Event Agenda | June 23rd, 2020

7:15 AM - 7:30 AM	**Breakfast & Registration**
7:30 AM - 7:45 AM	**Welcome & Introduction**
	Oral Presentation Session 1 - Lecture Hall 2222 **Moderators – Dr. Sepideh Gholami & Dr. Kathleen Romanowski**
7:45 AM - 8:00 AM	***Alicia Gingrich*** - Comparative transcriptomics of canine and human natural killer cells as immunotherapy target in translational osteosarcoma model
7:45 AM - 8: 00 AM	***Melissa Grigsby*** - Upregulation of human glucocorticoid receptor isoform expression by gram-positive bacterial cell wall components
8:15 AM - 8:30 AM	***Hila Shimshi-Swindell*** - Extracellular matrix mediated local delivery of placental mesenchymal stem cell derived exosomes for spinal cord regeneration
8:30 AM - 8:45 AM	***James Clark*** - A prospective trial of intraoperative liposomal bupivacaine (Exparel) versus bupivacaine/lidocaine for thoracoscopic surgery
8:45 AM - 9:00 AM	***Kate Doyle*** - The neonatal intensive care unit as a source of deceased donor kidneys for transplantation: initial experience and 5-year data reviewed
9:00 AM - 9:15 AM	***Christina Theodorou*** - Increased mortality in very young children with traumatic brain injury due to child abuse (presented by Laura Galganski)
9:15 AM - 9:30 AM	**Break**
	Oral Presentation Session 1 - Lecture Hall 2222 **Moderators: Kent Lloyd & Dr. Amanda Kirane**
9:30 AM - 9:45 AM	***Kaeli Jo Yamashiro*** - Fetal tolerance of maternal partial resuscitative endovascular balloon occlusion of the aorta in an ovine model
9:45 AM - 10:00 AM	***Lalithasri Ramasubramanian*** - Engineering synthetic extracellular vesicle mimics for vascular regeneration
10:00 AM - 10:15 AM	***Sean Judge*** - Immune phenotype of tumor infiltrating t and nk cells in soft tissue sarcomas are associated with clinical outcome
10:15 AM - 10:30 AM	***Dattesh R. Dave*** - Geriatric age confers increased risk of post-operative complications following open reduction internal fixation for distal radius fracture: A NSQIP analysis
10:30 AM - 10:45 AM	***Lauren Perry*** - The role of radiation therapy in addition to lumpectomy and hormone therapy in men 70 years of age and older with early breast cancer: A NCDB analysis
10:45 AM - 11:00 AM	***Matthew Zeiderman*** - The Omnimax MMF system: A cohort study for clinical evaluation

11:00 AM - 11:15 AM	**BREAK**
	ORAL PRESENTATION SESSION 3 - LECTURE HALL 2222 **MODERATORS: DR. LISA BROWN & DR. DAVID COOKE**
11:15 - 11:30 AM	***DAKE HAO*** - Functionalization of polymeric scaffolds with human chorionic villus mesenchymal stem cell derived exosomes to improve vascularization and regeneration potential
11:30 AM - 11:45 AM	***KAITLIN CLARK*** - Functionalization of polymeric scaffolds with human chorionic villus mesenchymal stem cell derived exosomes to improve vascularization and regeneration potential
11:45 AM - 12: 00 PM	***TIMOTHY GUENTHER*** - Development of a Porcine Model of Emergency Re-Sternotomy at a Low Volume Cardiac Surgery Military Center
12:00 PM - 12:15 PM	***MOUNIKA BHASKARA*** - Therapeutic Potential of Placenta-derived Mesenchymal Stem/Stromal Cells Cultured in Human Platelet Lysate for Acquired Spinal Cord Injury
12:15 PM - 12:30 PM	***SHAWN TEJIRAM*** - Comparing Frailty Scores and Predicting Falls in Acutely Injured Elderly Patients Over Time: A Prospective Study
12:30 PM - 12:45 PM	***JORDAN JACKSON*** - Post-Operative Opioid Prescribing Trends in Adolescents and Pain Related Encounters
12:45 PM - 1:00 PM	**LUNCH**
	QUICK SHOT SESSION 1 - LECTURE HALL 1222 **MODERATORS: DR. CHETAN IRWIN & DR. MIMMIE KWONG** **MODERATORS: DR. ROBERT CANTER & DR. ALANA BERES**
1:00 PM - 1:10 PM	***LUIS GODOY*** - Comparison of First 25 Robotic Lobectomy at UC Davis for Lung Cancer to Contemporaneous and Historical Video-Assisted Thoracoscopic Surgery Lobectomy
1:10 PM - 1:20 PM	***YUNFENG XUE*** - Panniculectomy in preparation for renal transplant: A ten-year experience
1:20 PM - 1:30 PM	***PING SONG*** - Drivers of Increased Hospital Resource Utilization in 15,510 Hand Infection Patients
1:30 PM - 1:40 PM	***GANESH RAJASEKAR*** - Trends in Pediatric Drowning from 2000-2016: Challenges and Opportunities
1:40 PM -1:50 PM	***ANGELA AGUIRRE*** - Time to diagnostic testing and risk of amputation for patients with lower extremity ulcers
1:50 PM - 2:00 PM	**BREAK**
2:00 PM - 2:10 PM	***AVNI SURI*** - Predictors of Unplanned Readmission and Mortality after Below Knee Amputation
2:10 PM - 2:20 PM	***UGUR BASMACI*** - Surgical and Oncologic Outcomes in Vascular Resection and Reconstruction for Advanced Cancer: A Case Series

2:30 PM - 2:40 PM	***Sarah Mahdavi*** - Optimized Long-term Result of Nipple-Areola Complex Reconstruction in Implant-Based Breast Reconstruction
2:40 PM - 2:50 PM	***Lauren Coleman*** - MAGNesia: Magnesium Infusion for Analgesia in the Critically Ill Trauma Patient
2:50 PM - 3:00 PM	***Andrew Wishy*** - Subdermal Skin Closure and Tourniquet Use Improves Outcomes After Below Knee Amputation
	Quick Shot Session 1 - Lecture Hall 1222 **Moderators – Dr. Payam Saadai & Dr. Eleanor Curtis** **Moderators – Dr. Junichiro Sageshima & Dr. Elizabeth Raskin**
1:00 PM - 1:10 PM	***Amanda Phares*** - Trauma-Informed Care and Secondary Traumatization: Knowledge, Attitudes, and Education of General Surgery Residents
1:10 PM - 1:20 PM	***Stephanie Kwan*** - Reducing Opioid Use in Endocrine Surgery through Patient Education and Provider Prescribing Patterns
1:20 PM - 1:30 PM	**Leora Goldbloom-Helzner** - Optimizing the yield of placental mesenchymal stromal cell-derived extracellular vesicles in 3D culture systems
1:30 PM - 1:40 PM	***Mollie Mustoe*** - Surgery and population health: Engagement and effectiveness of a smoking cessation quitline intervention in a thoracic surgery clinic
1:40 PM -1:50 PM	***Nikia McFadden*** - Injured Behind Bars: A Descriptive Study of Prisoners Presenting to a Level 1 Trauma Center
1:50 PM - 2:00 PM	**Break**
2:00 PM - 2:10 PM	***Siqi He*** - Effects of 7,8-Dihydroxyflavone liposomes on diabetic wound healing
2:10 PM - 2:20 PM	***Kara Kleber*** - Economic & Quantitative Assessment of Unanticipated Emergency Department Visits for Recently Discharged Violently Injured Patients
2:30 PM - 2:40 PM	***Sam Miotke*** - Causes and Injury Patterns of Elderly Burn Patients
2:40 PM - 2:50 PM	***Charleston Chua*** - Quantity of Extirpated Tissue Does Not Predict Post-Operative Seroma Rates
2:50 PM - 3:00 PM	***Sarah Stokes*** - Determining the need for pre-operative prophylactic antibiotics in pediatric patients receiving antibiotics for acute intra-abdominal infection

WELCOME

Welcome from Dr. Diana Farmer, Chair of Surgery, and Dr. Tina Palmieri, Vice Chair of Research

Welcome to the 31st Annual Department of Surgery Research Symposium at the University of California, Davis. The current pandemic has provided us the opportunity to develop new research initiatives, technologies, and collaborations. This Symposium celebrates our research successes and provides an opportunity for trainees to hone their research presentations as they share their work. Research is a core value of the Department of Surgery and is made possible by the hard work of the faculty by the hard work of our faculty, staff, and trainees. Our program includes oral presentations and quick-shot oral poster presentations that highlight the diverse research in the Department of Surgery. We will award prizes for the top clinical and basic science oral presentations as well as the best quick-shot oral presentation tonight.

Thank you for joining us today to celebrate research in the Department of Surgery!

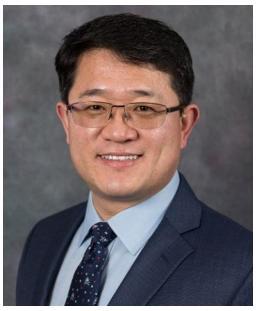
Sincerely,

Diana L. Farmer, MD, FACS, FRC
Professor and Chair, Department of Surgery UC Davis Health Surgeon-in-Chief, UC Davis Children's Hospital

Tina L. Palmieri MD, FACS, FCCM
Professor and Director, Firefighters Burn Institute Burn Center at UC Davis, Assistant Chief of Burns, Shriner's Hospital for Children, Northern California

RESEARCH COMMITTEE

TINA PALMIERI, MD, FACS, FCCM
SENIOR VICE CHAIR FOR RESEARCH, DEPARTMENT OF SURGERY



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Oral Presentations

Medical Education Building | Session 1 | Lecture 2222

Alicia Gingrich

Melissa Grigsby

Hila Shimshi-Swindell

James Clark

Kate Doyle

Christina Theodorou

Comparative transcriptomics of canine and human natural killer cells as immunotherapy target in translational osteosarcoma model

Gingrich A[1,2], Reiter T[2], Judge S[1], York, D[3], Yanagisawa M[1], Sturgill I[4], Basmaci UN, Brady RV[3], Stoffel K[3], Brown CT[2], Rebhun RB[3], Canter RJ[1].

Introduction: Natural killer (NK) cells are key effectors of the innate immune system, but major differences between human and murine NK cells have been a barrier to translation. Outbred dogs are an important link for NK-based cancer immunotherapy studies. We used RNAseq to compare gene expression profiles of ex vivo dog NK cells to in vivo NK signatures from dogs with pulmonary metastases receiving inhaled recombinant human (rh) IL-15 in a phase I clinical trial.

Methods: Eight dogs with pulmonary metastases were enrolled on an IACUC and clinical trials review board-approved Phase I clinical trial of inhaled rhIL-15 using a 3+3 cohort design with escalating doses of inhaled rhIL-15. Blood was collected from study subjects immediately pre-treatment and on days 7, 14 and 21 after initiation of treatment for isolation of NK cells and RNAseq. We performed differential gene expression (DGE) comparing subjects to healthy donor purified NK populations (resting), ex vivo activated dog NK cells using IL-15 and feeder line co-culture. We assessed global transcriptional profile and principal component analysis (PCA) for variation between treatment groups (FDR <0.05).

Results: Of 8 dogs, 2 demonstrated > 100 day survival with 1 stable disease and 1 partial response based on RECIST criteria. DGE revealed distinct transcriptional profiles between the ex vivo resting, IL-15 and co-cultured canine NK cells. Among treated patients, hierarchical clustering and PCA revealed in vivo NK cell transcriptional signatures grouped by individual dog, and not amount of time exposed to treatment. This suggests response to therapy could be determined by baseline NK cell characteristics rather than changes over time. Key genes induced in vivo (>20X) post inhalation of rhIL-15 include DLA-DRA, B2M, and thymosin beta 4, while key genes induced ex vivo post rhIL-15 exposure include CD96, KLRB1, and SPP1/OPN.

