UC DAVIS HEALTH | Department of Surgery

2023

THE 34TH ANNUAL

RESEARCH DAY SYMPOSIUM

APRIL 11, 2023

Lecture Hall 2222
Medical Education Bldg

Keynote Speaker:
David Mahvi, M.D.

Building a Surgical Career

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PROGRAM NOTES

AGENDA | APRIL 11, 2023

TIME	SESSION	LOCATION
6:30–8:00 a.m.	Poster Drop-Off	North Foyer and 1st Floor Breezeway
6:30–7:00 a.m.	Breakfast and Registration	North Foyer
7:15–7:30 a.m.	Welcome and Introduction	LH 2222
7:30–9:00 a.m.	Oral Presentations Session 1	LH 2222
9:00–9:15 a.m.	BREAK	
9:15–10:45 a.m.	Oral Presentations Session 2	LH 2222
10:45 a.m.–12:05 p.m.	Oral Mini Session 1	LH 2222
12:05–1:30 p.m.	Lunch and Poster Session 1	North Foyer and 1st Floor Breezeway
1:30–2:30 p.m.	Keynote Presentation	LH 2222
2:30–2:45 p.m.	BREAK	
2:45–4:00 p.m.	Oral Presentations Session 3	LH 2222
4:00–4:15 p.m.	Closing Remarks	LH 2222
6:00–8:00 p.m.	Dinner and Awards Ceremony	Tsakopoulos Library Galleria

ORAL PRESENTATION | SESSION 1 | LH2222 | 7:30–9:00 A.M.

TIME	PRESENTER AND TITLE
7:30–7:45 a.m.	***Matthew Farajzadeh*** — Do We Need Acellular Dermal Matrix in Prepectoral Breast Reconstruction? A Systematic Review and Meta-Analysis.
7:45–8:00 a.m.	***Alexandra Johns*** – Effect of Community Economic Well Being on Weight Recurrence following Bariatric Surgery
8:00–8:15 a.m.	***Sarah Chen*** – Use of 3D Printed Ribcage Models to Investigate Ideal Intrathoracic Ratio for Robotic Left Internal Thoracic Artery Harvesting
8:15–8:30 a.m.	***Kathleen Doyle –*** Proliferative Effects of Mesenchymal Stem/Stromal Cells on Neuroblastoma Cell Lines
8:30–8:45 a.m.	***Jacquelyn Yu –*** Pulsatile Perfusion Characteristics of En Bloc Kidneys Transplanted From Small Pediatric Donors May Predict Early Allograft Failure
8:45–9:00 a.m.	***Cyrus Sholevar*** – Tumor infiltrating natural killer cells in soft tissue sarcoma are predominantly CD56dim: Implications for outcomes

ORAL PRESENTATION | SESSION 2 | LH2222 | 9:15–10:45 A.M.

TIME	PRESENTER AND TITLE
9:15–9:30 a.m.	***Abdul Hassan*** — Development of a Simple and Reproducible Cell-Derived Orthotopic Xenograft Murine Model for Neuroblastoma
9:30–9:45 a.m.	***Kaitlin Clark*** – Optimization of Surface Modification Targeting Strategies of Placenta Mesenchymal Stem/Stromal Cell derived Extracellular Vesicles to Activated Leukocytes
9:45–10:00 a.m.	***Alyssa Bellini*** – Do serial troponins predict the need for cardiac evaluation in trauma patients after ground level fall?
10:00–10:15 a.m.	***Su Yeon Lee –*** Safety Outcomes of First Five Patients Enrolled in the Cellular Therapy for In Utero Repair of Myelomeningocele (CuRe) Trial
10:15–10:30 a.m.	***Kewa Gao –*** In utero delivery of mRNA to the heart, diaphragm and muscle with lipid nanoparticles to treat Duchenne muscular dystrophy

ORAL MINI SESSION 1 | LH2222 | 11:00 A.M.–12:15 P.M.

TIME	PRESENTER AND TITLE
11:00–11:08 a.m.	***Elise Hill*** — The Readiness Imperative: Leveraging Large Animal Research to Bolster Expeditionary Surgical Skills for Military Surgical Residents
11:08–11:16 a.m.	***Kathryn DiLosa*** – Defining Vascular Deserts to Describe Access to Care and Identify Sites for Targeted Limb Preservation Outreach
11:16–11:24 a.m.	***John Arriola*** – An Objective Assessment of Obesity-related Metabolic Comorbidities (AOMC) More Accurately Describes Disease Severity Compared to Clinical Assessment
11:24–11:32 a.m.	***Rachel Ekaireb –*** Current Practice Patterns in Palliative Care for the Injured Geriatric Trauma Patient
11:32–11:40 a.m.	***Zoe Saenz –*** Investigation of correlation between in vitro potency assay findings within vivo outcomes of the placental derived mesenchymal stem cell patch in a rodent myelomeningocele model.
11:40–11:48 a.m.	***Megan Gilbert*** – Patient's Perception of Likelihood to Attend Follow Up in Burn Surgery Clinic
11:48–11:56 a.m.	***Leora Goldbloom-Helzner*** – Optimization of Aptamer Surface Conjugation onto Extracellular Vesicles (EVs) using Single EV Analysis Technologies
11:56 a.m–12:04 p.m.	***Emily Zurbuchen*** – Structural Protein Content and Biomechanical Properties of Perforated and Unperforated Acellular Dermal Matrices for Surgical Reconstruction

LUNCH AND POSTER BOARD | 12:05–1:30 P.M.

GROUP AND POSTER #	PRESENTER AND TITLE
Group 1, Poster 1	***Miranda Bustamante*** – Impact of Fecal Microbiota Transplantation on Gut Bacterial Bile Acid Metabolism in Humans
Group 1, Poster 2	***Rahaf Shishani*** – Liraglutide Corrects Impaired Insulin Secretion in 14-3-3-ζ Overexpressing Mice
Group 1, Poster 3	***Priyadarsini Kumar*** – CuRe Trial: PMSC-ECM Product Manufacturing for Patients and Ongoing Characterization of the Cryopreserved Cell Banks
Group 1, Poster 4	***Tanishq Vaidya*** – Characterizing the protective effect of mitochondria-targeted antioxidant MitoTEMPO against ibuprofen-induced hepatotoxicity
Group 1, Poster 5	***Julia Persky*** – Characterization of the Immune Tumor Microenvironment in Colorectal Carcinoma Patients Undergoing Surgery
Group 1, Poster 6	***Sirjan Mor*** – Placental Mesenchymal Stem Cells and Extracellular Vesicles on an Extracellular Matrix Improved Motor Function Recovery After Acute Spinal Cord Injury
Group 2, Poster 1	***Sylvia Cruz*** – Intratumoral NKp46+ Natural Killer Cells are Spatially Distanced from T and MHC-I+ Cells with Prognostic Implications in Soft Tissue Sarcoma
Group 2, Poster 2	***Melanie Reuter*** – Dietary resistant starch supplementation upregulates deoxycholic acid production in mice
Group 2, Poster 3	***Kewa Gao*** – Co-transplantation of mesenchymal stromal/stem cells with endothelial colony-forming cells supported long-term survival and function
Group 2, Poster 4	***Lauren Farley*** – Cross-Species Characterization of Splenic Natural Killer (NK) Cells Reveals Organ-Specific Heterogeneity with Implications for Cancer Immunotherapy
Group 2, Poster 5	***Jennifer Loza*** – Analysis of Donor and Recipient Characteristics in Donation after Circulatory Death Kidney Transplants Resulting in Delayed Graft Function Compared to Primary Non-Function
Group 3, Poster 1	***Brian Luong*** – Identification of a Threshold Toe Arm Index to Predict Wound Healing in Patients Undergoing Vascular Intervention
Group 3, Poster 2	***Anastasiya Stasyuk*** – Prevalence of Co-Existing Esophageal Findings in Patients with Zenker's Diverticulum
Group 3, Poster 3	***John Arriola*** – Assessing Instrument Tray Utilization in Living Donor Renal Transplant (LDRT): Unused Instruments? Potential for a Leaner Tray
Group 3, Poster 4	***Nataliya Bahatyrevich*** – An Analysis of Thoracic Surgery Patients to Identify Predictors of Need for Home Health Services at Discharge

LUNCH AND POSTER BOARD | 12:05–1:30 P.M.

GROUP AND POSTER #	PRESENTER AND TITLE
Group 3, Poster 5	***Eric Robles Garibay*** – Association of Large Venous Vessel Invasion with Recurrence in Early-Stage Colon Cancer
Group 3, Poster 6	***Emily Xu*** – Improving Abdominal Aortic Aneurysm Surveillance for Women Using Natural Language Processing
Group 4, Poster 1	***Leslie Vuoncino*** – How Triage of Elderly Anticoagulated Falls Impacts Hospital Flow
Group 4, Poster 2	***Su Yeon Lee*** – Developmentally delayed children are more likely to present with perforated appendicitis
Group 4, Poster 3	***Karima Alghannam*** – Outcomes from Donation After Circulatory Death Kidneys with Prolonged Warm Ischemia Times are Comparable to All Deceased Donor Kidney Transplants
Group 4, Poster 4	***Kathleen Doyle*** – Building a Culture of Support at a Pediatric Surgery Center Through Multidisciplinary Peer Support
Group 4, Poster 5	***Anna Xue*** – Marking Subcentimeter Pulmonary Nodules for Resection Utilizing Robot-Assisted Bronchoscopy with Radial Endobronchial Ultrasound
Group 4, Poster 6	***Jordan Pitman*** – Pharmacotherapy Alone is Insufficient to Manage Metabolic Dysregulation in Patients with Severe Obesity
Group 5, Poster 1	***Golddy Saldana*** – Poor Availability and Readability of Spanish Patient Educational Materials for Cleft Lip and Palate — Review of the Nations' Top Children's Hospitals
Group 5, Poster 2	***Alexandra Johns*** – Outcomes After Bariatric Surgery in Patients with Pulmonary Comorbidities and Risk Factors
Group 5, Poster 3	***Araiye Medlock*** – Outcomes of Pulmonary Function after "Race De-correction" for Patients Undergoing Surgery for NSCLC
Group 5, Poster 4	***Kathryn DiLosa*** – Use of Lithotripsy for Treatment of Circumferential Calcification during TCAR for high-risk patients
Group 5, Poster 5	***Brian Howard*** – Rates of Approval for Kidney Transplant Listing at a Single Center Across Different Racial Groups
Group 5, Poster 6	***Matthew Vuoncino*** – Complications of Varicose Vein Interventions in the Vascular Quality Initiative

ORAL PRESENTATION | SESSION 3 | LH2222 | 2:45–4:00 P.M.

TIME	PRESENTER AND TITLE
2:45–3:00 p.m.	***Aryana Razmara*** – Pre-clinical evaluation and first-in-dog clinical trials of intravenous infusion of PBMC-expanded adoptive NK cell therapy in dogs with cancer
3:00–3:15 p.m.	***Leslie Vuoncino*** – Using Microfluidic Shear to Assess Transfusion Requirements in Trauma Patients
3:15–3:30 p.m.	***Matthew Vuoncino*** – Effects of Cyclic Peptide LXW7 Coating on Short Term Vascular Graft Patency Using a Porcine (Sus scrofa) Model
3:30–3:45 p.m.	***Nataliya Bahatyrevich –*** A Closer Look at Endothelial Cells of Vascular Bypass Conduits and Harvesting Techniques
3:45–4:00 p.m.	***Nick Antonino –*** Survival After Contralateral Secondary Breast Cancer by Age Group in California

WELCOME FROM THE CHAIRS

The Department of Surgery Annual Research Symposium is an opportunity to recognize and celebrate the extraordinary research accomplishments of our trainees and faculty, who work every day to ensure better outcomes for our patients. While conducting rigorous research is not without challenges, few things are as rewarding as creating and contributing to new knowledge and advancing surgical science.

Our department has a rich history of contributing to surgical science and research, and we strive to ignite the passion for research in our trainees. Research in the Department of Surgery is a core value made possible by the tireless dedication, commitment, and collaboration of faculty, staff, students, and trainees. Together, we all learn from curiosity, and periodically, we must step back to reflect on our efforts and celebrate them in a way that invigorates and prepares us to meet the challenges of tomorrow.

