%) | 0.04 |
| Y | 8 (61.5%) | 3 (18.7%) | 0.04 |
| Transfusion | | | 0.5 |
| N | 13 (100%) | 16 (100%) | Na |
| Y | 0 | 0 | Na |
| SSI | | | 0.5 |
| N | 13 (100%) | 16 (100%) | Na |
| Y | 0 | 0 | Na |
| Gender | | | 0.9 |
| M | 8 (61.5%) | 11 (68.7%) | 0.9 |
| F | 5 (38.4%) | 5 (31.25%) | 0.9 |

#C35 – Organ-Space Surgical Site Infections: Consequences and Prediction Using ACS-NSQIP

A Medline, VJ Muralidharan, J Codner, J Sharma

Background: The incidence of organ site infections (OSIs) across the US has not decreased to the same extent as superficial and deep surgical site infections (SSIs). This study aimed to highlight the consequences and create a predictive model of OSIs using 2019 NSQIP data.

Materials and Methods: The primary data source was the ACS NSQIP 2019 Participant Use Targeted File (PUF). Chi-squared and independent t-tests evaluated the association of OSIs and other postoperative complications. Variables of interest for our predictive model included 10 surgery types, 10 relevant preoperative laboratory values, and 26 other variables including demographics and comorbidities. A

stepwise logistic regression model fit with OSIs as the outcome was used to calculate the predicted ROC and c-index.

Results: A total of 1,076,441 cases submitted from 719 NSQIP-participating sites were included in our analysis, comprised of 16,751 (1.6%) OSIs with a median of 10 days (IQR: 11 days) between surgery and the development of an OSI. Forty-two variables were included in our final multivariable analysis. Esophageal and pancreatic surgeries yielded an approximate 4- and 6-fold higher increase in the odds of OSI, respectively ($p < .001$). ROC analysis yielded a c-index statistic of 0.846 (Fig. 1). Associated consequences of OSIs included hospital readmission (OR=20.74, 95% CI: 20.094-21.412, $p < .001$), sepsis (OR=35.084; 95%CI: 33.75-36.47, $p < .001$) and higher probabilities of mortality (34% vs. 0.8%, $p < .001$) and morbidity (16% vs. 5.8%, $p < .001$).

Discussion: OSIs have extensive consequences and may be predictable. These types of infections are multifactorial and require quality surveillance distinct from other SSIs.

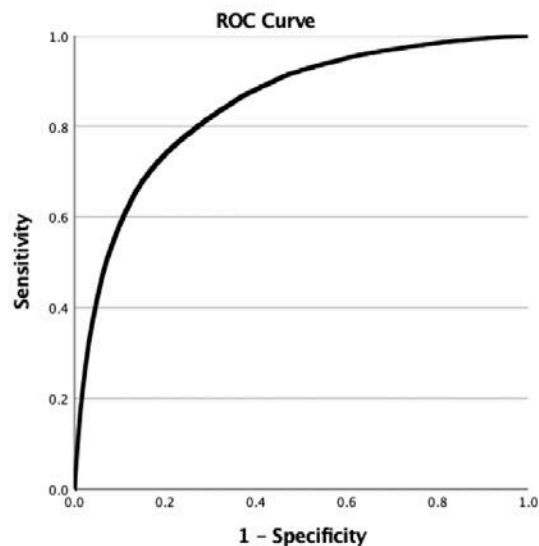


Fig. 1: ROC Curve for Organ Site Infections, NSQIP 2019, C-index statistic of 0.846

#C38 - African-American Breast Cancer Patients Have Proportionately Higher Recurrence Scores after TAILORx Reclassification vs Caucasian Patients: An Examination of the National Cancer Database

C Wasserman, K Gogineni, L Postlewait, PD Subhedar

Introduction: The recurrence score (RS) is used in early stage, hormone positive breast cancers (BC), to predict the benefit of adjuvant chemotherapy. The TAILORx study further stratified the RS into either “low or high risk” categories. This study aimed to determine if there was a difference in risk reclassification between African-American (AA) and Caucasian patients after incorporation of TAILORx scoring.

Methods: AA and Caucasian patients with BC who underwent RS testing in the National Cancer Database 2004 to 2014 were included. RS was defined in 2 ways: “pre-TAILORx” scores, classified into

low (0-17), intermediate (18-30), and high risk (> 30) groups; and “post-TAILORx” scores, classified into low (0-25) and high risk (> 25) groups.

Results: A total of 80,532 women were included; 87.7% were Caucasian and 7.3% were AA; 87.5% (n = 61,815) Caucasians and 82.6% (n = 4,824) AA were reclassified with low RS using post-TAILORx scores. While 12.5% (n = 8,820) Caucasians and 17.4% (n = 1,015) AA patients were reclassified with a high RS using post-TAILORx scores.

Conclusion: Reclassification after TAILORx has the majority of patients with early stage, hormone positive breast cancers to omit chemotherapy. However, a proportionately lower number of AA patients can safely omit chemotherapy when compared to Caucasian patients with similar tumor characteristics and clinical risk after reclassification of the RS using new TAILORx scoring.

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