Conclusion: In the first transcriptomic sequencing of dog NK cells, we demonstrate distinct gene profiles of ex vivo activated NK cells from healthy donors compared to circulating NK cells from dogs receiving inhaled rhIL-15 on clinical trial. Baseline NK cell profiles appear to predict response more than changes over time. These data highlight the strength of the outbred dog model in speeding novel immunotherapy and biomarker studies.

Upregulation of human glucocorticoid receptor isoform expression by gram-positive bacterial cell wall components

Melissa Grigsby, Tajia Green, Debora Lim, Kiho Cho, and David Greenhalgh

Burn Division, Department of Surgery, UC Davis and Shriners Hospitals for Children

Introduction: Patients' variable responses to steroid treatment during sepsis may be related to altered regulation of human glucocorticoid (hGR) isoforms by bacterial elements. We previously identified that lipopolysaccharide (LPS) increased the activity of several splice variant isoforms of the human glucocorticoid receptor (hGR). These isoforms (hGR-B) contain cryptic exons in intron B, between exons 2 and 3, that result in early stop codons and truncated proteins. We hypothesize that gram-positive bacterial cell wall components will similarly increase the activity of these hGR isoforms.

Methods: Peripheral blood mononuclear cells (PMBCs) were isolated from Leukopaks and treated with lipoteichoic acid (LTA) or peptidoglycan (PepG) for 1, 3, or 13 hours. RNA was extracted from the buffy coats, and the activity of the targeted hGR isoforms was evaluated by qualitative RT-PCR. Protein from similarly treated PMBCs was subjected to Western blot analysis. The gels were immunolabeled with a rabbit polyclonal antibody that recognized the N-terminus of hGR.

Results: After 3 hours of treatment with 10 µg/mL of LTA, the mRNA expression of hGR-B (54) was increased. Similarly, after 3 hours of treatment with 10 µg/mL of PepG, expression of hGR-B (77) was increased. The expression of hGR-B (93) appeared to follow a similar trend with both LTA and PepG. In preliminary analysis, Western blot showed a progressive increase in the amount of likely hGR splice variant protein detected after 13 hours of treatment with increasing concentrations of PepG: 1, 10, and 50 µg/mL. LPS also increased the amount of protein detected for what we believe to be hGR splice variant isoforms.

Conclusions: We found that cell wall components of both gram-positive and gram-negative bacteria increase expression of several hGR splice variant isoforms. Both types of bacteria are responsible for causing a septic response in patients, but the severity, timing, and length of the response often differ between patients. The pattern of hGR isoform expression in response to bacterial, viral or fungal elements may determine both the course of a patient's septic episode and the role of steroid treatment in mitigating the inflammatory mechanism.

Extracellular matrix mediated local delivery of placental mesenchymal stem cell derived exosomes for spinal cord regeneration

Hila Shimshi[1] Dake Hao[1], Priya Kumar[1] Aijun Wang[1,2]

[1]Surgical Bioengineering Lab, Department of Surgery, [2]Department of Biomedical Engineering, UC Davis

Introduction: Research suggests that regeneration of the spinal cord can occur if the microenvironment at the lesion site is pro-regenerative. Mesenchymal stem cells (MSCs) possess regenerative potential for tissue repair and wound healing. The current rational is that MSCs elicit their therapeutic effects primarily via paracrine mechanisms. Exosomes were found to be valuable paracrine signaling factors for delivering pro-regenerative molecules. Exosomes adhere to extracellular matrix (ECM) in an integrin-dependent manner and influence cell migration, proliferation, apoptosis, differentiation and other physiological activities. A recent proteomic and RNA sequencing analysis of placental MSC-derived exosomes (PMSC-exos) revealed several proteins and RNAs known to be involved in neuronal survival and development. Thus, in this study, we constructed delivery systems by using two types of scaffolds for local sustained release of PMSC-exos to serve as a stem cell-derived, cell-free therapy to protect and regenerate neurons.

Methods: We isolated and immobilized PMSC-exos onto two representative ECM scaffolds, injectable collagen hydrogel and small intestinal submucosa (SIS) patch material. We previously identified LLP2A, an integrin α4β1 ligand by one-bead one-compound combinatorial technology and showed that LLP2A can specifically bind to PMSCs and PMSC-exos. We couple a collagen-binding peptide, SILY, to LLP2A to generate a bifunctional peptide SILY-LLP2A, and use this bifunctional peptide to conjugate LLP2A to collagen-based scaffolds to thus immobilize PMSC-exosomes to the scaffolds via their α4β1 integrin. Binding affinity of PMSC-exos on SILY-LLP2A modified scaffolds were examined in vitro via scanning electron microscopy (SEM). The controlled release of exosomes was analyzed using nano tracking analysis (NTA). Neurorescue and neurogenesis assays will be further conducted to test the function of immobilized PMSC-exos.

Results: SEM showed specific mechanism of exosomes binding when modified with SILY-LLP2A ligand. A control release analysis showed a stronger binding affinity and slower release of exosomes from collagen-based scaffolds modified with SILY-LLP2A.

Conclusion: In this study we developed a scaffold based controlled release system to provide sustained release of exosomes which holds promising for neurorescue and neurodegeneration and can be widely used for other tissue regeneration applications.

A prospective trial of intraoperative liposomal bupivacaine (Exparel) versus bupivacaine/lidocaine for thoracoscopic surgery

James M. Clark, MD, Luis A. Godoy, MD, Anna Xue, MD, Sarah Holmes PA-C, John Ancona PA-C, Lisa M. Brown, MD, MAS, David T. Cooke, MD

Section of General Thoracic Surgery, Department of Surgery, University of California, Davis Health, Sacramento, CA

Introduction: Given the worsening opioid crisis, enhanced recovery protocols utilizing intraoperative liposomal bupivacaine (LipoB) have been implemented in a variety of surgical specialties to improve patient recovery. No study to date has examined the effect of LipoB on patient reported outcomes (PROMs), and there is a paucity of data on the effect of long-term opioid usage up to 2 months postoperatively.

Method: Through a prospective cohort trial we enrolled 20 patients to receive 1:1 0.25% bupivacaine:1.0% lidocaine (control) followed by 20 patients to receive LipoB via intraoperative posterior intercostal nerve block. Eligible patients were those undergoing planned video-assisted or robot-assisted thoracoscopic lung resection, lung biopsy, or pleural biopsy. Patient postoperative opioid usage in morphine equivalent doses (MEDs) was calculated, and PROMs were recorded via a validated survey in the preoperative area, on day of discharge, at postoperative month 1, and at postoperative month 2.

Results: There were no demographic differences between treatment groups. Control patients had a 2.3x higher opioid need postoperatively while inpatient compared to LipoB patients (MEDs 296±227 vs 130±123 mg, p=0.006), and were more likely to still require opioids at time of discharge (65.0 vs 30.0%, p=0.03). On multivariable analysis, use of LipoB compared to Control decreased inpatient opioid MED requirements by 125 mg (β -125, 95%CI -222 to -29, p=0.013). Each additional 10 mg of inpatient MEDs required postoperatively increased the odds of continued opioid usage at discharge by 6.6% (OR 1.07, 95%CI 1.01 to 1.13, p=0.03) and at 1 month by 10.4% (OR1.10, 95%CI 1.02 to 1.20, p=0.02). PROMs did not differ at discharge, 1 month, or 2 months postoperatively.

Conclusion: LipoB significantly reduces the need for postoperative inpatient opioids after thoracic surgery, and may reduce the need for opioid prescriptions at the time of discharge. There was no difference in long term postoperative PROMs, suggesting that LipoB is not masking short term symptoms but provides durable long-term pain relief and patient recovery. Accordingly, the UC Davis Pharmacy and Therapeutics Committee has approved LipoB for use in thoracic surgery procedures in clinical settings.

	Control n=20 (50.0%)	LipoB n=20 (50.0%)	p-value
Age	67.1±9.7	63.3±14.8	0.35
Female	14 (70.0%)	13 (65.0%)	0.74
Caucasian	17 (85.0%)	16 (80.0%)	0.70
Married	13 (65.0%)	12 (60.0%)	0.82
College degree	7 (35.0%)	9 (45.0%)	0.15
Presence of Preoperative Pain	12 (60.0%)	9 (45.0%)	0.34
Conversion to Thoracotomy	1 (5.0%)	2 (10.0%)	0.75
30 Day ER Visit	3 (15.0%)	2 (10.0%)	0.63
30 Day Readmission	0 (0.0%)	1 (5.0%)	0.31

Table 1. Demographics and narcotic usage of control and LipoB patients.

Kate Doyle

The neonatal intensive care unit as a source of deceased donor kidneys for transplantation: Initial experience and 5-year data reviewed

Kathleen Doyle, MD, Andrew Perry, MD, Jakub Woloszyn, MD, Chandrasekar Santhanakrishnan, MD, Christoph Troppmann, MD, Junichiro Sageshima, MD, John McVicar, MD and Richard Perez, MD.

Sponsoring Department: UC Davis Department of Transplant Surgery

Introduction: The organ donation gap between patients waiting for transplant and available organs in the United States is expanding. Kidney donation from the Neonatal Intensive Care Unit (NICU) is rare though the potential is significant. We developed an approach for transplanting neonatal kidneys and report our experience including 5-year patient follow up.

Methods: A retrospective analysis was performed of all recipients of kidneys from neonatal donors from 2011 to 2014 at a single center. All kidneys were procured en bloc and implanted into the iliac fossa with the donor aorta and IVC anastomosed to recipient iliac vessels. Recipients were primarily small adults with low immunologic risk. Patient and allograft outcomes were reviewed.

Results: 28 patients were included in the study with 64% (19/28) female, average age of 50.7 years; average weight of 54.7 kg and average percent reactive antibody of 2.9 ± 1.3%. Donor age was 9 days, and weight 3.4 ± 0.2 kg (range: 1.9-5.0 kg). 71% were donors after cardiac death (DCD) and 96% were imported from outside our local organ procurement area. All kidneys were preserved with hypothermic pulsatile perfusion. Patient survival was 96% with one fatality with a functioning graft after 2 years. One-year graft survival was 86% with 4 early graft failures. There were no other graft losses after the first year. All grafts had early hematuria and proteinuria; most resolved within 1 year. 5-year follow up data was available for 22 patients and showed progressive improvement of kidney function. Serum creatinine at 6 months, 1, 2, 3, 4, and 5 years was as follows: 1.26 ± 0.14, 1.0 ± 0.09, 0.90 ± 0.08, 0.88 ± 0.09, 0.82 ± 0.07, and 0.75 ± 0.07mg/dL, respectively. Estimated GFR normalized in all patients.

Conclusion: Successful neonatal kidney transplantation is feasible with the known risks of higher early graft failure rate and universal evidence of early hyperfiltration injury. However, kidney function does recover and improves up to 5 years. More widespread experience with these grafts will undoubtedly improve these outcomes. We believe neonatal kidney donation should be considered as a viable option to address the national organ shortage.

Increased mortality in very young children with traumatic brain injury due to child abuse

CM Theodorou, M Nuño, KJ Yamashiro, SC Stokes, JE Jackson, DL Farmer, S Hirose, AL Beres, P Saadai, EG Brown, Department of Pediatric Surgery

Introduction: Traumatic brain injury (TBI) is the leading cause of death and disability in children and younger age is associated with worse outcomes. The impact of mechanism on outcomes has not been fully evaluated. We hypothesized that children with TBI due to child abuse would have higher mortality rates than children with TBI due to motor vehicle collisions (MVC).

Methods: We performed a retrospective review of the national Kids' Inpatient Database of all children < 2 years old with TBI due to child abuse or MVC from 2000-2012. The primary outcome was mortality. Secondary outcomes were length of stay (LOS) and total hospital charges. A multivariable regression model was created to determine predictors of mortality.