Our Annual Research Symposium is an opportunity to stimulate new ideas and collaborations by highlighting the breadth of research activities happening across the various surgical disciplines. It is important—and refreshing— to occasionally lift our heads, look around, and observe what is happening outside our focus areas. In doing so, we might identify resources that can enhance our own research portfolios as well as find the camaraderie of like-minded peers, which can serve as a source of inspiration.

This year our program will include oral presentations, quick-shot oral presentations, and traditional poster presentations to highlight the diverse research in our department. We will award prizes for the best oral and quick shot presentation, as well as two awards for the best poster.

We thank you for joining us today to celebrate surgical science and research and help advance our field forward.

Sincerely,

Diana L. Farmer, M.D., F.A.C.S., F.R.C.S.
Distinguished Professor and Pearl Stamps Stewart Chair
Chair, Department of Surgery, UC Davis School of Medicine
Surgeon-in-Chief, UC Davis Children's Hospital

Rachael Callcut, M.D., M.S.P.H., F.A.C.S.
Professor and Vice Chair, Clinical Sciences

Aijun Wang, M.S., Ph.D.
Professor and Vice Chair, Translational Research, Innovation and Entrepreneurship

KEYNOTE SPEAKER – DR. DAVID MAHVI, M.D.

Dr. David Mahvi is a national and international authority in the field of hepatobiliary cancer and surgical education. He has pioneered the development of novel biologics and ablation techniques for the treatment of cancer. Dr. Mahvi is currently the Chief of the Division of Oncologic and Endocrine Surgery and a Professor of Surgery in the Department of Surgery at the Medical University of South Carolina (MUSC). He also holds important institutional roles including as the Chief of the Oncology Integrated Center of Clinical Excellence (ICCE) at the MUSC Cancer Center.

Prior to MUSC, Dr. Mahvi was the James R. Hines Professor of Surgery, Chief Division of Gastrointestinal and Oncologic Surgery, Vice Chair for Clinical Affairs, and President of Northwestern medical Group at Northwestern University Feinberg School of Medicine, and served as Chief of Surgical Oncology, and Director of the General Surgery Residency Program at the University of Wisconsin-Madison.

A native of Oklahoma, Dr. Mahvi completed his undergraduate work in microbiology and pre-medicine at the University of Oklahoma and his medical degree at the Medical University of South Carolina. He served as Chair of the American Board of Surgery (ABS), where he developed a national policy on the education and management of the surgical workforce, and as the former president of the Society for Surgery of the Alimentary Tract (SSAT).

ORAL PRESENTATIONS

SESSION 1

LH 2222 | 7:30–9:30 A.M.

Matthew Farajzadeh
Do We Need Acellular Dermal Matrix in Prepectoral Breast Reconstruction?
A Systematic Review and Meta-Analysis.

Alexandra Johns
Effect of Community Economic Well Being on Weight Recurrence following Bariatric Surgery

Sarah Chen
Use of 3D Printed Ribcage Models to Investigate Ideal Intrathoracic Ratio
for Robotic Left Internal Thoracic Artery Harvesting

Kathleen Doyle
Proliferative Effects of Mesenchymal Stem/Stromal Cells on Neuroblastoma Cell Lines

Jacquelyn Yu
Pulsatile Perfusion Characteristics of En Bloc Kidneys Transplanted
From Small Pediatric Donors May Predict Early Allograft Failure

Cyrus Sholevar
Tumor infiltrating natural killer cells in soft tissue sarcoma
are predominantly CD56dim: Implications for outcomes

DR. MATTHEW FARAJZADEH, M.D.

Do We Need Acellular Dermal Matrix in Prepectoral Breast Reconstruction? A Systematic Review and Meta-Analysis.

Dr. Matthew Farajzadeh, M.D.[1] • Dr. Ian Nolan, M.D.[2] • Dr. Jonathan Bekisz, M.D.[3]
Dr. Carter Boyd, M.D., M.B.A.[3] • Dr. Ella Gibson, M.D.[1] • Dr. Ara Salibian M.D.[1]

[1]UC Davis Medical Center, Sacramento, CA, USA. [2]Rush University Medical Center, Chicago, Illinois, USA.
[3]NYU Langone Health, New York, New York, USA

ABSTRACT

Introduction

Use of acellular dermal matrices (ADM) in implant-based breast reconstruction has contributed to increased popularity of prepectoral breast reconstruction (PBR). ADM is also associated with higher cost and complications including infection and seroma. Comparative studies on PBR with and without ADM are limited to small, single-institution series. This study performs a meta-analysis of prepectoral reconstruction with and without ADM to understand each technique.

Methods

A systematic literature review was performed to identify studies comparing PBR with and without ADM using PubMed, EMBASE, and Cochrane databases. 280 unique articles were identified, four met inclusion criteria. Reconstructive outcomes were compared.

Results

515 reconstructions from four studies were selected for analysis. The majority of cases were nipple-sparing mastectomies (61.2% in ADM and 65.6% in non-ADM cohorts) versus skin-sparing, and utilized tissue-expander based reconstructions (83.5% in ADM and 83.3% in non-ADM cohorts) versus direct-to-implant. In reconstructions utilizing ADM, Alloderm was utilized in 311 cases and Fortiva in 14 cases.

Meta-analysis demonstrated no significant difference in the rate of complications between cohorts with and without ADM. Short-term complications included reconstructive failure (1.2% in ADM cohort and and 2.8% in non-ADM), seroma (1.2% and 8.3%, respectively), hematoma (1.2% and 2.1%), infection (4.7% and 4.2%), ischemia and/or necrosis (2.4% and 5.2%). Long-term complications included rippling (3.3% and 5.1%) and capsular contracture (6.8% and 3.4%) (Figures 1-6). Reconstructive failure was inconsistently reported.

Conclusions

Meta-analysis of 515 cases of PBR demonstrated equivalent rates of seroma, infection, capsular contracture, and rippling between cases with and without ADM. Comparative studies are lacking in the literature and larger studies with long-term outcomes need further refinement for indications for ADM.

DR. ALEXANDRA JOHNS, M.D.

Effect of Community Economic Well Being on Weight Recurrence following Bariatric Surgery

Dr. Alexandra Johns, M.D., M.P.H.[1] • Dr. M. Siobhan Luce, M.D.[1] • Mr. Mason Kaneski, B.S.[2]
Dr. Victoria Lyo, M.D.[2] • Dr. Shushmita Ahmed, M.D.[2]

[1]University of California, Davis, Department of General Surgery, Sacramento, CA, USA.
[2]University of California, Davis, Division of Foregut, Metabolic, and General Surgery, Sacramento, CA, USA

ABSTRACT

Introduction

The role of socioeconomic status (SES) on postoperative weight recurrence remains unclear. Distressed Community Index (DCI) is an SES metric which creates a composite score of community economic well-being. This study aims to evaluate the effect of SES (using DCI) on post-bariatric weight recurrence.

Methods

Retrospective review of patients undergoing primary laparoscopic Roux-en-Y gastric bypass or sleeve gastrectomy was performed. Preoperative characteristics and postoperative weights were documented. Last recorded postoperative weight (LRPW) included last weight in the medical record, not limited to bariatric visits. Patients were stratified into low-tier (LT) and high-tier (HT) DCI groups based on zip code.

Results

Between 2015 and 2020, 325 patients underwent surgery and had LRPW >3 years postop; 182 had LRPW >5 years. Average follow-up in bariatric clinic was 1.78±1.6 years. Average time to LRPW was 4.17±1.95 years. Percent excess weight loss (%EWL) between groups was similar at 1 year (61.2% LT-DCI vs 56.9% HT-DCI, p=0.10) and 3-5 years postop (42.7% LT-DCI vs 40.5% HT-DCI, p=0.66). LT-DCI patients had greater weight loss at >5 years postop on univariate analysis (45.1% LT-DCI vs 34.5% HT-DCI, p=0.02); however, this was not significant on multivariate regression (controlling for multiple factors). There was no difference in percentage of patients who gained >15% EWL between 1 and 3-5 years postop or between 1 and >5 years postop. Average %EWL increase from 1 year was 16.4% for 3-5 years and 18% for >5 years. The percentage of patients with BMI > 35 at 3-5 years and >5 years were not different between groups.

Conclusions

Our study showed similar weight loss and recurrence between DCI groups, despite LT communities having fewer resources. These results challenge prior studies showing SES effects weight recurrence. Further evaluation is needed in the role of composite SES scores such as DCI on long term weight loss and weight recurrence.

DR. SARAH CHEN, M.D.

Use of 3D Printed Ribcage Models to Investigate Ideal Intrathoracic Ratio for Robotic Left Internal Thoracic Artery Harvesting

Dr. Sarah Chen, M.D. • Dr. Jorge Catrip, M.D. • Dr. Bob Kiaii, M.D.
UC Davis, Division of Cardiac Surgery, Sacramento, CA, USA

ABSTRACT

Introduction

Patient selection is crucial when considering eligibility for robotic coronary surgery. For robotic left internal thoracic artery (LITA) harvesting in particular, careful measurement of intrathoracic anatomy is critical to ensure adequate access to the length of the LITA. Generally, an anteroposterior (AP) distance to transverse distance ratio of greater than 0.45 has been accepted as the rule of thumb, as a lower ratio is thought to increase risk of instrument collision. This study investigates the limits of the AP to transverse ratio using customized 3D printed models.

Methods

Several life-sized left hemi-ribcage models were created based on a chest CT. The control ribcage model had an AP to transverse ratio of 0.55, from which derivative ribcage models were created with ratios of 0.45, 0.40, and 0.35. These models were 3D printed using a fused deposition modeling printer. The models were then used for simulation using a da Vinci robotic trainer to mimic LITA take down.

Results

There were no issues with instrument maneuverability and access to the LITA in the ribcage models with AP to transverse ratios of 0.55 and 0.45. For the 0.40 ratio model, there were initially challenges with instrument collision, which were eventually alleviated with port placement adjustment.

Conclusions

This study shows that robotic LITA harvesting may be possible in a chest with an AP to transverse ratio less of than 0.45—as low as 0.40 and potentially even lower—as long as port placements are sufficiently precise. This type of study using customized 3D models can be further utilized to investigate the extremes of chest anatomy to determine compatibility with robotic cardiac procedures, which may ultimately expand patient eligibility for robotic cardiac surgery.

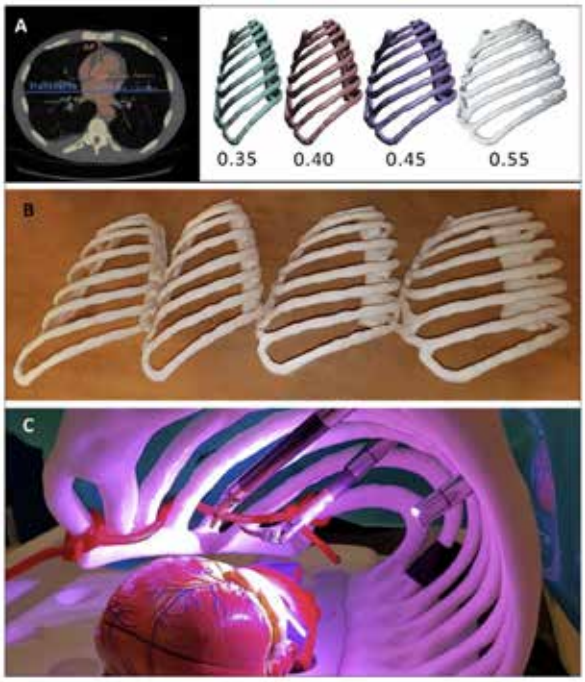

Figure: Ribcage models; (A) digital models, with varying AP to transverse ratios; (B) physical 3D printed models; (C) view of robotic LITA harvest simulation inside printed ribcage model.