Results: Of 5964 patients identified, 65.04% of patients had TBI due to child abuse. Abused children were more likely to be less than 1 year old than children with MVC (85.7% vs 54.63%, $p<0.0001$). Overall mortality was 9.98%. Compared to children with TBI due to MVC, abused children had a higher mortality (10.72% vs 8.59%, $p=0.0086$), longer LOS (6.0 vs 4.0 days, $p<0.0001$) and higher hospital charges ($18,706 vs $67,312, $p<0.0001$). On multivariable regression, children with TBI due to child abuse had 47% increased odds of mortality compared to children with TBI due to MVC (OR 1.47, 95% CI 1.16-1.88, $p=0.0017$) when adjusting for age, race, sex, insurance, hospital region, and hospital teaching status. On subgroup analysis by age, mechanism was not associated with mortality in children aged 0-1 years old, but odds of mortality were significantly increased in children aged 1-2 years old with TBI due to child abuse (OR 3.9, 95% CI 2.53-6.03, $p<0.0001$).

Conclusion: Children with TBI due to child abuse are younger, have longer hospital LOS, higher hospital charges, and increased mortality compared to children with TBI due to MVC. Given the dire outcomes for these vulnerable children, resources must be directed at preventing child abuse.

Oral Presentations

Medical Education Building | Session 2 | Lecture 2222

Kaeli Jo Yamashiro (Presented by Laura Galganski)

Lalithasri Ramasubramanian

Sean Judge

Dattesh R. Dave

Lauren Perry

Matthew Zeiderman

Fetal tolerance of maternal partial resuscitative endovascular balloon occlusion of the aorta in an ovine model

Kaeli Yamashiro, Laura Galganski, Diana Farmer, Lucas Neff, Daniel Fong, Soheil Ghiasi, Jacob Stephenson, Shinjiro Hirose, Timothy Williams, M. Austin Johnson

Introduction: Hemorrhage is the leading cause of maternal mortality. Resuscitative endovascular balloon occlusion of the aorta (REBOA) is used to decrease post-partum hemorrhage only after the fetus is delivered. Partial REBOA (pREBOA) prior to delivery may improve outcomes but the effects on the fetus are unknown. We aimed to evaluate how progressive levels of pREBOA effect the fetus.

Methods: A REBOA catheter was placed in Zone 3 in gravid ewes at term and fetal carotid arterial access was obtained. The REBOA balloon was inflated to attenuate mean arterial pressure at the placenta (pMAP) by 5-10mmHg in 10min intervals until a fetal SaO2 of <15%. The fetus was recovered for 10min and this was repeated twice. Fetal arterial blood gasses, heart rate (HR) and mean arterial pressure (MAP) were obtained.

Results: During the first round, fetal (n=3) changes from baseline first occurred at pMAP 40mmHg with a decrease in SaO2 (59.0 ± 12.1 vs 37.6 ± 14.8%, p=0.0009), followed by a decrease in fetal MAP and pH at pMAP 35mmHg (51.3 ± 5.8 vs 56.1 ± 10.1mmHg, p=0.04 and 7.20 ± 0.08 vs 7.17 ± 0.07, p=0.01) and an increase in lactate at pMAP 30mmHg (2.0 ± 0.5 vs 2.4 ± 0.4mmol/L, p=0.02). HR did not differ from baseline, even at the lowest pMAP of 25mmHg. The baseline SaO2 improved from round 1 to round 2 (59.0 ± 12.1 vs 70.6 ± 6.6, p=0.02), lactate worsened by round (2.0 ± 0.5 vs 4.7 ± 0.4 vs 5.6 ± 0.9, p=0.007) and there was no difference in fetal MAP or HR between the rounds.

Conclusion: Physiologic changes in the fetus from maternal pREBOA first occurred at pMAP 40mmHg. The fetus tolerated high levels of pREBOA and demonstrated an ability to recover. pREBOA prior to delivery may be possible without injuring the fetus.

Engineering synthetic extracellular vesicle mimics for vascular regeneration

Lalithasri Ramasubramanian, Priyadarsini Kumar, Diana L. Farmer, Aijun Wang

Surgical Bioengineering Laboratory

Introduction: Extracellular vesicles (EVs) derived from endothelial progenitor cells (EPCs) have been shown to facilitate vascularization via delivery of miRNA-126 (miR126). However, therapeutic translation has been greatly hindered by the inherent disadvantages in EV isolation and standardization. Here, we sought to overcome these shortcomings by engineering a biomimetic synthetic EV that can recapitulate the proangiogenic properties of native EPC EVs and can also be mass produced with a greater degree of standardization and specification. We propose that EPC EV mimics (EMs) can be synthesized by coating a miR126-loaded poly (lactic-co-glycolic acid) (PLGA) core with SILY (a collagen-binding peptide)-conjugated EPC-plasma membrane (PM) shell in order to mimic the functional characteristics of native EPC EVs.

Methods: miR126-loaded PLGA cores were synthesized using a modified nanoprecipitation method and mechanically coated with plasma membrane fractions isolated from EPCs. Click chemistry was used to conjugate SILY onto particle surfaces. Fluorescent microscopy and transmission electron microscopy (TEM) were used to visualize morphology and confirm coating. miR126 loading and release were quantified alongside EM stability over two weeks. EPC migration and proliferation were assessed using a scratch wound assay and MTS assay, respectively, to determine the angiogenic potential of the EMs.

Progress: Western blotting confirmed retention of EV surface markers (CD9, CD63, CD81, Alix) on isolated PM while fluorescence microscopy and TEM showed uniform PM coating onto the PLGA cores. Surface modification of the PM with SILY peptides was successful via Click chemistry. EMs were seen to exhibit high stability (~115 nm) over 2 weeks. miR126 encapsulation efficiency was 46.4%±3.72, with ~60% cumulative release over a week. Preliminary studies show that both the miRNA-126 and PM components of the EM system play functional roles in promoting EPC migration and proliferation.

Conclusion: Thus far, a relatively stable biomimetic EV structure has been synthesized to broadly recapitulate the physical structure of EPC-derived EVs and promote angiogenic processes in EPCs. Future work will focus on assessing and optimizing the EM functional properties for downstream in vitro and in vivo angiogenic models.

Differences in NK and Memory CD8 T-cell responses to antigen-nonspecific stimulation by interleukin-15

Sean J. Judge*, Cordelia Dunai, Catherine T. Le, Lam T. Khuat, Logan V. Vick, Kevin M. Stoffel, Arta M. Monjazeb, William J. Murphy, Robert J. Canter*

*Division of Surgical Oncology, University of California, Davis.

Introduction: Natural killer (NK) cells are innate lymphoid cells that exert immediate functions which can be further augmented and sustained with immunostimulatory cytokines. Memory CD8 T cells, due to expression of CD132 and CD122, can be activated by similar cytokines in the absence of TCR engagement (termed "bystander" activation). This results in activation and proliferation but necessitates high amounts of cytokine as high-affinity IL2R complexes (CD25) are not induced. Interestingly, both cell types can then elicit similar effector functions via NKG2D-mediated target cell recognition. As these cell types can fill a similar immunologic niche, we set out to compare NK and memory CD8 T cell responses following IL-15 exposure in vitro from healthy human donors.

Methods: Cell analysis was performed by flow cytometry and qRT-PCR. At baseline, CD25 expression was negligible at <5% on both human NK and memory CD8 T cells. Culture with rhIL-15 (10 ng/mL) for 4-6 days resulted in marked CD25 upregulation on CD56+CD3- NK cells but not bystander-activated CD45RA-CD95+ CD8 T cells (72±9.2% vs 11±3.8%, P=0.003) despite comparable proliferation. Additionally, cytokine-activated NK cells expressed higher levels of inhibitory receptor TIGIT (85±4% vs 57±2%, P=0.01) and activation marker CD69 (99±1% vs 27±9%, P=0.008). Functionally, NK cells had increased expression of granzyme B compared to bystander activated CD8 T cells.

Conclusion: Although NK and bystander CD8 T cells can fill a similar immunologic niche regarding target cell killing, there are significant differences in expression of critical markers following activation. These differences may have consequences in the regulation of these cell types and impact anti-viral and anti-tumor responses, as well as the immunopathologic response during highly inflammatory, non-infectious states.

Geriatric age confers increased risk of post-operative complications following open reduction internal fixation for distal radius fracture: An NSQIP analysis

Dattesh R Dave, MD, MSc , Matthew R Zeiderman, MD, Corey M Bascone, MD, MPH, MBA, Andrew I Li, MD, Chetan S Irwin, MD, Clifford T Pereira, MD
Division of Plastic Surgery, University of California, Davis, Sacramento, CA

Introduction: Open reduction internal fixation of distal radius fractures is one of the most common fracture surgeries for Hand surgeons. Few studies have evaluated open reduction internal fixation within the geriatric population. This study hypothesizes that geriatric patients are at greater risk of post-operative complications relative to non-geriatrics following distal radius fracture fixation.

Methods: The American College of Surgeons National Surgical Quality Improvement Project (NSQIP) database was reviewed for open reduction internal fixation (ORIF) for distal radius fractures (DRFs) from 2005 – 2017. Hypothesis testing for demographics, co-morbidities, and post-operative complications between geriatric and non-geriatric patients was performed. Statistically significant differences were then evaluated with multi-variate logistic regression analysis.

Results: A total of 17,097 ORIF for DRFs were collected by NSQIP 2005-2017, with 5,654 patients older than 64 years (33.2%). Average age for geriatric patients undergoing ORIF for DRF was 73.7 years versus 46.7 years for non-geriatric patients. Rates of pre-operative risk factors including body mass index, albumin level, diabetes, dialysis dependence, smoking status, and operative time were statistically different between the groups ($p<.001$). Geriatric age confers a 1.5-times increased risk for any post-operative complication following ORIF for distal radius fracture adjusting for pre-operative risk factors (OR^a 1.5 $p=.04$). Within the geriatric cohort, dialysis dependence was singularly predictive of returning to the operative room with a 14.5-times increased risk (OR^a 14.5 $p<.01$). Predictors for any 30-day post-operative complication within the geriatric cohort include prolonging operative time by 45-minute increments after 80 minutes (OR^a 1.3 $p<.001$).

Conclusion: Geriatric age confers an adjusted increased risk of 30-day post-operative complication. Geriatric patients who are dialysis dependent carry a significant increased risk for returning to the operative room within 30 days. Prolonging operative time increased the risk for any post-operative complication within the geriatric cohort. Hand surgeons can use these findings to guide pre-operative discussions with their geriatric distal radius fracture patients.

Lauren Perry

The role of radiation therapy in addition to lumpectomy and hormone therapy in men 70 years of age and older with early breast cancer: An NCDB analysis

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Division of Surgical Oncology, Department of Surgery
*Lauren Perry and Sarah B. Bateni contributed equally to this work.

Introduction: Current treatment guidelines for male breast cancer are guided by female-only trials despite data suggesting distinct clinicopathologic differences between sexes. We sought to evaluate if radiation therapy (RT) after lumpectomy was associated with equivalent survival among men ≥ 70 years of age with Stage I, estrogen receptor (ER) positive tumors, as seen in women from the Cancer and Leukemia Group B (CALGB) 9343 trial.

Methods: We performed a retrospective analysis of 752 stage I, ER-positive male breast cancer patients ≥70 years who were treated with hormone therapy and surgery, with or without RT, from the National Cancer Database between 2004-2014. Patients were categorized based on surgery and RT (lumpectomy alone, lumpectomy with RT, and mastectomy alone). Multivariable Cox proportional hazards regression analysis was used to compare overall survival between treatment groups.

Results: Most patients underwent total mastectomy, with only 32.6% treated with lumpectomy. Of those who underwent lumpectomy, 72.7% received adjuvant RT. In multivariate analysis, there was no statistical difference in overall survival when comparing lumpectomy alone to lumpectomy with RT (aHR 0.72 [95%CI 0.38-1.37], p=0.31), or when comparing lumpectomy (alone or with RT) and mastectomy (aHR 1.28 [95%CI 0.88-1.87], p=0.20).

Conclusion: In this national sample of elderly men with ER-positive early-stage disease treated with endocrine therapy, there were no significant differences in overall survival when comparing lumpectomy alone to lumpectomy with RT, or lumpectomy (alone or with RT) to mastectomy. These results suggest that less aggressive treatment may be appropriate for a subset of male breast cancer patients.

The OmniMax MMF System: A cohort study for clinical evaluation

Matthew Zeiderman MD, Douglas Kendrick DDS, Kyle Stein DDS, Michael S. Wong MD, Granger B. Wong MD, DMD, William Morio DDS, M. Kinon Lecholop DMD, Martin Steed DDS

Division of Plastic & Reconstructive Surgery

Introduction: Hybrid maxillomandibular fixation (MMF) systems are composed of an arch bar fixated to the alveolus with screws. Perceived problems of these systems include risk of damage to tooth roots and periodontal structures. This study presents the results of a clinical trial evaluating the safety and efficacy of the OmniMax MMF system (Zimmer Biomet), applied to patients undergoing repair of uncomplicated mandibular fracture(s).

Methods: This multi-center, prospective, uncontrolled, single cohort study included 39 adult patients (31 males, 8 females) with one or more mandibular fractures repaired within 10 days using the OmniMax MMF system. Open-reduction internal fixation of fractures were completed as indicated and MMF placed for 4-8 weeks. Data was collected prospectively at baseline, intra-operative device placement, and removal. Outcome measures included tooth root damage from screw insertion, time for device implantation and removal, incidence of surgeon glove perforation or sharps exposure, incidence of mucosal overgrowth and gingival necrosis, patient quality of life metrics, and adverse events.

Results: Average length of MMF was 49.6±11 days. Average time for device implantation was 14.6±5.0 minutes. All removals were completed in an outpatient setting in an average 3.2±2.2 minutes. Mean patient-reported pain score (0-10 scale) was 5.1±1.6 before device application and 1.9±2.2 prior to removal. 605 root surfaces could be affected by screws. 515 (85.6%) had no contact, 84 (13.9%) had minor contact, 6 (1.0%) had root contact. No screw contact required further treatment. Adverse events at final visit included 3 cases (7.7%) of injury/damage to periodontal structure. 38/39 (97.4%) had adequate fracture healing. 37/39 (94.9%) had satisfactory final occlusion. No glove perforations or accidental punctures occurred.

Conclusion: Results of this study support safe and effective use of the OmniMax MMF system for treating uncomplicated mandibular fractures.

Oral Presentations

Medical Education Building | Session 3 | Lecture 2222

Dake Hao

Kaitlin Clark

Timothy Guenther

Mounika Bhaskara

Shawn Tejiram

Jordan Jackson

DAKE HAO

Functionalization of polymeric scaffolds with human chorionic villus mesenchymal stem cell derived exosomes to improve vascularization and regeneration potential

Dake Hao[1], Hila Swindell[1], Ruiwu Liu[2], Kit Lam[2], Diana Farmer[1], Aijun Wang[1,3]

[1]Department of Surgery, [2]Department of Biochemistry and Molecular Biology, [3]Department of Biomedical Engineering, UC Davis

Introduction: Polymeric scaffolds have been widely used in regenerative medicine to provide structural support to guide cell growth and tissue regeneration. Electrospun nanofibrous scaffold has a three-dimensional structure mimicking the native extracellular matrix (ECM) architecture, however, lack biological motifs and surface cytocompatibility. Exosomes have immense potential to impact tissue engineering and regenerative medicine applications due to the mediation of intercellular information transfer in numerous biological systems. Vascularization is crucial to supply cells and tissue with nutrients and oxygen for tissue engineering and regeneration. Thus, in this study, we propose to improve the vascularization and regeneration potential of the polymeric electrospun scaffolds by loading the scaffolds with functional exosomes.

Methods: We isolated exosomes from human chorionic villus mesenchymal stem cells (CV-MSCs) and characterized them by nanoparticle tracking analysis (NTA), transmission electron microscopy (TEM) and Western-blot. We previously identified LLP2A, an integrin α4β1 ligand by One-Bead One-Compound (OBOC) technology. We here developed an approach to enable 'click chemistry' to immobilize LLP2A onto the surface of polymeric electrospun scaffolds as a linker to immobilize exosome. Exosome immobilization was evaluated by scanning electron microscope (SEM). The endothelial cell (EC) functions on the exosome-modified electrospun scaffolds were evaluated by MTS, RT-PCR and Western-blot.

Results: Exosomes derived from CV-MSCs significantly improved EC migration and endothelial gene expression. LLP2A treated 2D culture surface significantly improved exosome attachment. SEM results showed exosomes were successfully immobilized onto the surface of LLP2A modified electrospun nanofibrous scaffolds. Exosome modified electrospun scaffolds significantly improved EC attachment, survival and phosphorylation of AKT, decreased the expression of apoptosis-related genes such as caspase 9.

Conclusion: This study demonstrates that exosomes hold promising potential to functionalize biomaterial constructs and improve the vascularization and regeneration potential. The exosome modified biomaterial scaffolds can be widely used for different tissue engineering applications

Postnatal treatment of canine spina bifida using placenta-derived mesenchymal stem/stromal cells: Clinical trial update

Kaitlin Clark[1,2], Melissa Vanover[1], Nicole Kreutzberg[1], Connor Long[1], Lee Lankford[1] Priyadarsini Kumar[1], Naomi Walker[2], Rogério Martins Amorim[2], Dori Borjesson[2], Beverly Sturges[2], Diana L. Farmer[1], Aijun Wang [1,2]
[1]Surgical Bioengineering Laboratory, [2] Veterinary Institute for Regenerative Cures

Introduction: The canine is increasingly recognized as a valuable pre-clinical large animal model for many human diseases. Canine spina bifida (SB) clinically presents very similarly to human SB, and English bulldogs in particular have a high incidence of naturally occurring SB. Placental mesenchymal stem cells (PMSCs) are being investigated as an adjunct to prenatal repair of SB; however, similar treatments have not been explored for postnatal repair. English bulldogs could serve as the first postnatal animal model of SB. The goal of this study is to evaluate canine PMSCs (cPMSCs) to test their efficacy as a postnatal therapy in a naturally occurring large animal disease model.

Methods: To date, we have enrolled six 10-week-old English bulldogs with SB defects confirmed by neurological evaluation and magnetic resonance imaging (MRI). Each dog underwent a multi-segment laminectomy and 4/6 dog's treatment was coupled with transplant of allogeneic cPMSCs embedded in hydrogel and extracellular matrix scaffold. One-year follow-up has been completed on four study animals and the remaining two animals are currently being evaluated.

Results: The first two dogs enrolled were initially ambulatory with notable abnormal gaits and incontinence. MRI revealed L7-S1 defects of varying severity. One MRI also showed a large syringohydromyelnia involving the lumbar spinal cord. Electrophysiologic testing revealed low-normal conduction velocity for both motor and sensory hindlimb nerves. Both dogs recovered from posterior laminectomy and cPMSC implantation uneventfully. At 8 weeks post-treatment both dogs showed improved ambulatory gaits. MRIs performed at 8 weeks showed only syrinx recurrence. No significant adverse events occurred in any dog by 12 months. The remaining four animals' evaluations are currently being collected and/or analyzed.

Conclusions: Postnatal treatment of a naturally occurring canine model of SB with allogeneic cPMSCs is clinically feasible and appears safe. Further studies are currently being performed to evaluate efficacy. The findings from this study suggest that naturally occurring canine SB is a valuable translational model to evaluate PMSC postnatal therapy and will provide critical insights for human clinical studies.

High versus low volume fluid resuscitation strategies in a porcine model (Sus scrofa) of thermal and traumatic brain injury

Tim Guenther, Lindsey Bach, Marguerite Spruce, Carl Beyer, Conor Caples, John K Grayson, Tina Palmieri, Ian Brown

Division of Burn Surgery, UCD

Division of Trauma and Acute Care Surgery, UCD

Background: Combined burn and traumatic brain injury (TBI) treatment priorities may not align due to the need for high volume burn resuscitation while attempting to minimize cerebral edema due to TBI. We developed a porcine model of combined thermal injury and TBI and compared an "aggressive" strategy using the Parkland formula and a "restrictive" strategy using the modified Brooke formula.

Methods: 28 Yorkshire cross swine were anesthetized and received a 40% total body surface area full thickness burn injury and TBI. Swine were then randomized to receive "restrictive" or "aggressive" resuscitation. Resuscitation continued for 8 hours after which time animals were euthanized and necropsy was performed. The volume of brain injury was assessed after analyzing segmental slices of brain tissue.

Results: Swine in the aggressive resuscitation group gained significantly more mass during resuscitation (2.3±1.3 kg vs 1.1±1.1, p value 0.01). There were no differences between the restrictive and aggressive resuscitation groups in MAP, heart rate, central venous pressure, or ICP. There were no significant elevations in serum lactate for either group compared to baseline measurements or between groups after 8 hours of resuscitation. UOP was higher in the aggressive resuscitation group (7.3±1.8 mL/kg/hr. vs 5.3±1.8, p value <0.01). The restrictive group had a significantly higher serum BUN in comparison to baseline and in comparison, to the aggressive group. There was no significant difference in size of brain injury between groups. (1.4±0.5 cm^3 vs 1.6±0.8, p valve 0.51)

Conclusions: By widely used clinical assessments of resuscitation (MAP, serum lactate, and UOP), both the restrictive and aggressive resuscitation groups appeared to demonstrate adequate resuscitation at 8 hours from injury. Elevation in serum BUN were seen in the restrictive group and may be an indicator of early acute kidney injury, even though both groups had UOP that was clinically adequate (> 1 mL/kg/hr.). Resuscitation strategy did not appear to effect ICP levels or the size of brain injury.

Mounika Bhaskara

Therapeutic potential of placenta-derived mesenchymal stem/stromal cells cultured in human platelet lysate for acquired spinal cord injury

Mounika L. Bhaskara, Priyadarsini Kumar, Christopher D. Pivetti, Kaitlin C. Clark, Aijun Wang, Diana L. Farmer

Surgical Bioengineering Laboratory

Introduction: Spinal Cord Injury (SCI) is a life-altering event that can result in irreversible disabilities. We have successfully used placenta-derived mesenchymal stem/stromal cells (PMSCs) as a therapy in an ovine model of myelomeningocele, a congenital form of SCI. PMSCs are currently cultured in a growth medium containing fetal bovine serum. But, to limit the risk of any zoonotic transmissions, we propose serum-free based expansion of PMSCs using Human Platelet Lysate (HPL) for the treatment of acquired SCIs.

Methods: PMSCs were isolated from discarded 2nd-trimester human placenta via an established explant culture method in HPL supplemented medium. PMSCs were evaluated for growth kinetics, trilineage differentiation potential, MSC phenotype by flow cytometry, and basal concentrations of brain-derived neurotrophic factor (BDNF), vascular endothelial growth factor (VEGF), and hepatocyte growth factor (HGF) by enzyme-linked immunosorbent assay (ELISA). The neuroprotective capability of PMSCs was studied using a staurosporine-induced apoptotic human neuroblastoma cell line. PMSC angiogenic potential was analyzed using an ex vivo aortic ring sprouting assay and the immunomodulatory effect was observed via a mixed leukocyte reaction (MLR).

Results: HPL containing growth medium increased PMSC proliferation as evaluated by their doubling time. PMSCs cultured in HPL containing medium expressed typical MSC surface markers CD29, CD44, CD73, CD105 and CD90 and did not express endothelial marker CD31, or hematopoietic markers CD45 and CD34. PMSCs maintained their differentiation potential into adipogenic, chondrogenic and osteogenic lineages. The secretory profiles of the cells contained substantial amounts of BDNF, VEGF, and HGF. PMSCs demonstrated robust neuroprotective capabilities based on increased neurite outgrowth. Improved sprouting was seen in the aortic rings treated with PMSCs. The cells were also able to inhibit T-cell proliferation in an MLR assay as shown by reduced BrdU incorporation.

Conclusion: These results demonstrated that PMSCs cultured in HPL containing medium maintain their therapeutic potential. Our next aim is to test the cells in vivo in a SCI rat contusion model to establish a therapy for Acquired Spinal Cord Injuries.