Proliferative Effects of Mesenchymal Stem/Stromal Cells on Neuroblastoma Cell Lines

Dr. Kathleen Doyle, M.D.[1] • Ms. Maria Sutter, B.S.[2] • Ms. Monica Rodriguez, B.S.[2]
Dr. Abd-Elrahman Hassan, M.D.[3] • Mr. Matthew Ponzini, M.S.[4] • Dr. Priyadarsini Kumar, Ph.D.[2]
Dr. Erin Brown, M.D.[5]

[1]General Surgery, Sacramento, CA, USA. [2]Surgical Center for Bioengineering, Sacramento, CA, USA.
[3]General Surgery, Sacramento, CA, USA. [4]Clinical and Translational Science Center, Sacramento, CA, USA.
[5]Pediatric Surgery, Sacramento, CA, USA

ABSTRACT

Introduction

Neuroblastoma is a devastating pediatric cancer with survival rates of less than 50% for high-risk disease. Mesenchymal stem/stromal cells (MSCs) may be a novel cellular delivery vehicle given their innate tumor homing properties, but MSCs have shown variable effects on tumor growth. We compared the effects of placental MSCs (PMSCs) and bone marrow MSCs (BM-MSCs) on the proliferation of neuroblastoma (NB) cells *in vitro*.

Methods

Proliferative effect were assessed by indirect co-culture with inserts with no MSCs as controls. NB cell proliferation was assessed using MTS assay and fold change (fc) over control was calculated. 3 NB cell lines (NB1643, SH-SY5Y, and CHLA90) were co-cultured with early-gestation PMSC (n=9), term PMSC (n=5) or BM-MSC (n=4) cells. Early PMSCs were sub-grouped by neuroprotective effects: strong (n=2), intermediate (n=3), and weak (n=4). A linear mixed effects model was used to assess the relationship between MSC type, PMSC neuroprotective level, and PMSC gestational age on NB cell proliferation.

Results

Proliferative effects varied between MSC groups and NB cell lines. BM-MSCs had a lower proliferative effect (fc 1.18) on all NB cell lines compared to early (fc 1.4, $p=0.002$) and term PMSCs (fc 1.51, $p<0.001$). Levels of neuroprotective effect of PMSCs did not significantly affect proliferation. BM-MSCs had the lowest proliferative effects on CHLA90 (fc 1.01), compared to NB1643 (fc 1.33) and SH-SY5Y (fc 1.20). For NB1643, there was no difference in proliferation between PMSCs and BM-MSCs, however, term PMSCs significantly increased NB proliferation vs. early PMSCs ($p=0.0376$).

Conclusions

Effects of MSCs on NB cell proliferation varies by MSC source and NB cell line. BM-MSCs showed lower proliferative effects than most PMSCs, except with NB1643, suggesting the effects of PMSCs on NB cell growth may vary by tumor histology. Further characterization of these MSCs may provide insight for which cells are best suited for drug delivery.

DR. JACQUELYN YU, M.D.

Pulsatile Perfusion Characteristics of En Bloc Kidneys Transplanted From Small Pediatric Donors My Predict Early Allograft Failure

Dr. Jacquelyn Yu, M.D. • Dr. Junichiro Sageshima, M.D. • Dr. Peter Than, M.D.
Dr. Neal Mineyev, M.D. • Dr. Naeem Goussous, M.D. • Dr. Richard Perez, M.D.
University of California Davis Health, Transplant Surgery, Sacramento, CA, USA

ABSTRACT

Introduction

While hypothermic pulsatile perfusion (PP) is commonly used to evaluate the viability of adult donor kidneys prior to transplantation, little is known about its application to kidneys from small pediatric deceased donors. In this study, we analyze the PP characteristics of pediatric en bloc (PEB) kidneys from this underutilized source to establish baseline PP parameter values and determine whether these parameters can identify kidneys at risk of early allograft failure (EAF).

Methods

We reviewed PP characteristics of PEB kidneys from donors weighing less than 20 kg transplanted at our institution between 2010 and 2021. Analysis of variance was performed on PP characteristics by donor weight quartiles, and chi-square test was applied to identify thresholds for EAF within 90 days of transplantation.

Results

During the study period, 265 patients (98% adult), of which 134 (51%) were female, with a median (range) age of 50 (7 to 76) years, underwent transplantation using PEB kidneys from donors with a median (range) weight of 6.5 (1.9 to 18.5) kg. The median (range) pulsatile perfusion time was 6.9 (1.4 to 30.3) hours. We found that as donor weight decreases, terminal resistance increases (Figure). Within donor weight quartiles, higher terminal resistance was associated with EAF, although not statistically significant throughout. In the 1-5 kg and 5-10 kg donor weight quartiles, resistance greater than or equal to 1.1 and 0.8 mmHg/ml/min, respectively, was significantly associated with EAF (p=0.038, p=0.014, respectively). Similarly, lower terminal flow was associated with EAF, although not statistically significant throughout.

Conclusions

These findings enhance our understanding of PP characteristics of small PEB kidneys ad demonstrate that changes in resistance occur as a function of donor weight. Elevated resistance may be an important consideration in estimating the risk of EAF.

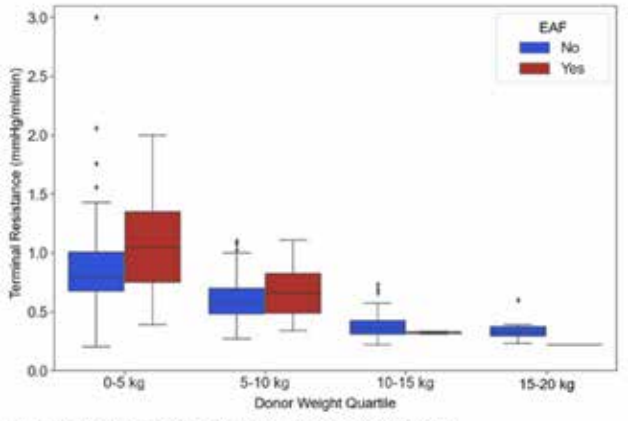

Figure: Distribution of terminal resistance by donor weight quartiles.

DR. CYRUS SHOLEVAR, M.D.

Tumor infiltrating natural killer cells in soft tissue sarcoma are predominantly CD56^{dim}: Implications for outcomes

Dr. Cyrus Sholevar, M.D.[1] • Ms. Sylvia Cruz, B.S.[1] • Ms. Khurshid Iranpur, B.S.[1] • Dr. Sean Judge, M.D.[1] Dr. Alicia Gingrich, M.D.[1] • Ms. Lauren Farley, B.S.[1] • Ms. Aryana Razmara, M.S.[1] • Mr. Marshall Lammers, B.S.[1] Dr. Steven Thorpe, M.D.[1] • Dr. Arta Monjazeb, M.D., Ph.D.[2] • Dr. William Murphy, Ph.D.[3] • Dr. Robert Canter, M.D.[1]

[1]UC Davis, Department of Surgery, Sacramento, CA, USA. [2]UC Davis, Department of Radiation Oncology, Sacramento, CA, USA. [3]UC Davis, Department of Dermatology, Sacramento, CA, USA

ABSTRACT

Natural killer (NK) cells have been shown to be important mediators of anti-tumor responses, including in soft tissue sarcomas (STS). However, NK cells show significant heterogeneity, depending on maturation, tissue residency, and inflammatory environment. As previous studies have suggested that tumor-infiltrating NK cells (TiNKs) acquire a less cytotoxic CD56bright tissue resident phenotype, we sought to compare blood versus tumor NK cell phenotype in STS, evaluate the frequency of CD56bright NK cells in tumors and assess their association with survival. We prospectively collected blood and tumor from 27 STS patients undergoing surgery from 2018-2022 and analyzed NK phenotype by flow cytometry. 52% were female, the mean age was 59, and 74% were AJCC stage 3. Increasing absolute number of NK cells in the blood correlated with longer survival ($P<0.005$, $r=0.6$). As expected, CD56dim NK cells predominated in the blood (91.5±5.8% of CD3-CD56+ lymphocytes compared to 80.1±13% in tumor, $P<0.005$). In contrast, CD56bright cells were enriched in tumors, representing 18.5±13% of TiNKs compared to 8.4±5.8% in blood ($P<0.005$). Although CD56bright NK cells were approximately 2.4±3-fold higher in tumor compared to blood, CD56dim NK cells still represented the majority of TiNKs. Higher proportions of both overall NK cells and CD56dim NK cells in tumors were associated with better metastasis-free survival on Kaplan-Meier analysis ($P<0.05$). CD56dim TiNKs had significantly higher NKp46 expression than CD56brights consistent with increased activation. In conclusion, both blood and intra-tumoral NK cells appear prognostic in STS. Although the proportion of CD56bright TiNKs is higher in blood than tumor, the majority of TiNKs in STS are CD56dim consistent with a cytotoxic phenotype. CD56dim NK cells are promising targets for improved immunotherapy in STS.

PROGRAM NOTES

ORAL PRESENTATIONS

SESSION 2

LH 2222 | 9:15–10:45 A.M.

Abdul Hassan
Development of a Simple and Reproducible Cell-Derived Orthotopic Xenograft Murine Model for Neuroblastoma

Kaitlin Clark
Optimization of Surface Modification Targeting Strategies of Placenta Mesenchymal Stem/Stromal Cell derived Extracellular Vesicles to Activated Leukocytes

Alyssa Bellini
Do serial troponins predict the need for cardiac evaluation in trauma patients after ground level fall?

Su Yeon Lee
Safety Outcomes of First Five Patients Enrolled in the Cellular Therapy for In Utero Repair of Myelomeningocele (CuRe) Trial

Kewa Gao
In utero delivery of mRNA to the heart, diaphragm and muscle with lipid nanoparticles to treat Duchenne muscular dystrophy

DR. ABD-ELRAHMAN HASSAN, M.D.

Development of a Simple and Reproducible Cell-Derived Orthotopic Xenograft Murine Model for Neuroblastoma

Dr. Abd-elrahman Hassan, M.D.[1,2] • Dr. Kathleen Doyle, M.D.[1,2] • Priyadarsini Kumar, Ph.D.[2]
Maria Sutter, M.S.[2] • Erin Brown, M.D., M.S.[1,2]

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ABSTRACT

Introduction

Neuroblastoma is a rare childhood cancer with remarkable heterogeneity. Development of targeted therapies is essential for improved treatment. Patient-derived xenografts (PDX) and genetically engineered mouse models (GEMM) are reliable models for oncologic research; however, they are resource-intensive, expensive, and require significant experience to develop and maintain. We developed an orthotopic xenograft murine model of neuroblastoma that utilizes banked human neuroblastoma cell lines, requires minimal equipment, and is easily reproducible.

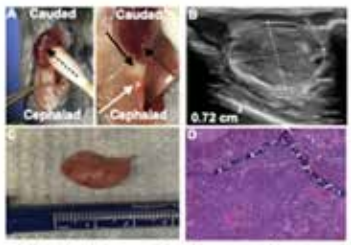

Figure 1. Establishment of *in vivo* neuroblastoma orthotopic model. (A) intraoperative neuroblastoma seeding; cell pellet suspended in hydrogel (black arrow), adrenal gland (white arrow) and kidney (hashed arrow) **(B)** Ultrasound with tumor area **(C)** Tumor from necropsy **(D)** H&E staining of tumor after necropsy confirming neuroblastoma appearance.

Methods

Neuroblastoma cell line NB1643 was obtained from the Children's Oncology Group Childhood Cancer Repository. NSG mice underwent orthotopic injection of 2x10e6 NB1643 cells suspended in 10µL of collagen hydrogel directly into the adrenal gland via an open retroperitoneal surgical approach. Mice were monitored by ultrasound and Lago X (Spectral Instruments) until the tumor reached the volume of the ipsilateral kidney. Tumor identity was confirmed by necropsy and histologic analysis.

Results

36 mice underwent surgery. 4 died due to anesthetic or surgical complications. 25/32 (78%) survivors grew adrenal tumors. Average anesthesia time was 30 minutes. Ultrasound and bioluminescence imaging successfully characterized tumor growth in all mice. Average time to target tumor size was 5 weeks (range 3–9 weeks). Gross pathologic and histologic analysis confirmed neuroblastoma in all mice with adrenal tumors.