Comparing frailty scores and predicting falls in acutely injured elderly patients over time: A prospective study

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Introduction: Elderly fall-related injuries are a significant cause of morbidity and mortality. Though frailty is considered a predictor of poor outcomes in geriatric trauma, literature comparing frailty scoring systems remains limited. This study seeks to examine which frailty scoring system best predicts falls over time in the elderly.

Materials and Methods: Acutely injured patients 65 years and older were enrolled and prospectively observed. Demographics and frailty measures using FRAIL Scale, Trauma Specific Frailty Index (TSFI), and Canadian Frailty Scale (CSHA-CFS) were determined from surveys at enrollment and 3 months intervals following discharge for one year. Surveys queried the total number and timing of falls. Changes in frailty over time were assessed by logistic regression and area under the curve (AUC).

Results: Fifty-eight patients were enrolled. FRAIL Scale and CSHA-CFS did not change over time, but TSFI did ($F_{4, 152} = 4.52$, $p = 0.002$). Worsening frailty was observed by TSFI at 6 ($p = 0.006$) and 12 months ($p = 0.0001$) relative to baseline. Mortality did not differ between frailty systems. Increasing frailty scores and time post-discharge was associated with increased odds of a fall. AUC estimates with 95% CI were 0.722 [0.641, 0.803], 0.813 [0.744, 0.881], and 0.761 [0.682, 0.841] for Frail Scale, TSFI, and CSHA-CFS, respectively.

Conclusions: Risk of falls post-discharge was associated with increased age, time post-discharge, and frailty in our population. No scale appeared to significantly outperform the other by AUC estimation. Further study on the longitudinal effects of frailty is warranted.

Post-operative opioid prescribing trends in adolescents and pain-related encounters

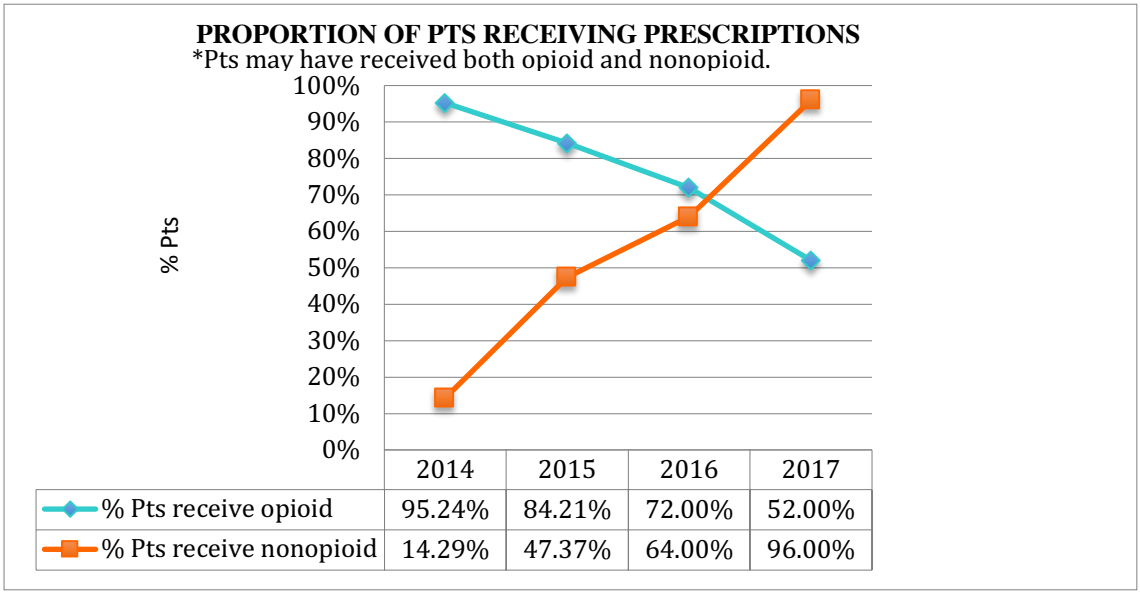
Jordan E Jackson, Christina M Theodorou, Kaeli J Yamashiro, Sarah C Stokes, Erin Brown, Shinjiro Hirose, Alana Beres, Diana Farmer, Payam Saadai

Purpose: The United States is amidst an opioid epidemic with over-prescribing and diversion of unused prescriptions as major contributors. This study aimed to evaluate opioid prescribing trends for adolescents at a tertiary children's hospital as national awareness of this opioid crisis increased. We hypothesized that opioid prescriptions would decrease and that this decrease would not be associated with an increase in clinical encounters for pain.

Methods: From 7/2014 to 12/2017, patients aged 13-18 years who underwent either a laparoscopic appendectomy (LA) or laparoscopic cholecystectomy (LC) were included. Patients were categorized based on year and receipt of opioid prescriptions or non-opioid prescriptions (including discharge instructions to take over-the-counter pain medications) at discharge. Encounters for pain were evaluated for each patient. Data were analyzed with Fischer's exact test.

Results: 109 total patients (77 LA and 32 LC) with a mean age of 15.7 ± 1.5 years were included. There was a decrease in proportion of patients receiving opioid prescriptions from 95.2% in 2014 to 52.0% in 2017 (p=0.002). There was also an increase in proportion of patients receiving non-opioid prescriptions from 14.3% in 2014 to 96.0% in 2017 (p<0.0001)[Fig 1]. 12 patients had documented encounters for pain; 11 were patients prescribed an opioid at discharge and one was not prescribed an opioid. Additionally, there were 3 phone calls for constipation, all in patients who had been prescribed opioids.

Conclusion: Mirroring the national emphasis to decrease opioid prescriptions, there was a significant decrease in the proportion of adolescent patients prescribed opioids and an increase in non-opioid prescriptions. There were more post-discharge encounters for patients who were prescribed opioids, suggesting that a decrease in opioid prescriptions is not associated with an increase in post-discharge encounters for pain.



	2014	2015	2016	2017
% Pts receive opioid	95.24%	84.21%	72.00%	52.00%
% Pts receive nonopioid	14.29%	47.37%	64.00%	96.00%

Quick Shot Presentations

Medical Education Building | Session 1 | Lecture 1222

Luis Godoy

Yunfeng Xue

Ping Song

Ganesh Rajasekar

Angela Aguirre

Avni Suri

Ugur Basmaci

Sarah Mahdavi

Andrew Wishy

Comparison of first 25 robotic lobectomy at UC Davis for lung cancer to contemporaneous and historical video-assisted thoracoscopic surgery lobectomy

Luis Godoy, MD, Timothy Huynh, BA, James M. Clark, MD, Lisa M. Brown, MD, MAS, David T. Cooke, MD

Section of General Thoracic Surgery, Department of Surgery, University of California, Davis Health

Introduction: Technical innovation, including improved image quality, wristed movements, and instrument stability have promoted the growing use of robotic surgery as an alternative to Video-Assisted Thoracoscopic Surgery (VATS) lobectomy in patients with stage 1 lung cancer. We sought to compare the quality and safety of our first 25 Robot-Assisted lobectomy, to VATS and tested the hypothesis that new and complex surgical technology can be introduced without sacrificing patient safety or outcomes.

Methods: Using the UC Davis Section of General Thoracic Surgery Database, we compared robotic lobectomy and VATS lobectomy cases, from 2/2017 to 2/2018 (the year before introducing the new robotic system) and 3/2018 to 2/2019 (the year of introduction of the new robotic system). We measured perioperative morbidity, 30-day mortality, nodal upstaging and we performed a univariate analysis to observe differences between the three cohorts: Robotic (3/2018-2/2019), VATS (3/2018-2/2019), and VATS (2/2017-2/2018).

Results: We identified 25 robotic lobectomy and 28 contemporaneous VATS lobectomy cases from 3/2018 to 2/2019 (year of introduction of the robotic system), and 35 VATS lobectomy cases from 2/2017 to 2/2018 (year before introducing the robotic system). Robotic lobectomy operating room times were longer compared to VATS (median 383 versus 295 minutes, respectively; $p < 0.0001$); all other operative measurements were similar. All postoperative outcomes were similar, including 30-day mortality (robotic lobectomy, 0% versus VATS, 0%) and perioperative complications. Median length of stay was 4 days for all three cohorts. There was no difference in nodal upstaging (28% incidence in robotic, versus 14.4% and 10.7% in VATS 2/17-2/18 and 3/18-2/19, respectively; $p = 0.377$). There was a decrease over time in robotic OR time.

Conclusion: Patients undergoing robotic lobectomy had longer operative times, but otherwise no difference in hospital length of stay, perioperative outcomes, mortality, and had similar incidence of nodal upstaging when compared to VATS lobectomy. These results suggest equipoise when comparing early experience of robotic lobectomy with VATS and demonstrates that new and complex surgical technology can be introduced without sacrificing patient outcomes.

Panniculectomy in preparation for renal transplant: A ten-year experience

Yunfeng Xue, MD; Pope Rodnoi, BS; Ping Song, MD; Jennifer H. Kuo, MD, Christoph Troppmann, MD; Chad Bailey, MD; Michael S. Wong, MD

Division of Plastic Surgery

Division of Transplant Surgery

Introduction: Patients with end-stage renal disease are frequently denied access to transplant surgery due to obesity and poor functional status. Those with a large panniculus may be declined secondary to concern for potential wound healing complications. To decrease post-transplant wound and graft complications, we implemented a program where patients underwent panniculectomy to regain candidacy for renal transplant.

Methods: We performed a retrospective review of all patients deemed high-risk for post-kidney transplant wound complications who underwent panniculectomy in preparation for renal transplant at our institution from 2008 to 2018. A minimum of 3 months follow-up is needed for inclusion in the study. Patient characteristics (age, BMI, medical comorbidities, maximum BMI and weight lost prior to panniculectomy) and surgical outcomes (specimen weight, operation length, time to drain removal, wound complications, time to treat complication) were analyzed after panniculectomy as well as after transplantation.

Results: A total of 65 panniculectomies in renal transplant candidates were included in our study. Overall complications occurred in 33 patients (50.8%). Minor complications (wound separation, cellulitis, skin necrosis) occurred in 23 patients (35.4%); major complications (hematoma, seroma, abscess, unplanned return to the operating room) and medical complications occurred in 12 patients (17%). 32 patients have since undergone renal transplant. No patients have experienced post-transplant wound healing complications.

Conclusions: Panniculectomy in preparation for renal transplantation can be performed in patients with end-stage renal disease with a high but manageable complication rate, converting previously ineligible patients into eligible candidates for kidney transplantation. These wound complications are more easily managed prior to institution of immunosuppression required for renal transplant.

Drivers of increased hospital resource utilization in 15,510 hand infection patients

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Samuel J. Lin, MD, MBA,[2] Andrew Li, MD[1]

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2Division of Plastic and Reconstructive Surgery, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA

Introduction: Hand infections are commonly encountered, with severe cases often necessitating surgical intervention and hospitalization. This study aims to characterize patient and hospital level factors associated with increased hospital resource utilization.

Methods: Patients with a primary diagnosis of hand infection and primary intervention of incision and drainage were retrieved from the Healthcare Cost and Utilization Project National Inpatient Sample Database (2014-2015). A gamma regression with a log-link function was performed to adjust for confounders and to identify drivers of increased length of stay (LOS), hospital costs, as well as procedural delay following admission. Reference groups for regression were included, race, age <65 years, private insurance, and Elixhauser Comorbidity Index (ECI): 0,

Results: There were 15,510 identified patients. Significant drivers of increased LOS included non-White race (Black: 0.190 days, Hispanic: 0.560 days), age >65 years, income in the 3rd quartile, non-private insurance status, and ECI (1: 0.219 days, 2: 1.132 days). Drivers of increased hospital costs included non-White race, income quartile, non-private insurance, and ECI (1: $326.23; 2: $2049.26). Notably, such drivers were associated with patients who received incision and drainage at a significantly delayed time following admission.

Conclusions: Our results suggest that increased hospital resource utilization for severe hand infections requiring incision and drainage and hospitalization is largely associated to racial minority, non-private insurance status, and increased comorbidity status, rather than hospital-level influences.