Conclusions

A cell-derived orthotopic xenograft murine model can be successfully used to create an in vivo model of neuroblastoma. This model can be utilized in environments where PDX or GEMM models are not feasible. Further directions include expansion and optimization of the current model, as well as exploration of percutaneous orthotopic tumor cell injections.

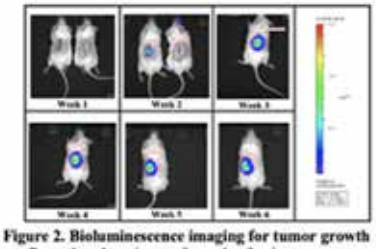

Figure 2. Bioluminescence imaging for tumor growth confirmation. Imaging performed at 3 minutes exposure with luciferin injection dosed to body weight. Radiance (p/sec/cm^2/sr) measures are indicative of tumor presence and growth. Week 2: (1.91×10^5; 1.09×10^5), Week 3: (4.78×10^5), Week 4: (1.75×10^6), Week 5: (5.82×10^6), Week 6: (8.95×10^6)

MS. KAITLIN CLARK, M.A.

Optimization of Surface Modification Targeting Strategies of Placenta Mesenchymal Stem/Stromal Cell derived Extracellular Vesicles to Activated Leukocytes

Ms. Kaitlin Clark, M.A.[1,2] • Ms. Ashley Amador, B.S.[1,2] • Ms. Leora Goldbloom-Helzner, M.S.[1,2]
Mr David Wang, B.S. • Dr. Dake Hao, Ph.D.[1,2] • Mr. Julian Durian, B.S.[1,2] • Dr. Priyadarsini Kumar, Ph.D.[1,2]
Dr. Diana Farmer, M.D.[1,2] • Dr. Aijun Wang, Ph.D.[1,2]

[1]UC Davis, Center for Surgical Bioengineering, Sacramento, CA, USA. [2]Institute of Pediatric Regenerative Cures, Shriner's Hospital for Children NorCal, Sacramento, CA, USA

ABSTRACT

Multiple sclerosis (MS) is an autoimmune disease characterized by inflammation, demyelination, and axonal degeneration in the central nervous system leading to chronic neurological deficits. Placenta-derived mesenchymal stem/stromal cells (PMSCs) and PMSC-derived extracellular vesicles (EVs) are a promising approach to treat MS due to their multifactorial functional properties. PMSC-EVs have been shown to promote remyelination and improve motor function outcomes in a murine model of MS. The ligand LLP2A has been shown to have high specificity binding to activated forms of α4β1 integrin associated with MS pathogenesis. We aim to demonstrate LLP2A conjugation onto PMSC-EV surfaces can facilitate targeting of PMSC-EVs to activated leukocytes, thus improving targeting efficiency, and ultimately therapeutic efficacy.

In this study, scrambled or LLP2A was conjugated onto PMSC-EVs. Biorthogonal copper-free Click chemistry using reactive azide groups to dibenzylcyclootyne (DBCO)-LLP2A was used. A lipid insertion or amine groups-based approach was utilized by using DSPE-PEG-Azide or Sulfo-NHS-PEG-Azide respectively. Conjugation efficiency of labeled LLP2A was established by nanoparticle tracking analysis, super resolution microscopy, and ExoView. Cellular uptake and targeting efficiency of native or LLP2A modified PMSC-EVs in leukocytes was quantified using flow cytometry.

Quantitative fluorescence profiling of tetraspanin expression and conjugated LLP2A on PMSC-EVs demonstrated successful conjugation of LLP2A to PMSC-EVs. ExoView visualized and quantified CD63 and CD81 based capture of labeled LLP2A modified EVs. Cryo-electron microscopy of LLP2A modified EVs demonstrated that surface modification did not disrupt lipid EV structure, membrane or cargo. Preliminary data demonstrates that LLP2A modification strategy of PMSC-EVs is feasible. Further optimization of conjugation strategy will support the development of stem cell-derived cell-free regenerative treatment for MS.

DR. ALYSSA BELLINI, M.D.

Do serial troponins predict the need for cardiac evaluation in trauma patients after ground level fall?

Dr. Alyssa Bellini, M.D.[1,2] • Dr. James Ross, M.D.[2,3] • Dr. Julia Riccardi, M.D.[1] • Ms. Madelyn Larson, B.S., M.S.[4]
Mr. Skyler Pearson, B.S.[4] • Dr. Anamaria Robles, M.D.[2,3] • Dr. Rachael Callcut, M.D., M.S.P.H., F.A.C.S.[2,3]

[1]General Surgery Residency, University of California Davis Medical Center. [2]Division of Trauma, Acute Care Surgery, and Surgical Critical Care. [3]Department of Surgery, University of California Davis Medical Center. [4]University of California Davis School of Medicine

ABSTRACT

Introduction

Troponin T levels are routinely checked in trauma patients evaluated for falls to identify cardiac causes of syncope. Here we examine the role of serial troponins in predicting the need for further cardiac workup in trauma patients with falls.

Methods

Retrospective review of all adult trauma activations for ground level fall from 1/1/2021–12/31/2021 who were hemodynamically normal. Outcomes included cardiology consult, admission to cardiology service, cardiology follow up, and in-hospital mortality. Statistical analyses were performed in SAS Studio and included Mann Whitney Wilcoxon Test and odds ratio.

Results

There were 1234 trauma activations for ground level fall in the study period. Of these, 227 (18.4%) patients were admitted and had an abnormal troponin at presentation (>19 ng/L). The median troponin was 38 ng/L (27-59). 211 patients (93%) had second troponin drawn (median 42 ng/L [29-62]), with 45% of patients having an increase from first to second test (mean change was 5.43 SD 41.3). The first troponin was significantly associated with receiving a cardiology consult (p<0.01.) and cardiology admission (p<0.01). There was no association between the change in troponin over time and outcome variables. Sensitivity analysis was performed; troponin cutoffs used were 30 ng/L, 50 ng/L, 70 ng/L, and 90 ng/L and odds ratio was done to compare the odds of the event happening in the higher cutoff group (Table 1). A troponin cutoff of 50 ng/L significantly predicted the odds of needing cardiology consult and admission. An increased cutoff of 90 ng/L was also associated with higher odds of cardiology follow up and in hospital mortality.

Conclusions

The initial troponin value after ground level fall was statistically significant for predicting cardiology consult and admission, therefore, trending may be of limited utility. A troponin cutoff > 50 ng/L (versus >19 ng/L) may be more clinically predictive in the evaluation for syncope after fall.

TABLE 1. Sensitivity Analysis

Troponin T Cutoff High risk group (%)	Cardiology consult OR (95% CI)	Cardiology Admission OR (95% CI)	Cardiology Follow up OR (95% CI)	In Hospital Mortality OR (95% CI)
Troponin T >30 ng/L n = 157 (69.2%)	0.5 (0.24- 1.08) p = 0.08	0.71 (0.31- 1.6) p = 0.41	0.9 (0.46- 1.74) p = 0.75	NA
Troponin T >50 ng/L n = 81 (35.7%)	0.49 (0.26- 0.93) **p = 0.03**	0.33 (0.16- 0.68) **p < 0.01**	0.78 (0.42- 1.46) p = 0.44	0.73 (0.16- 3.36) p = 0.69
Troponin T >70 ng/L n = 45 (19.8%)	0.35 (0.17- 0.72) **p < 0.01**	0.16 (0.08- 0.36) **p < 0.01**	0.56 (0.28- 1.15) p = 0.11	0.31 (0.07- 1.46) p = 0.14
Troponin T >90 ng/L n = 33 (14.5%)	0.22 (0.1- 0.47) **p < 0.01**	0.15 (0.06- 0.33) **p < 0.01**	0.43 (0.20- 0.92) **p = 0.03**	0.21 (0.04- 0.99) **p = 0.05**

DR. SU YEON LEE, M.D.

Safety Outcomes of First Five Patients Enrolled in the Cellular Therapy for In Utero Repair of Myelomeningocele (CuRe) Trial

Dr. Su Yeon Lee, M.D.[1] • Dr. Priyankadarsini Kumar, Ph.D.[2] • Ms. Amy Powne, M.S.N., R.N.[3]
Ms. Maria Hernandez, C.R.C.[4] • Mr. Christopher Pivetti, M.S.[2] • Dr. Erin Brown, M.D.[1]
Dr. Payam Saadai, M.D.[1] • Dr. Shinjiro Hirose, M.D.[1] • Dr. Aijun Wang, Ph.D.[2] • Dr. Diana Farmer, M.D.[4]

[1]Pediatric Surgery, UC Davis, Sacramento, California, USA. [2]Center for Surgical Bioengineering, UC Davis, Sacramento, California, USA. [3]Fetal Care and Treatment Center, UC Davis, Sacramento, California, USA. [4]Surgery, UC Davis, Sacramento, California, USA

ABSTRACT

Introduction

Management of Myelomeningocele Study (MOMS) trial has established benefit of fetal repair of myelomeningoceles (MMC) with decreased need for ventriculoperitoneal shunt placement. While it also showed some improvement of motor function, more than half of the patients were unable to ambulate independently. Human placental mesenchymal stem cell-seeded on extracellular matrix (PMSC-ECM) product demonstrated significant motor function improvements in pre-clinical animal testing. Cellular Therapy for In Utero Repair of Myelomeningocele (CuRe) trial using this product is the first Food and Drug Administration (FDA) Investigational New Drug approved Phase1/2a in utero stem cell trial and we are reporting on safety outcomes of the first five patients.

Methods

We enrolled five women eligible to undergo prenatal surgery according to MOMS criteria and fetuses were treated sequentially with PMSC-ECM patch at the time of surgery. Primary outcome was safety of the product.

Results

In all five patients, there was no evidence of tumor growth or abnormal tissue proliferation seen on post-natal magnetic resonance imaging (MRI) obtained within the first 2 weeks of life. All the patients had an intact repair site, with no evidence of cerebrospinal fluid leak, infection, or dehiscence. Additionally, post-natal MRI showed reversal of the hindbrain herniation that was seen on fetal MRI of all five patients.

Conclusions

Novel stem cell therapy for fetal repair of myelomeningocele has been found safe in first five patients of the CuRe Trial. Patients had improvements to hindbrain herniation and ventriculomegaly as expected after prenatal repair. With the birth of the sixth patient, this will complete of the planned 6 patients for the Phase I study.

DR. KEWA GAO, M.D.

In utero delivery of mRNA to the heart, diaphragm and muscle with lipid nanoparticles to treat Duchenne muscular dystrophy

Dr. Kewa Gao, M.D., Ph.D.[1,2] • Dr. Jie Li, Ph.D.[3] • Dr. Hengyue Song, M.D.[1,2] • Dr. Hesong Han, Ph.D.[3]
Mr. Yongheng Wang, M.S.[1,2,4] • Ms. Boyan Yin, B.S.[1,2] • Dr. Diana Farmer, M.D.[1,2] • Dr. Niren Murthy, Ph.D.[3]
Dr. Aijun Wang, Ph.D.[1,2,4]

[1]Department of Surgery, School of Medicine, University of California Davis, Sacramento, CA, USA. [2]Institute for Pediatric Regenerative Medicine, Shriners Hospitals for Children, Sacramento, CA, USA. [3]Department of Bioengineering, University of California, Berkeley, CA, USA. [4]Department of Biomedical Engineering, University of California, Davis, CA, USA

ABSTRACT

Nanoparticle-based drug delivery systems have enormous potential to revolutionize medicine. However, their medical impact has been limited due to low vascular permeability and rapid clearance by phagocytic cells. One promising approach to overcoming these limitations is the delivery of nanoparticles during the in utero stage of development, as fetal tissues have a high rate of angiogenesis and cell division, and an underdeveloped immune system.

Despite this potential, very little is currently known about the efficacy and safety of nanoparticle drug delivery at the fetal stage. In this report, using Ai9 CRE reporter mice, we demonstrate that lipid nanoparticle (LNP) mRNA complexes can be successfully delivered in utero, with remarkable efficiency and low toxicity. The LNP complexes can access and transfect major organs, such as the heart, liver, kidneys, lungs, and gastrointestinal tract. At 4 weeks after birth, we demonstrate that 50.99 ± 5.05%, 36.62 ± 3.42% and 23.7 ± 3.21% of myofiber in the diaphragm, heart and skeletal muscle, respectively, were transfected. Finally, we demonstrate that Cas9 mRNA and sgRNA complexed with LNPs can edit fetal organs in utero, suggesting the potential for therapeutic applications.

Our findings suggest that in utero delivery of LNP/mRNA complexes could be a promising approach for targeting and editing muscle stem and progenitor cells before birth. We expect this could potentially correct dystrophin mutations and restore dystrophin expression in patients with Duchenne muscular dystrophy.

ORAL MINI SESSION 1

LH 2222 | 11:00 A.M.–12:15 P.M.

Elise Hill
The Readiness Imperative: Leveraging Large Animal Research
to Bolster Expeditionary Surgical Skills for Military Surgical Residents

Kathryn DiLosa
Defining Vascular Deserts to Describe Access to Care
and Identify Sites for Targeted Limb Preservation Outreach

John Arriola
An Objective Assessment of Obesity-related Metabolic Comorbidities (AOMC) More
Accurately Describes Disease Severity Compared to Clinical Assessment

Rachel Ekaireb
Current Practice Patterns in Palliative Care for the Injured Geriatric Trauma Patient

Zoe Saenz
Investigation of correlation between in vitro potency assay findings within vivo outcomes of
the placental derived mesenchymal stem cell patch in a rodent myelomeningocele model.

Megan Gilbert
Patient's Perception of Likelihood to Attend Follow Up in Burn Surgery Clinic

Leora Goldbloom-Helzner
Optimization of Aptamer Surface Conjugation onto Extracellular Vesicles (EVs)
using Single EV Analysis Technologies

Emily Zurbuchen
Structural Protein Content and Biomechanical Properties of Perforated
and Unperforated Acellular Dermal Matrices for Surgical Reconstruction

DR. ELISE FANNON, M.D., M.P.P.

The Readiness Imperative: Leveraging Large Animal Research to Bolster Expeditionary Surgical Skills for Military Surgical Residents

Dr. Elise Fannon, M.D., M.P.P.[1,2] • Mr. Andrei Dangan, B.A.[1] • Dr. Katrina Hauck, M.D.[1,2]
Dr. Elan Sherazee, M.D.[1,2] • Dr. Scott Zakaluzny, M.D.[1,2,3] • Dr. Rachel Russo, M.D., M.S.[1,2,3]

[1]UC Davis Department of Surgery, Sacramento, CA, USA. [2]David Grant Medical Center, Travis AFB, CA, USA.
[3]Uniformed Services University of the Health Sciences, Bethesda, M.D., USA

ABSTRACT

Introduction

The Defense Health Agency (DHA) aims to ensure military surgical residents have the expeditionary general surgical (EGS) skills necessary to deploy to a combat environment. The DHA also maintains the Clinical Investigation Programs (CIP) to foster research during graduate medical education (GME) that is responsive to the changing combat landscape. This project evaluates the potential to achieve both aims simultaneously through a large animal Combat Casualty Care Research Program (CCCRP). As an example, we quantify the expeditionary surgical cases performed by a resident during the conduct of large animal research over two years.

Methods

Large animal experimental protocols within a single CIP's CCCRP were collected from July 1, 2020 to June 30, 2022. Operations performed as a part of experimental set-up, conduct, and necropsy/ specimen collection were tabulated and categorized by EGS procedure equivalent.

Results

A single resident independently performed 1609 tabulated procedures. Major surgical procedures included 154 laparotomies, 129 thoracotomies, 125 splenectomies, 108 craniotomies, 81 hepatorraphies, 62 nephrectomies, 48 bowel resections, 48 spine exposures with laminectomies, 45 bowel anastomoses, 22 guillotine amputations, 9 sternotomies, 8 vascular shunts and 8 vascular interposition grafts. Additional procedures included 127 central venous lines, 127 arterial lines, 67 tube thoracostomies, 67 cricothyroidotomies, 62 pericardiotomies, 61 open carotid artery cannulations, 37 other carotid artery exposures, 29 suprapubic urostomies, and placement of 10 aortic occlusion catheters. In this time the resident had 10 presentations at national meetings, 7 research awards, and published multiple peer-reviewed manuscripts.

Conclusions

This large animal CCCRP represents a unique training model that not only achieves its primary goal of fostering GME research but also bolsters EGS readiness for military surgical residents.

DR. KATHRYN DILOSA, M.D., M.P.H.

Defining Vascular Deserts to Describe Access to Care and Identify Sites for Targeted Limb Preservation Outreach

Dr. Kathryn DiLosa, M.D., M.P.H.[1] • Mr. Ryan Nguyen, B.A., B.S.[1] • Ms. Christina Brown, B.A.[2]
Mr. Aidan Waugh, B.S.[1] • Dr. Mimmie Kwong, M.D., M.A.S.[1] • Dr. Misty Humphries, M.D., M.A.S.[1]
[1]UC Davis, Division of Vascular Surgery, Sacramento, CA, USA. [2]UC Davis, Department of Surgery, Sacramento, CA, USA

ABSTRACT

Introduction

Access to care is critical for limb salvage in chronic limb threatening ischemia (CLTI). “Medical deserts” describe communities lacking access to medical necessities, resulting in increased morbidity and mortality. Here we describe vascular deserts, defined as regions with decreased access to specialty vascular care.

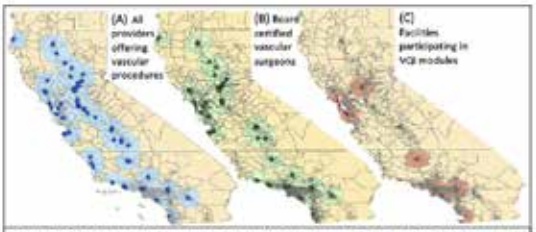

Figure 1: Maps demonstrating types of vascular care across California with buffer zones to demonstrate desert and non-desert communities.

Table 1: Population demographics and social factors of residents in desert versus non-desert communities.

	All Providers			Board-certified Vascular Surgeons			VQI Facilities		
	Non-Desert (%)	Desert (%)	P value	Non-Desert (%)	Desert (%)	P value	Non-Desert (%)	Desert (%)	P value
Census Level Demographics									
200% below poverty level	36.3	37.5	<.001	36.1	39.7	<.001	35.2	39.6	0.16
White	39.2	82.2	<.001	58.8	81.3	<.001	55.0	75.6	<.001
Asian	22.1	4.48	<.001	22.4	6.1	<.001	25.0	10.3	<.001
Hispanic	37.1	28.2	0.08	37.7	38.7	<.001	33.1	36.8	<.001
Black	13.2	5.5	<.001	12.4	5.4	<.001	13.6	7.4	<.001
Uninsured	17.9	17.6	0.71	19.6	16.8	<.001	15.1	17.2	0.93
Healthy Places Index Factors (Mean Percentile)									
Overall HPI Percentile*	50.26	53.22	.007	39.48	49.65	<.001	52.68	43.32	<.001
HPI Domains (Economic, Education, Healthcare Access, Housing, Neighborhood, Pollution, Transportation, Social)									
Economic Percentile	49.13	42.62	<.001	49.48	32.22	<.001	52.18	38.35	<.001
Mean Income Percentile	49.19	44.53	<.001	49.41	35.07	<.001	51.63	40.62	<.001
Education Percentile	49.05	45.66	.005	49.38	34.60	<.001	52.10	38.46	<.001
-Percent high school aged in high school	74.23	70.25	.014	74.41	66.91	<.001	75.21	70.44	<.001
-Percentage >25 years completed college	48.99	47.93	.347	49.27	35.29	<.001	52.23	38.22	<.001
Healthcare Access Percentile	48.73	50.12	.209	48.87	43.05	<.001	49.86	46.00	<.001
Housing Percentile	48.43	53.71	<.001	48.33	54.90	<.001	47.38	53.65	<.001
Neighborhood Percentile	48.59	46.86	.130	48.87	40.69	<.001	50.09	43.28	<.001
Pollution Percentile	48.13	63.01	<.001	47.93	57.00	<.001	47.32	52.77	<.001
Transportation Percentile	48.87	50.16	.291	48.66	41.00	<.001	51.43	39.92	<.001
Social Percentile	48.64	53.62	<.001	48.61	50.61	106	48.13	50.28	319

*The HPI percent is derived from a score composed of 25 individual factors organized in 9 domains: economy, education, healthcare access, housing, neighborhoods, clean environment, transportation, and social environment. A higher percentile corresponds to healthier community conditions.

Methods

California providers performing vascular procedures were identified through on-line searches. Hospital participation in Vascular Quality Initiative (VQI) lower extremity bypass and peripheral vascular intervention modules was also determined. Addresses were geocoded in ArcGIS with a 30-mile buffer, creating maps based on care type, including all providers performing procedures, board certified vascular surgeons, and facilities participating in VQI modules. Overlayed census data demonstrated population composition in deserts versus non-deserts. And the Healthy Places Index (HPI) overlayed social factors defined under 8 domains including:
economy, education, healthcare access, housing, transportation, etc. Factors comprised an overall HPI percent, with lower scores corresponding to poorer health outcomes.

Results

Maps depicting care demonstrated decreased coverage with increasing specialty care (Figure 1). When comparing non-deserts versus deserts by care type, race, percentage 200% below the poverty line, percentage uninsured, HPI percentage and factors were described. (Table 1) All desert regions had decreased racial and ethnic diversity and increased poverty. Mean HPI percentile was significantly lower in board certified provider and VQI facility deserts compared to non-deserts. The economic, education, healthcare access, and transportation HPI factor percentiles were significantly lower in all desert regions.

Conclusions

Through mapping of vascular deserts, patient factors in desert regions are better understood and areas that would benefit most from targeted outreach limb preservation programs for CLTI are identified.

DR. JOHN ARRIOLA, M.D.

An Objective Assessment of Obesity-related Metabolic Comorbidities (AOMC) More Accurately Describes Disease Severity Compared to Clinical Assessment.

Dr. John Arriola, M.D.[1] • Dr. Victoria Lyo, M.D.[1] • Dr. Shushmita Ahmed, M.D.[1] • Dr. Rouzbeh Mostaedi, M.D.[2] Dr. Aaron Carr, M.D.[3] • Sean Adams, Ph.D.[1] • Dr. Mohamed Ali, M.D.[1]

[1]University of California, Davis, Division of Foregut, Metabolic, and General Surgery, Dept of Surgery, Sacramento, CA, USA. [2]Kaiser Permanente, Bariatric Surgery, Richmond, CA, USA. [3]St Marys Medical Group, Bariatric and Minimally Invasive Surgery, Athens, GA, USA

ABSTRACT

Objective
Compare the utility of AOMC to clinical assessments of metabolic diseases.

Obesity is associated with metabolic comorbidities like diabetes mellitus (DM), hypertension (HTN), and dyslipidemia (DYS). Reporting of comorbidity severity and longitudinal changes are not standardized. We devised a new assessment tool AOMC that objectively measures DM, HTN, and DYS to more accurately assess obesity-related comorbidity severity compared to clinical assessment alone.

Demographic, clinical, and biochemical data were prospectively collected on adult patients (n=1442) evaluated for bariatric surgery over six years. Comorbidity profiles assessed by the AOMC criteria were compared to traditional clinical parameters. Chi-Square analysis was performed to detect differences in the frequency of scores in both groups.

Most patients were middle-aged (mean 46.2±11.1 years) women (78.2%) with mean BMI of 47.9±9.3 kg/m2. AOMC showed greater prevalence of DM (40.8% vs 36.1%) and less adequate glucose control than clinical assessment (47.1% vs 97.7%). The prevalence of HTN and DYS were similar on AOMC compared to clinical assessments (64.2% vs 64.4% and 44.5% vs 47.3% respectively). However, fewer patients' HTN (71.8% vs 99.3%) and DYS (65.3% vs 76.4%) were adequately controlled on medications. The frequencies of patients with no disease on AOMC vs clinical assessment were different for DM (304 vs 654), HTN (99 vs 387), and DYS (408 vs 529), all $p<0.05$. The frequencies of patients with severe disease on AOMC vs clinical assessment were different for DM (280 vs 9), HTN (262 vs 6), and DYS (241 vs 4), all $p<0.05$. Additionally, disease severity was upstaged in: DM 65.9%, HTN 42.9%, and DYS 30.9%.