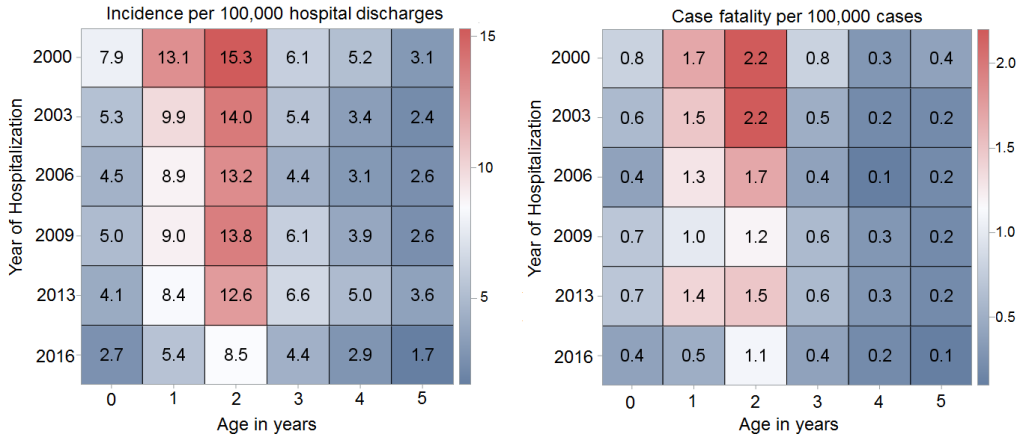

Figure 1. Drowning incidence and case fatality rates between 2000 and 2016 by age.

Trends in pediatric drowning from 2000-2016: Challenges and opportunities

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Introduction: Drowning is the leading cause of death in children under the age of 5 years. Despite prevention efforts, drowning continues to disproportionately affect children in the US. We examined the national incidence of drowning and noted high-risk populations.

Method: A retrospective analysis of a nationally representative sample of children ages 0-5 years, hospitalized for drowning between 2000 and 2016, was conducted using the Health Care Cost and Utilization Project Kid Inpatient Database.

Results: The average annual incidence of drowning in the study period is 6.5 cases per 100,000 hospitalizations. From 2000 to 2016, incidence decreased from 8.4 to 4.3 cases per 100,000 hospitalizations per year (49% reduction). Case fatality decreased from 1.04 to 0.46 per 100,000 cases per year (56% reduction). Two-year-old children experienced the highest incidence, with a rate of 15.3 in 2000 and 8.5 in 2016 per 100,000 hospitalizations per year. The case fatality rate was also highest in 2-year-olds, 13.1 in 2000 and 5.4 in 2016 per 100,000 cases per year (**Figure 1**). The average annual incidence of drowning per 100,000 hospitalizations was higher in males (7.9) versus females (4.9) and hospitals in the West (8.6) and South (7.9), compared to Midwest (3.8), and North (3.7).

Conclusion: Prevention efforts to reduce drowning in children have been effective, as evidenced by an overall reduction of cases in the last decade. However, 2-year-old children, boys of all ages, and children in hospitals in the West and South continue to experience rates that exceed national averages. Prevention efforts targeted to reduce drowning in these high-risk groups are needed.

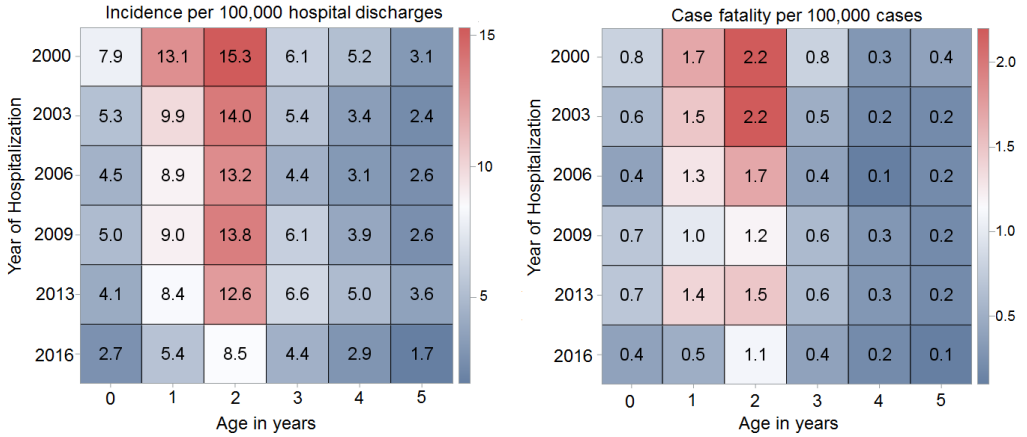

Figure 2. Drowning incidence and case fatality rates between 2000 and 2016 by age.

Time to diagnostic testing and risk of amputation for patients with lower extremity ulcers

Angela Aguirre, Aman Aroro, Misty D. Humphries. Division of Vascular Surgery

Objectives: Patients with lower extremity wounds from diabetes mellitus or peripheral artery disease have a risk of amputation as high as 25%. In patients with arterial disease, revascularization decreases the risk of amputation. We aimed to determine if early assessment of arterial perfusion correlates with amputation rates.

Methods: We retrospectively reviewed patients referred to the vascular clinic over an 18 months with lower extremity wounds to determine when and who performed a complete pulse exam, and when diagnostic studies to evaluate perfusion were performed. Kaplan Meier analysis was used to determine if timing affected outcomes for treatment an amputation.

Results: Sixty-one patients with lower extremity wounds were identified. Of these, 26 patients (43%) did not have a pulse exam performed by their primary care provider when the wound was identified. Patients were classified by when they underwent ankle brachial index testing to assess arterial perfusion. Fourteen patients had early ABI (<30 days) testing, with the remaining 47 patients having late ABI testing. Patients in the early ABI group were more likely to have a pulse exam done by their PCP than those in the late group, 11 (78%) vs 23 (49%), p =0.13. Early ABI patients had a quicker time to vascular referral. (Table) Early patients also had quicker times to revascularization and wound healing than those in the late group. Finally, patients that underwent early ABI were less likely to require major amputation (Figure), although this did not reach statistical significance (p=0.2).

Discussion: Early ABI testing expedites specialty referral and time to revascularization. It can decrease time to wound healing. Larger cohort studies are needed to determine the overall effect of early ABI testing to decrease amputation rates.

Patient Characteristic	Early ABI n=14	Late ABI n=47	p-value
Age (Mean and SD)	69 years	70 years	0.93
Male Gender	11	27	0.26
Diabetes	10	33	0.87
Coronary Artery Disease	6	16	0.82
COPD	3	8	0.97
Mean Time to Vascular Referral	17 days	165 days	0.0001
Mean Time to Revascularization	48 days	101 days	0.02
Mean Time to Wound Healing	141 days	349 days	0.005

Predictors of unplanned readmission and mortality after below knee amputation

Avni Suri, Leo M. V. Andrada, Andrew M. Wishy, Matthew Vuoncino, Matthew W. Mell, Mimmie Kwong.

Division: Vascular

Introduction: Perioperative mortality and unplanned readmissions are considered quality indicators for patient care. Published data suggests that major lower extremity amputations are associated with high perioperative complication rates and low long-term survival.

Methods: We conducted a retrospective review of all patients who underwent below-knee amputation (BKA) between July 2014 and June 2019 at our medical center. Patient demographics and preoperative conditions were collected and statistical analysis was performed to determine predictors of 30-day mortality and unplanned 30-day readmission.

Results: 128 patients underwent below knee amputations during the study period (52% right; 48% left). 69% of patients were male, 31% were female, with a mean age of 62.7 years. There were high rates of medical comorbidities, including 48% of patients with coronary artery disease, 48% with chronic kidney disease, and 71% with diabetes. The overall 30-day mortality rate was 4.8%. 27.3% of patients experienced a complication during the admission. The overall unplanned 30-day readmission rate was 29.8%. Independent predictors of 30-day mortality included coronary artery disease (p=.01), congestive heart failure (p=.008), preoperative clopidogrel use (p=.01), and complications during the index admission (p = 0.046). The most significant predictor of unplanned 30-day readmission was wound complications (p=.002).

Conclusion: Patients undergoing BKA at our institution had high rates of comorbid conditions. While the overall perioperative mortality rate was low, nearly 30% of patients were readmitted within 30 days with wound breakdown being the primary contributing factor for unplanned readmissions. Future efforts to reduce readmissions after lower extremity amputation should be aimed toward prevention and outpatient treatment of wound breakdown.

Surgical and oncologic outcomes in vascular resection and reconstruction for advanced cancer: A case series

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Introduction: Arterial involvement/encasement is a rare complication of advanced tumors, and the optimal management of these patients is unclear. Limited data currently exist describing short- and long-term outcomes, including peri-operative morbidity/mortality and oncologic outcomes. We sought to evaluate surgical outcomes including vascular graft patency and long-term oncologic outcomes among patients undergoing major tumor resection with en bloc arterial resection and reconstruction.

Methods: From a prospective database, we identified and retrospectively analyzed 7 patients who underwent oncologic surgery with vascular resection and reconstruction for various neoplasms involving major blood vessels at UCD Medical Center since 2010. Data were abstracted on patient and treatment factors as well as surgical and oncologic outcomes. Descriptive statistics were evaluated.

Results: In this cohort, the mean age was 58.3 ± 21.7 yrs and 86% were female. Median length of stay was 14 days [7, 30]. Diagnoses were primary sarcomas (4), recurrent carcinomas (2) and an inflammatory pseudotumor encasing the aorta. All patients underwent arterial reconstruction of a major vessel (2 aortic, 4 iliac, and 1 femoral) using cryopreserved allografts. Two patients had no post-Op complications and 3 had complications unrelated to oncologic/vascular surgery. One patient developed fascial dehiscence requiring re-operation and 1 was readmitted due to acute DVTs. One patient developed cancer recurrence and died after 29 mo., and 1 is under active surveillance for potential recurrence. All grafts are patent at a median follow-up of 1.2 yrs with 0% re-intervention rate for stenosis/occlusion.

Conclusion: In this small series, vascular resection and reconstruction as part of the multi-modality treatment of regionally advanced cancers is associated with acceptable short- and long-term outcomes, including excellent graft patency with cryopreserved allografts. In appropriately selected patients, involvement of major arterial structures should not be a contraindication to attempted curative surgery.

Optimized long-term result of nipple-areola complex reconstruction in implant-based breast reconstruction

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Background: Nipple-areola complex reconstruction (NACR) is a crucial step providing the visual appearance of procedural completion after breast reconstruction. However, the long-term outcomes after NACR remain less than satisfactory. We performed these reconstructions with a modified skate flap and derma-fat grafts and assessed patient satisfaction and surgical outcomes.

Surgical technique: A flap is designed between 1-1.5 cm and the diameter of the new areola is 3.8 or 4.2 cm depending on the expected final size and projection of the reconstructed nipple. To reconstruct the areola, a skin graft is harvested from common donor sites. Derma-fat graft is inserted into the reconstructed nipple before final closure for additional projection. Complete healing is achieved by three weeks. If excess skin develops around the reconstructed nipple, de-epilthelization and skin-edge re-approximation are performed to improve shape without compromising vascularity.

Methods: 30 patients underwent unilateral (n=9) or bilateral (n=21) NACRs post implant-based breast reconstruction. Patient satisfaction (with respect to size, shape, and, projection of nipple) and post-operative complications were reviewed in patient charts and post-operative photography.

Results: Reconstructed nipples showed maintenance of adequate shape, size and projection, with the final projection of each nipple appearing to be more than 5mm. 24 (80%) patients reported full satisfaction. 6 (20%) were satisfied with size and projection, but not shape due to excess skin around the reconstructed nipple. With revision, all patients reported full satisfaction. There were no surgical complications requiring reoperation.

Conclusion: A modified skate flap with derma-fat grafts after implant-based breast reconstruction improves long-term patient satisfaction and may maintain good long-term projection without the need for additional patient donor sites.