Our study showed clinical assessment underestimates frequency of severe disease and overestimates no disease. AOMC tool may be used to more accurately describe longitudinal metabolic response to bariatric surgery.

DR. RACHEL EKAIREB, M.D.

Current Practice Patterns in Palliative Care for the Injured Geriatric Trauma Patient

Dr. Rachel Ekaireb, M.D.[1] • Ms. Anna Nordquist ,B.S.[2] • Dr. Christine Cocanour, M.D.[3]

[1]UC Davis, General Surgery, Sacramento, CA, USA. [2]UC Davis School of Medicine, Sacramento, CA, USA.
[3]UC Davis, Division of Trauma, Acute Care and Surgical Critical Care, Sacramento, CA, USA

ABSTRACT

Introduction

After traumatic injury, older patients are at risk for death or long-term functional decline that may impact their quality of life. Delivery of palliative care in conjunction with life-saving trauma care is considered the standard of care based on guidelines developed by the American College of Surgeons Trauma Quality Improvement Program (TQIP). As part of a multi-institutional study, we conducted a retrospective chart review to investigate practice patterns of palliative care at UC Davis and evaluate adherence to TQIP guidelines among geriatric trauma patients.

Methods

This retrospective cross-sectional study included all patients age >55 hospitalized after traumatic injury from two 2-week "snapshots" June 6th-19th, 2021 and October 17th-30th, 2021. Data collected included patient demographics, life-limiting co-morbidities, injury severity, life-sustaining treatment interventions, mortality, and adherence to TQIP practice guidelines such as identification of a surrogate decision-maker and pre-existing advance directive within 24 hours of admission, goals of care conversations within 72 hours, and utilization of specialty palliative care team services.

Results

We identified 120 geriatric trauma patients, of whom 57% were male, 78% Caucasian, 73% fall mechanism, with median ISS score of 9 and in-hospital mortality rate of 7.5%. Although >60% of patients had at least one life-limiting comorbidity, and 37% were admitted to the ICU, very few received any palliative care intervention. Fewer than half had a surrogate decision-maker identified during their admission, 9% had goals of care discussions documented, and 6% received a specialty palliative care consultation. Among the 18% of patients who had a pre-existing advance directive or POLST, less than half were identified within 24 hours of admission.

Conclusions

Significant opportunity exists to improve delivery and documentation of primary palliative care to older adult trauma patients at UC Davis.

DR. ZOE SAENZ, M.D.

Investigation of correlation between in vitro potency assay findings with in vivo outcomes of the placental derived mesenchymal stem cell patch in a rodent myelomeningocele model.

Dr. Zoe Saenz, M.D. • Dr. Monalisa Hassan, M.D. • Dr. Priyadarsini Kumar, Ph.D.
Miss Samantha Avallone, B.S. • Mr. Brandon Light, B.S. • Miss Ashley Amador, B.S
Miss Emma Loll, B.S. • Mr. Christopher Pivetti, M.S. • Dr. Aijun Wang, Ph.D. • Dr. Diana Farmer, M.D.
University of California Davis, Surgery, Center for Surgical Bioengineering, Sacramento, CA, USA

ABSTRACT

Introduction

The CuRe Trial: Cellular Therapy for In Utero Repair of Myelomeningocele (MMC) is the first human clinical trial using the PMSC-ECM product. The candidate placental derived mesenchymal stem cell (PMSC) line used was chosen based on its efficacy in an in vitro assay compared to 3 other cell lines. Our objective is to evaluate the correlation between in vitro and in vivo potency using candidate and 1 other cell line in rat MMC model by testing degree of apoptosis at the site of defect. The first aims of the study are to ensure reproducible defect creation and use of IVISense Annexin V 750 fluorescent probe for live animal imaging.

Methods

Time-mated dams receive administration of retinoic acid (RA) via orogastric gavage at 40mg/kg to chemically induce spina bifida. Two fetuses per dam are chosen for fetal intervention. Two days after surgery the dam will be euthanized, and the pups collected. The fluorescent probe will be applied to the site of defect and undergo in-vivo imaging to assess the degree of apoptosis. Three experimental groups (ECM only, PMSC-ECM candidate cell line A and PMSC-ECM cell line B) will be collected with a goal of 12 fetuses per group.

Results

14 total dams have been treated with RA. A total of 174 pups were found to be viable at time of surgery. 9 fetuses (5%) were found to have a defect, with 4 undergoing surgical intervention. Three fetuses survived to time of harvest and underwent in-vivo imaging. The other fetus was found to be hydropic and not viable. In-vivo imaging for assessment of apoptosis showed decreased signal overlying the defect in PMSC-ECM cell line A compared to ECM alone.

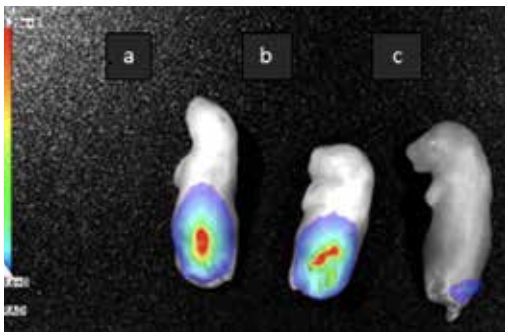

Figure 1. In-vivo imaging using IVISense Annexin V a) ECM only b) PMSC-ECM candidate cell line A c) normal control

Conclusions

Consistent defect creation will continue to require optimization due to dosing variability. Annexin V in-vivo imaging has shown promising results and is a novel method to evaluate apoptosis in a rodent MMC model.

DR. MEGAN GILBERT, M.D.

Patient's Perception of Likelihood to Attend Follow Up in Burn Surgery Clinic

Dr. Megan Gilbert, M.D.[1] • Ms. Lillia Tumbaga, R.N., C.C.M.[2] • Dr. Jason Heard, M.D.[3]
Dr. David Greenhalgh, M.D., F.A.C.S.[3] • Dr. Soman Sen, M.D., F.A.C.S.[3]
Dr. Tina Palmieri, M.D., F.A.C.S., F.C.C.M.[3] • Dr. Kathleen Romanowski, M.D., F.A.C.S., F.C.C.M.[3]
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ABSTRACT

Previous work has demonstrated that follow up rates in burn patients are low. Our ability to predict which patients will follow up could improve care through providing alternative means to obtain medical care. This study aims to evaluate if patients are aware of their likelihood of attending follow up appointments.

A survey assessing patient's confidence that they would present to follow up was obtained once discharge disposition was identified for all admitted Burn Surgery patients from September 2021 to June 2022 (N=251). Chart review was then performed to determine if patients presented for follow up within thirty days of discharge. General demographic, burn severity, and hospital course events were also obtained. Univariate statistical analysis was performed. For all statistically significant variables related to follow up care, multivariate logistic regression with backward elimination was performed.

Of the 251 included patients, 65% (N=165) presented for follow up within 30 days. These patients were able to accurately predict on their survey if they would present to follow up ($p<0.0001$). A history of substance use disorder ($p=0.004$), tobacco use ($p=0.0004$), housing insecurity ($p<0.0001$), disposition to a location other than their prior residence ($p=0.02$), and MediCal and Medicare insurance ($p=0.003$) were all associated with lack of follow up care. The factors independently associated with follow up include confidence of presenting on survey Odds Ratio (OR)=1.36 (95% Confidence Interval (CI) 0.18-9.8), housing insecurity OR=4.17 (95% CI 1.53-11.32), and history of substance use disorder OR=3.09 (95% CI 1.47-6.49).

Patients can accurately predict if they will present to follow up after discharge, while housing insecurity and history of substance use disorder are independently associated with lack of follow up care. Further research on alternatives to traditional follow up are warranted to improve patient outcomes.

MS. LEORA GOLDBLOOM-HELZNER, M.S.E.

Optimization of Aptamer Surface Conjugation onto Extracellular Vesicles (EVs) using Single EV Analysis Technologies

Ms. Leora Goldbloom-Helzner, M.S.E.[1,2,3] • Mr. Harjn Bains, B.S.[2] • Mr. Tanner Henson, B.S.E.[2]
Dr. Priyadarsini Kumar, Ph.D.[1,3] • Dr. Diana Farmer, M.D.[1,3] • Dr. Aijun Wang, Ph.D.[1,2,3]

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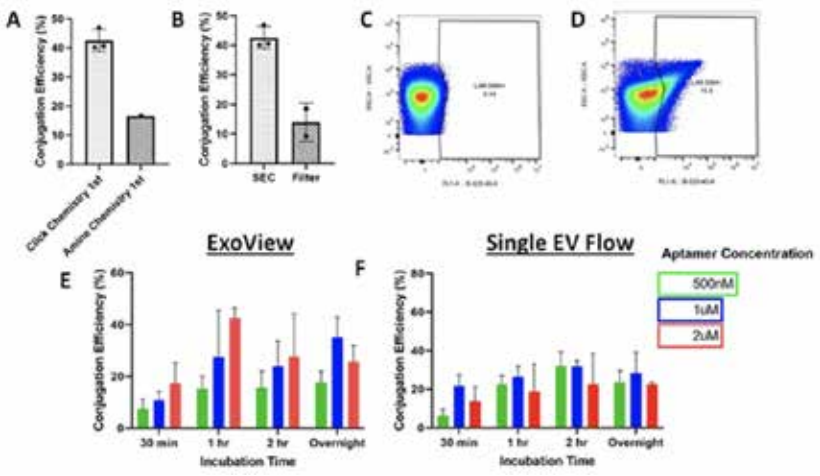
ABSTRACT

Extracellular vesicles (EVs) are cell-secreted nanovesicles that play an important role in long range cell-cell communication. Though EVs pose a promising alternative to cell-based therapy, EV targeting in vivo still falls short. We have engineered EVs with a myelin-targeting aptamer, LJM-3064, to improve EV targeting across the blood brain barrier and increase remyelination in the context of spinal cord injury. Single EV analysis technology has not yet been used to measure surface conjugation efficiency nor has it assessed correlation between EV conjugation and function in vivo. In this study, ExoView and CytoFLEX were used to determine conjugation efficiency of FITC-labeled LJM-3064-modified EVs (Apt-EVs) and inform surface modification optimization efforts.

SK-OV-3 EVs were modified with 5'FITC 3'azide group LJM-3064 using amine-aided click chemistry. ExoView quantified total EVs through immobilization using antibodies against normal EV markers (CD63, CD81) and CytoFLEX used the 405 nm laser as a trigger channel to discriminate extracellular vesicles from noise. Both technologies measured LJM-3064 conjugation on EVs by dividing FITC+EVs by total EVs.

Amine-aided click chemistry was optimized, using ExoView, to reach 46% conjugation efficiency by changing parameters such as order of reactions (Fig.A), method of excess chemical removal (Fig.B), incubation times and aptamer concentration (Fig.E). Using the CytoFLEX, we observed lower conjugation efficiencies from 15% to 30% (Fig.F) through gating strategies as shown above (Fig.C-D).

This study used single EV analysis technologies to successfully measure conjugation efficiency of LJM-3064 on EV surfaces. With this efficiency, researchers will be able to determine the degree of conjugation required to see therapeutic effects in vivo. Future experiments will continue 1) optimization of lipid insertion-aided click chemistry and 2) determination of correlation between conjugation efficiency and Apt-EV function.



DR. EMILY ZURBUCHEN, M.D.