MAGnesia: Magnesium infusion for analgesia in the critically ill trauma patient

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Division of Trauma, Acute Care Surgery, and Surgical Critical Care

Introduction: In perioperative patients, magnesium has been shown to reduce postoperative pain and analgesic requirements. However, magnesium has yet to be applied systematically outside of the operating room. Critically ill trauma patients often require opiate-based pain regimens and may benefit from magnesium as an adjunct to decrease opiate requirements and provide adequate pain control.

Methods: This double-blinded randomized, placebo-controlled trial will enroll 156 patients when complete. Patients are randomized to receive a 40 mg/kg bolus followed by a 24-hour infusion of normal saline (placebo) or magnesium sulfate. Oral morphine equivalents (OMEs) and pain scores are tracked before, during, and after study drug infusion. Instances of bradycardia, dysrhythmia, over-sedation, agitation, and respiratory depression are recorded. For this interim report, the groups remain blinded and were labeled "Group A" and "Group B" by the pharmacy team performing randomization.

Results: Currently, 22 patients (32% female, mean age= 48) have received study drug infusion. Mechanism of injury has been MVC (50%), fall (27%), assault (9%), gunshot wound (9%), and motorcycle crash (5%). Common injury patterns include fracture of at least one rib (64%), spine (55%), and at least one extremity (55%). Seven patients have had an intra-abdominal injury (32%). The mean ISS score of Group A is 21; Group B is 16. Both groups have received an average of 23 hours of infusion; 3 patients required early termination of infusion due to a surgery. One patient in Group B experienced mild respiratory depression, not requiring cessation of infusion. There have been no other instances of side effects in either group. There is no difference in OME requirement between groups during (57 vs. 88 p=0.28) or after infusion (50 vs. 69, p=0.45). The instances of severe pain scores during infusion have been lower in Group A (p=0.01).

Conclusion: Thus far, infusion of magnesium sulfate for pain control has been safe; its efficacy remains unknown. Group A has had significantly fewer instances of severe pain during infusion, though OME requirements are not different between groups. Patient accrual continues, with a goal of 156 patients.

Objective: Below knee amputations (BKA) have high rates of wound complications and surgical revisions. Published studies suggest a correlation between closure technique and wound healing, however, there is a paucity of literature discussing wound closure types and amputation outcomes.

Methods: This single institution study included all BKA patients over a 5-year period. Patients with subdermal closure and tourniquet use (TREATMENT) were compared with those closed with staples, skin sutures, or without tourniquet use (CONTROL). Demographics, preoperative conditions, and intraoperative factors were recorded. The primary outcome was 30-day wound breakdown.

Results: 128 patients received BKA with complete data (101 [78.9%] TREATMENT and 27 [21.1%] CONTROL). Groups were similar with exception of race, sex, and indication for operation. Median length of stay was 5 days (IQR 3-8 days). Wound breakdown occurred in 29 (24%) of patients. Of these, 83% happened after discharge. TREATMENT patients had less wound breakdown (18.6% vs. 40.7%, p=.016). On univariate analysis, surgical technique, post-operative antiplatelet (19.8% vs. 44.4%, p=.022), and sex (male 15.1% vs. female 42.1% p=.001) were associated with less wound breakdown while post-operative anticoagulation was associated with more wound breakdown (40% vs. 15.5%, p=.003). After stratifying for sex, multivariate logistic regression showed a persistent benefit for the TREATMENT in men (OR .09, CI .016 – .55, p=.009) but no benefit in women (OR 4.1, CI .36 – 46, p=.26). Surgical revision was required in 51.7% of patients with wound breakdown vs. 0% patients without breakdown (p<.0001).

Discussion: Subdermal skin closure with the use of tourniquet significantly decreased wound breakdown and subsequent surgical revision after BKA. This benefit was seen for men but not for women. Factors explaining the interaction between sex and surgical technique are unknown and may be a tangible area for further investigation.

Quick Shot Presentations

Medical Education Building | Session2 | Lecture 2222

Amanda Phares

Stephanie Kwan

Leora Goldbloonm-Helzner

Mollie Mustoe

Nikia Mcfadden

Siqi He

Kara Kleber

Sam Miotke

Charleston Chua

Sarah Stokes

Amanda Phares

Division of Trauma, Acute Care, and General Surgery, Department of Surgery, UC Davis Health

M Spruce, A Phares, K Richards, E Salcedo

Introduction: Trauma-informed care (TIC) is an organizational structure and treatment framework that understands the complex interactions and consequences of all types of trauma with an emphasis on responding to trauma victims in a way that protects both the victim and the provider from additional harm.

Methods: General surgery residents at a large academic medical and Level I trauma center were invited to participate in a two-hour workshop on TIC. A 12-item survey was created to assess awareness, understanding, and attitudes surrounding TIC and secondary traumatization and was administered before and after the workshop.

Results: Forty-six general surgery residents participated in the workshop. Pre-workshop resident familiarity with TIC was low but significantly improved after the workshop (1.85 vs 4.44, $p<0.001$). Resident perceived ability to recognize symptoms of secondary trauma in themselves and others improved (3.28 vs 4.00, $p<0.001$; 3.13 vs 3.86, $p<0.001$) as did resident awareness of treatment strategies (2.46 vs 3.95, $p<0.001$). Residents overwhelmingly agreed with both (4.49 and 4.58) the workshop's value and its benefit to other trauma providers.

Conclusion: Research has demonstrated that training providers to be trauma-informed improves patient-centered interactions. Improved TIC awareness and practice is achievable through educational sessions such as the activity described above.

Stephanie Kwan

Reducing opioid use in endocrine surgery through patient education and provider prescribing patterns

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University of California- San Francisco, Anesthesia and Perioperative Care

Introduction Postoperative opioid use can lead to dependence, contributing to the opioid epidemic in the U.S. New persistent opioid use after minor surgeries occurs in 5.9% of patients. With increased documentation of persistent opioid use postoperatively, surgeons must pursue interventions to reduce opioid use peri-operatively.

Method We performed a prospective cohort study to assess the feasibility of a pre-operative intervention via patient education/counseling and changes in provider prescribing patterns to reduce post-operative opioid use. We included adult patients undergoing thyroidectomy and parathyroidectomy from 1/22/2019-2/28/2019 at a tertiary referral, academic endocrine surgery practice. Surveys were administered to assess pain and patient satisfaction post-operatively. Prescription, demographic, and comorbidity data were collected from the electronic health record.

Results 66 patients (74.2% women, mean age 58.6 [SD 14.9] years) underwent thyroidectomy (n= 35), parathyroidectomy (n=24), and other cervical endocrine operations (n= 7). All patients received a pre-operative educational intervention in the form of a paper handout. 91% of patients were discharged with prescriptions for non-opioid pain medications and 8% were given an opioid prescription on discharge. Among those whom received an opioid prescription, the median quantity of opioids prescribed was 135 (IQR 120-150) oral morphine equivalents. On survey, four patients (6%) reported any postoperative opioid use and 94% of patients expressed satisfaction with their pre-operative education and post-operative pain management.

Conclusion Clear and standardized education regarding post-operative pain management is feasible and associated with high patient satisfaction. Initiation of such education may support efforts to minimize unnecessary opioid prescriptions in the endocrine surgery population.

Optimizing the yield of placental mesenchymal stromal cell-derived extracellular vesicles in 3D culture systems

Leora Goldbloom-Helzner, Tatu Rojalin, Hila Shimshi Swindell, Kaitlin Clark, Aijun Wang

Surgical Bioengineering Lab

Introduction: Extracellular vesicles (EVs) derived from placental mesenchymal stem cells (PMSCs) have been shown to provide neuroprotection at sites of injury. However, a rate limiting step in EV research is low yield, high technical time, and high cost of current isolation procedures. To address this inefficiency, we cultured PMSCs on the PET matrix of a unique 3D bioreactor system to increase the absolute yield of EVs per mL of media and per cell.

Methods: PMSCs were cultured in this bioreactor system for 10 weeks. EV-conditioned media was collected weekly and EVs were isolated through differential centrifugation. Nanoparticle tracking analysis (NTA) measured EV size and concentration. Western blots were performed to quantify normal expression of EV markers (CD9, CD63, and CD81 and Calnexin(-)). Enzyme-linked immunosorbent assays (ELISA) measured levels of characteristic growth factors including vascular endothelial growth factor (VEGF), brain-derived neurotrophic factor (BDNF), and hepatocyte growth factor (HGF).

Results: EV morphological features remained unchanged until week 8, after which a decrease in both EV size and concentration was seen. Western blots revealed typical expression of the EV markers CD9, CD63, and CD81 and negative expression of Calnexin. Concentrations of VEGF, BNDF, and HGF in conditioned media were comparable after 10 weeks. Cost analysis revealed an overall increase in EV yield while shortening labor time and material costs. Future experiments will assess the preserved neuroprotective capabilities of the PMSC EVs.

Conclusions: This initial study uses a new 3D bioreactor system for a unique source of cells and has brought us closer to optimizing PMSC EV isolation protocols for increased yield and maintained sample purity, while simultaneously lowering costs and time commitment. Future studies will assess the optimization parameters using additional 3D culture systems including hollow fiber bioreactors, microspheres, and spheroid culture.

A prospective trial of intraoperative liposomal bupivacaine (Exparel) versus bupivacaine/lidocaine for thoracoscopic surgery

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Introduction: Given the worsening opioid crisis, enhanced recovery protocols utilizing intraoperative liposomal bupivacaine (LipoB) have been implemented in a variety of surgical specialties to improve patient recovery. No study to date has examined the effect of LipoB on patient reported outcomes (PROMs), and there is a paucity of data on the effect of long-term opioid usage up to 2 months postoperatively.

Method: Through a prospective cohort trial we enrolled 20 patients to receive 1:1 0.25% bupivacaine:1.0% lidocaine (control) followed by 20 patients to receive LipoB via intraoperative posterior intercostal nerve block. Eligible patients were those undergoing planned video-assisted or robot-assisted thoracoscopic lung resection, lung biopsy, or pleural biopsy. Patient postoperative opioid usage in morphine equivalent doses (MEDs) was calculated, and PROMs were recorded via a validated survey in the preoperative area, on day of discharge, at postoperative month 1, and at postoperative month 2.

Results: There were no demographic differences between treatment groups. Control patients had a 2.3x higher opioid need postoperatively while inpatient compared to LipoB patients (MEDs 296±227 vs 130±123 mg, p=0.006), and were more likely to still require opioids at time of discharge (65.0 vs 30.0%, p=0.03). On multivariable analysis, use of LipoB compared to Control decreased inpatient opioid MED requirements by 125 mg (β -125, 95%CI -222 to -29, p=0.013). Each additional 10 mg of inpatient MEDs required postoperatively increased the odds of continued opioid usage at discharge by 6.6% (OR 1.07, 95%CI 1.01 to 1.13, p=0.03) and at 1 month by 10.4% (OR1.10, 95%CI 1.02 to 1.20, p=0.02). PROMs did not differ at discharge, 1 month, or 2 months postoperatively.

Conclusion: LipoB significantly reduces the need for postoperative inpatient opioids after thoracic surgery, and may reduce the need for opioid prescriptions at the time of discharge. There was no difference in long term postoperative PROMs, suggesting that LipoB is not masking short term symptoms but provides durable long-term pain relief and patient recovery. Accordingly, the UC Davis Pharmacy and Therapeutics Committee has approved LipoB for use in thoracic surgery procedures in clinical settings.

	Control n=20 (50.0%)	LipoB n=20 (50.0%)	p-value
Age	67.1±9.7	63.3±14.8	0.35
Female	14 (70.0%)	13 (65.0%)	0.74
Caucasian	17 (85.0%)	16 (80.0%)	0.70
Married	13 (65.0%)	12 (60.0%)	0.82
College degree	7 (35.0%)	9 (45.0%)	0.15
Presence of Preoperative Pain	12 (60.0%)	9 (45.0%)	0.34
Conversion to Thoracotomy	1 (5.0%)	2 (10.0%)	0.75
30 Day ER Visit	3 (15.0%)	2 (10.0%)	0.63
30 Day Readmission	0 (0.0%)	1 (5.0%)	0.31

Table 1. Demographics and narcotic usage of control and LipoB patients.