Structural Protein Content and Biomechanical Properties of Perforated and Unperforated Acellular Dermal Matrices for Surgical Reconstruction

Dr. Emily Zurbuchen, M.D.[1] • Dr. Annica Stull-Lane, Ph.D.[1] • Mr. Nate Anderson, B.S.[2]
Dr. Richard Levenson, M.D.[2] • Dr. Farzad Fereidouni, Ph.D.[2] • Mr. Yofiel Wyle, M.S.[3]
Dr. Hengyue Song, M.D.[3] • Dr. Aijun Wang, Ph.D.[3] • Dr. Granger Wong, M.D., D.M.D., F.A.C.S.[1]

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[3]Center for Surgical Bioengineering Laboratory, Department of Surgery, School of Medicine, University of California at Davis, Sacramento, CA, USA

ABSTRACT

Introduction

Acellular dermal matrices, or decellularized products derived from human or animal cadaver dermis, are used as structural support in breast reconstruction and abdominal wall reconstruction. The extracellular matrix remains after sample processing, and the structural proteins elastin and collagen influence the biomechanical properties of the product. Various processing protocols are in-use commercially, including perforated and unperforated products. We hypothesize that perforated samples will have less tensile strength than unperforated samples, and this finding will be dependent on the elastin:collagen ratio.

Methods

Two groups of 20 samples each will be assessed, comparing perforated product and unperforated product from the same manufacturer. We will image slides with dual-mode emission technology (DUET), quantify elastin and collagen density per sample, and calculate the elastin:collagen ratio. Portions of each sample will also be assessed by universal testing machine to measure biomechanical properties like tensile strength. Analyzes will include comparisons of the two groups and descriptions of inter-group variability.

Results

BPreliminary results established a workflow in acellular dermal matrix sample processing and imaging by brightfield (Fig 1) and dual-mode emission technology (DUET) (Fig 2). Next, we will finalize an overlay with elastin on the same image, and then coordinate sample receipt, processing, and analysis.

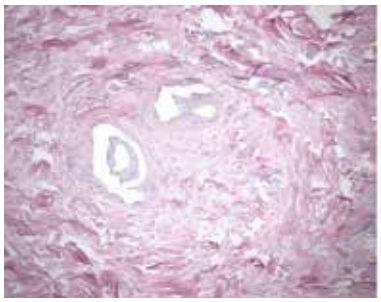

Fig 1. Brightfield H&E staining.

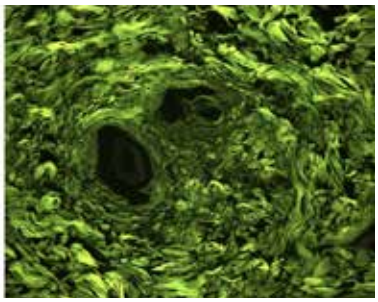

Fig 2. Dual-mode emission technology imaging with collagen staining.

Conclusions

We will measure the elastin:collagen ratio and test whether tensile strength is significantly different between perforated and unperforated samples. We will describe inter-group variability since donor tissue may vary in age, sex, sun exposure, and body site. This information will guide the surgeon on different indications for the use of the variety of acellular dermal matrix products available.

PROGRAM NOTES

ORAL PRESENTATIONS

SESSION 3

LH 2222 | 2:45–4:00 P.M.

Aryana Razmara
Pre-clinical evaluation and first-in-dog clinical trials of intravenous infusion of PBMC-expanded adoptive NK cell therapy in dogs with cancer

Leslie Vuoncino
Using Microfluidic Shear to Assess Transfusion Requirements in Trauma Patients

Matthew Vuoncino
Effects of Cyclic Peptide LXW7 Coating on Short Term Vascular Graft Patency Using a Porcine (Sus scrofa) Model

Nataliya Bahatyrevich
A Closer Look at Endothelial Cells of Vascular Bypass Conduits and Harvesting Techniques

Nicholas Antonino
Survival After Contralateral Secondary Breast Cancer by Age Group in California

MS. ARYANA RAZMARA, M.S.

Pre-clinical evaluation and first-in-dog clinical trials of intravenous infusion of PBMC-expanded adoptive NK cell therapy in dogs with cancer

Ms. Aryana Razmara, M.S.[1] • Ms. Lauren Farley, B.S.[1] • Dr. Rayna Harris, Ph.D.[2]
Mr. Marshall Lammers, B.S.[1] • Dr. Cordelia Dunai, Ph.D.[3] • Dr. William Murphy, Ph.D.[3]
Dr. Robert Rebhun, D.V.M., Ph.D.[4] • Dr. Michael Kent, D.V.M.[4] • Dr. Robert Canter, M.D.[1]
[1]UC Davis School of Medicine, Surgery. [2]UC Davis School of Veterinary Medicine, Population Health & Reproduction.
[3]UC Davis School of Medicine, Dermatology. [4]UC Davis School of Veterinary Medicine, Surgical & Radiological Sciences

ABSTRACT

Natural killer (NK) cells are cytotoxic cells capable of recognizing heterogeneous cancer targets without prior sensitization, making them attractive for use in cellular immunotherapy. Previously, CD5 depletion of peripheral blood mononuclear cells (PBMCs) has been used in dogs to isolate and expand a CD5dim-expressing NK subset prior to co-culture, but this can limit the final yield. This study aimed to assess NK activation, expansion, and preliminary clinical activity in first-in-dog clinical trials using unmanipulated PBMCs without CD5 depletion to generate our NK cell product. Starting populations of CD5-depleted cells and PBMCs from 12 matched healthy beagle donors were co-cultured with irradiated K562-C9-mIL21 cells and 100IU/mL rhIL-2 for 14 days. In addition, two first-in-dog feasibility clinical trials were performed in dogs with melanoma and osteosarcoma using autologous (N=9) and allogeneic (N=5) NK cells expanded from unmanipulated PBMCs. Flow analysis showed similar upregulation of NKp46 expression in both groups post-expansion with high NK purity. Killing assays against canine tumor targets demonstrated increased percent killing among PBMC-expanded day 14 NK cells. Median production of canonical NK cytokines, IFN-γ and GM-CSF, was over 5-fold greater in PBMC-expanded NK cells. Sequencing data showed principal component sample variance based on time points and upregulation of NK pathways related to activation and function in both groups. PBMC-expanded NK cells for first-in-dog clinical trials showed sufficient expansion for multiple NK cell transfers with no serious adverse events. We also observed preliminary data for efficacy, particularly in the allogeneic setting, where one dog survived 445 days post-treatment. Overall, the use of unmanipulated PBMCs to generate a purified and expanded NK cell product for immunotherapy appears safe and potentially effective, supporting further evaluation as a novel platform for optimizing immunotherapy in dogs.

DR. LESLIE VUONCINO, M.D.

Using Microfluidic Shear to Assess Transfusion Requirements in Trauma Patients

Dr. Leslie Vuoncino, M.D.[1] • Dr. Anamaria Robles, M.D.[2] • Ms. Ashli Barnes, B.S.[2] • Mr. Leonardo Graeff, B.S.[2]
Dr. James Ross, M.D.[3] • Ms. Taylor Riedley, B.S.[2] • Dr. Anthony Calabro, Ph.D.[2] • Mr. Nico Vincent, B.S.[2]
Ms. Nithya Tippireddy, B.S.[2] • Ms. Kimi Tanaka, B.S.[2] • Mrs. Randi Mays, M.S.W., P.M.P.[2]
Dr. Lucy Kornblith, M.D.[3] • Dr. Rachael Callcut ,M.D., M.S.P.H., F.A.C.S.[2]

[1]UC Davis Medical Center, General Surgery, Sacramento, CA, USA. [2]UC Davis Medical Center; Trauma, Acute Care & Critical Care, Sacramento, CA, USA. [3]Zuckerberg San Francisco General Hospital, Trauma and Surgical Critical Care, San Francisco, CA, USA

ABSTRACT

Introduction

Viscoelastic assays have widely been used for evaluating coagulopathies but lack the shear stress important to in vivo clot formation. Stasys technology subjects whole blood to shear forces over factor-coated surfaces. Microclot formation is analyzed to determine clot area (CA) and platelet contractile forces (PCF). We hypothesize this novel assay will provide utility about trauma-induced coagulopathy and transfusion requirements.

Methods

Blood samples were collected on high-level adult trauma patients from a single-institution prospective cohort study. Patient and injury characteristics, transfusion data, and outcomes were collected. Thromboelastography (TEG), coagulation studies, and Stasys were run on paired samples collected at admission. Stasys CA and PCF were quantified as area under the curve calculations and maximum values according to manufacturer normal ranges. Data was compared using Pearson's correlation.

Results

From March 2021-January 2023, 108 samples were obtained. Median age was 37 (IQR 28-52), 78% were male. 72% suffered blunt trauma, 26% had an injury severity score (ISS) ^{3}25. A decrease in Stasys clot area (CA) correlated with transfusion of red blood cells (RBCs) at 12-24 hours (p=0.04), fresh frozen plasma (FFP) at 12-24 hours (p=0.09), and platelets (PLTs) at 6-12 hours (p=0.08). Elevated platelet contractile forces (PCF) positively correlated with prothrombin time (PT; p=0.06), while decreased PCF correlated with higher ISS (p=0.047). A decreased maximum PCF showed negative correlation with overall transfusion in 24 hours (p=0.04) as well as transfusion of RBCs, FFP, and PLT in the first six hours (p=0.02, p=0.02, p=0.03, respectively).

Conclusions

Assessing coagulopathy in real-time remains challenging in trauma patients. In this pilot study, we demonstrated that microfluidic approaches incorporating shear stress could predict transfusion requirements at time of admission as well as requirements in the first 24 hours.

DR. MATTHEW VUONCINO, M.D.

Effects of Cyclic Peptide LXW7 Coating on Short Term Vascular Graft Patency Using a Porcine (Sus scrofa) Model

Dr. Matthew Vuoncino, M.D.[1] • Dr. Dake Hao, Ph.D.[2] • Dr. Natalie Bahatyrevich, M.D.[3]
Dr. Aijun Wang, Ph.D.[2] • Dr. Mimmie Kwong, M.D.[1]

[1]UC Davis, Vascular, Sacramento, CA, USA. [2]UCD, Sacramento, CA, USA. [3]UCD, Cardiac Surgery, Sacramento, CA, USA

ABSTRACT

Introduction

We previously identified LXW7, a specific integrin αvβ3 targeting ligand capable of selectively capturing endothelial progenitor cells (EPCs) and endothelial cells (ECs), and developed a parylene-based conformal coating technology to covalently present LXW7 to prosthetic materials. This study aims to assess the function of LXW7 coating on interposition expanded polytetrafluoroethylene (ePTFE) graft thrombus formation and patency in a large animal model.

Methods

8 female Yorkshire pigs underwent implantation of bilateral iliac artery interposition bypasses using control plain ePTFE grafts and LXW7-coated ePTFE grafts. Each animal served as its own control and the implanting surgeon and experimental team were blinded to treatment and evaluations. Computed Tomography Angiogram (CTA)was performed immediately post-operatively, at 3 weeks, and 6 weeks post-implantation. Animals were sacrificed and interposition grafts were harvested for histological evaluation.

Results

Six animals were included in final analysis, with 2 excluded due to complications during their surgical and post-operative course requiring euthanasia. Immediate post-procedure CTA demonstrated procedural success for all 6 pigs with no evidence of thrombus or stenosis. At 3 week imaging, all grafts remained patent. At 6 week imaging, all 6 LXW7-coated grafts were patent without evidence of thrombus or stenosis while 4 of the 6 control grafts were either fully or partially thrombosed. Repeated measures mixed effects analysis demonstrated significantly improved patency over time with LXW7 coated grafts ($p<0.001$).

Conclusions

This is the first study using CTA to investigate the impact of LXW7-coating on prosthetic vascular graft patency in a clinically relevant large animal model. The findings demonstrate significantly improved graft patency over time with use of LXW7-coating, suggesting promise as a potential adjunct to clinical outcomes with prosthetic grafts in vascular bypass applications.

DR. NATALIYA BAHATYREVIC, M.D.

A Closer Look at Endothelial Cells of Vascular Bypass Conduits and Harvesting Techniques

Dr. Nataliya Bahatyrevich, M.D.[1] • Dr. Lalithasri Ramasubramanian, Ph.D.[2] • Dr. Dake Hao, Ph.D.[2]
Dr. Mimmie Kwong, M.D.[3] • Dr. Sabrina Evans, M.D.[4] • Dr. Jorge Catrip, M.D.[4] • Dr. Bob Kiaii, M.D.[4]
Dr. Aijun Wang, Ph.D.[2]

[1]University of California, Davis Health, Department of Surgery, Sacramento, CA, USA. [2]University of California, Davis Health, Department of Biomedical Engineering, Sacramento, CA, USA. [3]University of California, Davis Health, Department of Surgery, Division of Vascular Surgery, Sacramento, CA, USA. [4]University of California, Davis Health, Department of Surgery, Division of Cardiac Surgery, Sacramento, CA, USA

ABSTRACT

Introduction

To determine degree of endothelial cell damage between different conduits and harvesting techniques.