Nikia McFadden

Injured behind bars: A descriptive study of prisoners presenting to a level 1 trauma

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Introduction: Over the past 40 years, the U.S. prison population has increased by more than 600%, but little has been previously described about this subpopulation of injured patients. Prisoners currently account for approximately 2-3% of hospitalized trauma patients at UCDMC. By improving our understanding of traumatic patterns in prisoners we can optimize the care of this marginalized population.

Methods: The medical records of injured adult prisoners who presented to UCDMC between February 2011 and April 2017 were reviewed. Data from the medical record was then linked to our institution's trauma registry. We conducted descriptive analyses to summarize characteristics of the injured prisoners and the care they received.

Results: During the aforementioned period, 14,461 injured adults were hospitalized at UCDMC and the hospitalizations of 299 injured prisoners were reviewed. 285 (96%) patients were male, mean age was 40.5 (SD=13) years and median length of hospital stay was 3 (IQ=5) days. 67% sustained blunt and 42% sustained penetrating trauma. 43% went to the operating room during their hospitalization. 70 patients (23%) were victims of interpersonal violence between prisoners. 10% of those who were able to communicate were noted to not be forthcoming about circumstances surrounding their injury. 36 cases (12%) involved self-inflicted harm and 33% of patients had a documented history of a psychiatric illness. However, psychiatry was only consulted in 15% of admissions.

Conclusion: A large number of injured prisoners who present to UCDMC have a history of psychiatric illness, are victims of interpersonal violence, and/or admit to self-harm. Clinicians who care for this population should consider liberal psychiatric evaluation. Since many do not feel comfortable sharing details about their injury, trauma centers who care for prisoners should consider mechanisms to better assure confidentiality.

The Mother Infant Lactation Questionnaire (MILQ): Assessing breastfeeding performance

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Introduction: Despite a growing focus on breastfeeding promotion and research, there currently is no validated measure to assess lactation and breastfeeding performance.

Methods: The Mother Infant Lactation Questionnaire (MILQ) was developed by our team in conjunction with biostatistics, nursing, and lactation support staff to assess lactation and breastfeeding performance across multiple mother and infant domains. The MILQ was piloted in a sample of mothers between the ages of 18-45 years who were between 6 months - 5 years postpartum.

Results: Fifteen subjects completed the MILQ (mean age: 31.8 years). All subjects produced milk within the first postpartum week and 86.7% attempted to breastfeed. Two patients did not breastfeed due to preference or infection. Roughly one-third of breastfeeding mothers indicated having insufficient milk production; of which 50% of these patients underwent prior surgery for fibroadenoma or macromastia. Of mothers who breastfed, two-thirds used breastmilk to feed their children almost exclusively. Thirty-eight percent of breastfeeding mothers noted lack of employer support and space to breastfeed at work as a considerable barrier.

Conclusion: The MILQ has the potential to become a widely recognized tool for clinicians and researchers to quantify and compare breastfeeding and lactation performance. Our findings indicate that the majority of mothers in our sample attempt to breastfeed, with most exclusively using breast milk. All patients in our sample who underwent previous breast surgery were able to lactate and breastfeed, although with limited milk supply.

Effects of 7, 8- dihydroxyflavone liposomes on diabetic wound healing

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Introduction: Diabetes is an important risk factor of chronic wounds. Skin innervation and neuropeptides may play an important role in wound healing. 7, 8-dihydroxyflavone (7, 8-DHF), a selective agonist for tyrosine kinase receptor B (TrkB) receptors, has been well studied for its neurotrophic functions. However, its role in angiogenesis still unknown. Since 7,8-DHF is very hydrophobic and its bioavailability is low, we designed a liposome nanoformulation for effective delivery. We further engineered the liposome surface with LXW7, a ligand specifically binds to integrin αvβ3 on endothelial cells (ECs). We hypothesize that 7,8-DHF liposomes could possess adequate bioavailability and promote both skin innervation and angiogenesis and modification with LXW7 will further increase EC targeting and uptake efficiency, ultimately accelerate diabetic wound healing.

Methods: We developed a protocol to produce 7,8-DHF liposomes and modified 7,8-DHF liposome surface with LXW7 using Click chemistry. We characterized 7,8-DHF liposomes and tested their effects on EC function and confirmed the activation of the TrkB pathway in ECs. In vivo, we use db/db diabetic mouse excisional splint wound model to test the effect of 7,8-DHF on wound healing. Wounds were treated by PBS, 7,8-DHF solution, 7,8-DHF liposomes or LXW7 modified 7,8-DHF liposomes. The wound healing process was determined by histological analyses and immunohistochemistry of the excisional wounds.

Results: We successfully developed a protocol to produce 7,8-DHF liposomes with high stability. In vitro function of the 7,8-DHF liposomes on ECs and neurons and in vivo function for diabetic wound healing are being evaluated and data will be collected in the coming weeks.

Conclusion: The 7,8-DHF liposomes possess outstanding stability and bioavailability and represent a promising novel treatment for diabetic wound healing. Future work will focus on the mechanisms of action of 7,8-DHF liposomes on both tissue innervation and neovascularization.

Economic & quantitative assessment of unanticipated emergency department visits for recently discharged violently injured patients

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Introduction: Evidence regarding emergency department (ED) recidivism specific to violent injury is sparse, but data suggest this population has a higher rate of re-visitation. Determining the economic impact and identifying predictive factors for unnecessary utilization can be used to tailor population specific interventions. We hypothesized that our violently injured population at UC Davis would have a high volume, low acuity ED utilization.

Methods: The study was designed as a retrospective cohort review of violently injured patients (VIP) over three years followed for 90-days post discharge. Demographic data, follow up instructions, ED visits, and trauma clinic visits were recorded. A financial analysis was completed on all ED visits to determine hospital and professional charges for each encounter.

Results: VIP presented to the ED after discharge at a rate of 32% with 16% having greater than 1 visit. Approximately half of these encounters had professional charges less than $500 and 90% had professional charges under $5000. Overall, the median professional cost was $561. Most of the 450 patients followed (76%) has scheduled or instructed outpatient follow up, however almost half never presented to trauma clinic.

Conclusion: Preliminary data demonstrates violently injured patients have a high rate of low acuity emergency department visits after discharge. This level of acuity suggests the majority of concerns were non-emergent and could be addressed in an outpatient setting. Future analysis will further classify predictive factors including reasons for ED visits and a more detailed economic component.

Causes and injury patterns of elderly burn patients

Sam Miotke MD, Kathleen Romanowski MD, Tina Palmieri MD, David Greenhalgh MD, Soman Sen MD

Introduction: Older patients are a vulnerable population with respect to burn injuries. The American Burn Association has invested resources in improving burn care and prevention within this age group. The National Electronic Injury Surveillance System (NEISS) is maintained by the Consumer Product Safety Commission to surveil for injury trends and is populated with data from a representative group of approximately 100 emergency departments in the United States. This database could be useful to evaluate burn injury patterns in elderly patients with an eye toward targeted prevention measures.

Methods: The NEISS was queried for patients aged 55 years and older with a diagnosis of scald, thermal, chemical, electrical, or unspecified burn injuries for the years 2008 - 2017. Each injury was classified by body part(s) burned, causative product, gender, and age group of patient (55-64, 65-74, 75-84, 85 and older). The ten most commonly burned sites and the ten most common causative products were determined for each gender and age group and in aggregate. Weighted estimates were utilized to calculate injury numbers across the population.

Results: The most common etiology of burn injuries for all patients was hot water. Men were most commonly injured by gasoline, a product which did not rank in the top ten for women in any age group. Cookware was the second most common cause among women and the sixth most common cause among men. For women, the combination of cookware and ranges/ovens was among the top two causative products within each age group. The most commonly injured body part for all patients was the face, holding across most age and gender groupings. Men were more likely to injure their hands than women.

Conclusions: The most common cause of burn injuries in older adults is hot water, and the most common body part affected is the face. Women are more likely to be injured by cookware and ranges/ovens. Men are more likely to be injured secondary to gasoline and are more likely to injure their hands.

Applicability of Research to Practice: NEISS data could be useful in the development of targeted prevention campaigns, such as focused education about the dangers of hot liquids, cooking, and accelerants.

Quantity of extirpated tissue does not predict post-operative seroma rates

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Plastic Surgery

Introduction: Post-operative closed suction drainage is a common practice in surgery to address the potential space created during a procedure. A surgical drain is composed of an evacuator which generates the negative pressure, tubing which propagates this negative pressure to the surgical site, and an open end in the surgical site which promotes tissue apposition by evacuating air or fluid. The literature currently demonstrates that drains generally reduce seroma formation however the decision to place a drain is largely anecdotal and there are no guidelines for the necessity of a drain. Our study aims to determine whether the potential space created during surgery, using excised tissue weight as a surrogate, to guide drain placement is a valid strategy.

Methods: A retrospective chart review of adult patients between 2014 to 2018 who had an extirpative surgery followed by reconstruction by a plastic surgeon at the University of California, Davis Medical Center were included in the study. Weight of tissue removed, placement of closed suction drain, and 90-day post-operative follow up for clinically significant seroma (seroma requiring drainage) were recorded. Criteria for drain removal was output of less than 30mL in the 24 hours preceding removal whereby no more than 1 drain was removed at a time in a 24 hour period if more than 1 drain was placed in the same potential space.

Results: Of 276 patients which met initial criteria, 142 patients had intra-operative specimen weight recorded. 6 patients were diagnosed with a clinically significant seroma requiring drainage with a mean tissue excision mass of 800.3 grams. The remaining 136 patients without seroma related complications had a mean tissue excision mass of 1020.7 grams (p=0.602). 100% of patients in the seroma group had at least 1 drain placed intra-operatively. The non-seroma group had 69.9% drain placement rate.

Conclusions: The amount of excised tissue does not predict the risk of clinically significant post-operative seroma despite drain placement.

Determining the need for pre-operative prophylactic antibiotics in pediatric patients receiving antibiotics for acute intra-abdominal infection

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Pediatric Surgery

Introduction: Administration of antibiotics within an hour of incision is a common quality metric for reduction of surgical site infections (SSI). Many pediatric patients who undergo surgery for an acute intraabdominal infection are started on systemic antibiotic treatment upon diagnosis. For these patients, we hypothesized that additional prophylactic antibiotic coverage within an hour of incision would not decrease rates of SSI.

Methods: A single institution retrospective review of patients <18 years undergoing appendectomy or cholecystectomy from July 2014 to July 2019 was performed. Only patients receiving systemic antibiotics in the 24 hours before surgery were included. Patients were categorized based on receipt of an antibiotic to cover gram positive bacteria within an hour of incision (no prophylaxis vs. prophylaxis). The primary outcome was SSI within 30 days. Secondary outcomes were Clostridium difficile colitis, anaphylactic reaction in the operating room and readmission within 30 days due to infection. Outcomes were compared with chi-square test and Fisher's exact test.

Results: A total of 363 patients were evaluated, with 271 (75%) receiving antibiotics to cover gram positive bacteria within an hour of incision. There was no significant difference in rate of perforated appendicitis between groups (28.2% no prophylaxis vs. 28.4% prophylaxis, p>0.999). There was no significant difference in rates of organ space SSI (4.3% no prophylaxis vs. 4.4% prophylaxis, p=0.97), superficial SSI (1.1% no prophylaxis vs. 0.7% prophylaxis, p>0.999), anaphylaxis rate in the OR (2.2% no prophylaxis vs. 0.7% prophylaxis) or readmission (0% no prophylaxis vs. 1.8% prophylaxis, p=0.19). One patient who received prophylactic antibiotics an hour before incision was readmitted on post-operative day 29 with Clostridium difficile colitis.

Conclusion: For pediatric patients receiving systemic antibiotics for acute intraabdominal infection, additional prophylactic antibiotics within an hour of incision may not be necessary to prevent surgical site infections.

On Behalf Of The Department Of Surgery, We Would Like To Thank Our Staff For Organizing This Event

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