Methods

De-identified human samples were collected from the operating room from September 2021 through January 2023. The samples included internal mammary artery (IMA), radial artery (RA), and great saphenous vein (GSV). The harvesting techniques included open technique for IMA, endoscopic approach using Vasoview Hemopro 2 system for RA, and endoscopic techniques using Saphena Medical Venapax and Vasoview Hemopro 2 systems and open approach for GSV. The samples were fixed in 10% formalin and stained with anti-CD31 antibody to identify endothelial cells on the luminal surface. Enface imaging was then performed, and endothelial cell coverage was quantified using ImageJ software.

Results

A total of 41 specimens were collected and analyzed. There were 13 open IMA samples, 4 Saphena Medical Venapax GSV, 12 Vasoview Hemopro 2 GSV, 8 open GSV, and 4 Vasoview Hemopro 2 RA samples. The percentage of luminal surface covered by endothelial cells was 86.09.2% for IMA, 73.314.4% for RA, 55.812.7% for Saphena Medical Venapax GSV, 58.215.9% for Vasoview Hemopro 2 GSV, 58.05.7% for open GSV. Endothelial coverage area on IMA samples was significantly higher compared to both endoscopic GSV and open GSV ($p<0.001$), as well as RA ($p<0.05$). There were no statistically significant differences between endoscopic techniques and open GSV.

Conclusions

Microscopic examination of luminal surface of various conduits and harvesting techniques showed greatest preservation of endothelial cells on IMA conduit followed by RA and GSV but with no difference between open and endoscopic GSV harvesting techniques. These results correlate closely to clinically reported long-term patency rates of these conduits. Endothelial preservation might be a good target for both surgical harvesting technique optimization and therapeutic intervention in the future.

DR. NICHOLAS ANTONINO, D.O.

Survival After Contralateral Secondary Breast Cancer by Age Group in California

Dr. Nicholas Antonino, D.O.[1] • Dr. Lauren Perry, M.D.[1] • Dr. Theresa Keegan, Ph.D.[2,3,4] • Ms. Qian Li, M.S.[5] Dr. Richard Bold, M.D., M.B.A.[1,6] • Dr. Frances Maguire, Ph.D., M.P.H.[4] • Dr. Candice Sauder, M.D.[1,6]

[1]Department of Surgery, University of California Davis School of Medicine, Sacramento, CA. [2]Center for Oncology Hematology Outcomes Research and Training (COHORT) and Division of Hematology and Oncology, Sacramento, CA. [3]Comprehensive Cancer Center, University of California Davis, Sacramento, CA. [4]California Cancer Reporting and Epidemiologic Surveillance Program, University of California Davis Comprehensive Cancer Center, Sacramento, CA. [5]Center for Oncology Hematology Outcomes Research and Training (COHORT) and Division of Hematology and Oncology, University of California Davis School of Medicine, Sacramento, CA. 6Comprehensive Cancer Center, University of California Davis, Sacramento, CA

ABSTRACT

Introduction

Secondary cancers account for 16% of all new cancer diagnoses, with breast cancer (BC) the most common secondary cancer and having poorer survival than primary BC (pBC). Survivors who develop a contralateral secondary BC (CsBC) currently receive similar treatments to pBC given our present knowledge. Identification of survival differences between pBC and CsBC could influence future counseling and treatments for patients at risk for CsBC.

Methods

Women (>15 years) diagnosed with pBC from 1991-2015 in the California Cancer Registry (n=377,176) were compared to those with CSBC (n=15,586) by age group (15-39, n=406; 40-64, n=6,814; >65, n=8,366). Multivariable logistic regression models assessed factors associated with CSBC. Multivariable Cox proportional hazards regression models assessed BC-specific survival (BCSS), while accounting for the competing risk of death.

Results

Younger patients with CSBC more commonly underwent mastectomy (61%) and chemotherapy (54%) than middle-age (56%, 42%) and older women (46%, 16%). Across all ages, CSBC patients were less likely to have larger tumors (15-39, Odds Ratio (OR): 0.25, confidence interval (CI) 0.16-0.38; 40-64, OR 0.41, CI 0.37-0.45; >65, OR 0.46, CI 0.42-0.51) and lymph node-positive disease (15-39, OR: 0.86, CI 0.69-1.08; 40-64, OR 0.88, CI 0.83-0.93; >65, OR 0.89, CI 0.84-0.94). CsBC was associated with worse survival compared to pBC across all ages (15-39: Hazard Ratio (HR) 2.73, CI 2.30-3.25; 40-64: HR 2.13, CI 2.01-2.26; >65: HR 1.52, CI 1.43-1.61). Younger patients with CsBC had the poorest BCSS, with nearly three times the risk of death (OR 2.73; 2.30-3.25) compared to pBC.

Conclusions

BCSS is significantly decreased among all women diagnosed with CsBC compared to pBC, with the strongest impact seen in younger women. Worse survival after CsBC despite associations with smaller tumors and lymph node negativity suggests that CsBC may be biologically distinct and need treatment reconsideration.

POSTERS

MIRANDA BUSTAMANTE, M.S.

Impact of Fecal Microbiota Transplantation on Gut Bacterial Bile Acid Metabolism in Humans

Miranda Bustamante, M.S. [1] • Dr. Tyson Dawson, Ph.D.[2] • Dr. Caitlin Loeffler, Ph.D.[2] • Zara Marfori, B.S.[1]
Julian Marchesi, Ph.D.[3] • Dr. Benjamin Mullish, Ph.D.[3] • Dr. Christopher Thompson, M.D.[4]
Dr. Keith Crandall, Ph.D.[2,5] • Dr. Ali Rahnavard, Ph.D.[2,5] • Jessica Allegretti, M.D., M.P.H.[4]
Dr. Bethany Cummings, D.V.M., Ph.D.[1]

[1]Department of Surgery, School of Medicine, Center for Alimentary and Metabolic Science, University of California Davis, Sacramento, CA, USA. [2]Computational Biology Institute, Department of Biostatistics and Bioinformatics, Milken Institute School of Public Health, The George Washington University, Washington, DC, USA. [3]Division of Digestive Diseases, Department of Metabolism, Digestion and Reproduction, Faculty of Medicine, St. Mary's Hospital Campus, Imperial College London, London, W2 1NY, United Kingdom. [4]Division of Gastroenterology, Hepatology and Endoscopy, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA. [5]Department of Biostatistics and Bioinformatics, Milken Institute School of Public Health, The George Washington University, Washington, DC, USA

ABSTRACT

Fecal microbiota transplantation (FMT) is a promising therapeutic modality for the treatment and prevention of metabolic disease. We previously conducted a double-blind, randomized, placebo-controlled pilot trial of FMT in obese metabolically healthy patients in which we found that FMT enhanced gut bacterial bile acid metabolism and delayed the development of impaired glucose tolerance relative to the placebo control group. Therefore, we conducted a secondary analysis of fecal samples collected from these patients to assess the potential gut microbial species contributing to the effect of FMT to improve metabolic health and increase gut bacterial bile acid metabolism. Fecal samples collected at baseline and after 4 weeks of FMT or placebo treatment underwent shotgun metagenomic analysis. Ultra-high-performance liquid chromatography-mass spectrometry was used to profile fecal bile acids. FMT-enriched bacteria that have been implicated in gut bile acid metabolism included Desulfovibrio fairfieldensis and Clostridium hylemonae. To identify candidate bacteria involved in gut microbial bile acid metabolism, we assessed correlations between bacterial species abundance and bile acid profile, with a focus on bile acid products of gut bacterial metabolism. Bacteroides ovatus and Phocaeicola dorei were positively correlated with unconjugated bile acids. Bifidobacterium adolescentis, Collinsella aerofaciens, and Faecalibacterium prausnitzii were positively correlated with secondary bile acids. Together, these data identify several candidate bacteria that may contribute to the metabolic benefits of FMT and gut bacterial bile acid metabolism that requires further functional validation.

RAHAF SHISHANI, B.S.

Liraglutide Corrects Impaired Insulin Secretion in 14-3-3-ζ Overexpressing Mice

Rahaf Shishani, B.S.[1] • Madelynn Tucker, B.S.[1] • Rosalinda Moreno, B.S.[1] • Miranda Bustamante, M.S.[1]
Dr. Gareth Lim, Ph.D.[2] • Dr. Bethany Cummings, Ph.D.[1]

[1]University of California, Davis, Dept of Surgery, Davis, CA, USA. [2]University of Montreal, Montreal, Canada

ABSTRACT

Crosstalk between α-cells and β-cells is an important regulator of healthy islet function. α-cells display heterogeneity in their hormone profile. α-cells typically produce glucagon, but under certain conditions can produce glucagon-like peptide-1 (GLP-1). However, the mechanisms regulating α-cell GLP-1 production are poorly understood. We found that increased β-cell GLP-1R signaling via the GLP-1 analog, liraglutide, activates α-cell GLP-1 production through a paracrine signaling pathway. We recently identified the protein 14-3-3-ζ as a key downstream mediator of this pathway. Specifically, liraglutide downregulates β-cell 14-3-3-ζ expression which activates α-cell GLP-1 production. Consistent with this, we found that β-cell 14-3-3-ζ ablation enhances glucose-stimulated insulin secretion (GSIS). Furthermore, mice with 14-3-3-ζ overexpression (OE) have impaired GSIS. Therefore, we tested the hypothesis that liraglutide can correct the effect of 14-3-3-ζ OE to impair GSIS. Male and female wild-type (WT) or 14-3-3-ζ OE mice maintained on high fat diet underwent an oral glucose tolerance test (OGTT) after 2 weeks of liraglutide (200 mg/kg sc twice daily) or saline treatment. Liraglutide improved glucose tolerance in WT mice and tended to improve glucose tolerance in OE mice. Saline-treated 14-3-3-ζ OE mice exhibited lower GSIS compared with WT ($P<0.05$). Liraglutide treatment of 14-3-3-ζ OE mice normalized GSIS to match that of liraglutide-treated WT (Insulin secretion index [Insulin AUC/Glucose AUC] $*10^{-9}$: Saline WT = 38 ± 4, Lira WT = 37 ± 5, Saline OE = 25 ± 4, Lira OE = 39 ± 7; n=8, $P<0.05$ Saline WT vs Saline OE, $P=0.06$ Saline OE vs Lira OE). Overall, these data suggest that liraglutide can rescue deficits in GSIS induced by 14-3-3-ζ OE.

DR. PRIYADARSINI KUMAR, Ph.D.

CuRe Trial: PMSC-ECM Product Manufacturing for Patients and Ongoing Characterization of the Cryopreserved Cell Banks

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ABSTRACT

Introduction

The CuRe Trial utilizes allogeneic placenta-derived mesenchymal stem cells seeded on small-intestinal submucosa extracellular matrix (PMSC-ECM). With current increase in clinical trials evaluating cell therapy products, it has become evident that routine in-depth potency testing of cells and final product is necessary for an efficacious therapy. In our IND, FDA has requested that we continue to study the quality of cells and product to understand its mechanism of action.

Methods

The manufacturing of PMSC-ECM patch is a 4-day process: Day 1: PMSCs are seeded in flasks, Day2: ECMs are equilibrated in growth medium, Day3: PMSC-ECM is manufactured by seeding PMSCs onto ECM, cells and supernatant tested for sterility and identity, Day 4: PMSC-ECM undergoes release testing, packaged and delivered to hospital. The PMSCs used for the product were banked in 2019 and underwent initial testing for sterility, identity, and bioactivity tests. For the yearly bioactivity testing, we designed an assay matrix that includes BDNF & HGF secretion, PGE2, L-kynurenine & cytokine secretion in the presence of IFNγ/TGFβ, caspase 3 inhibitory potency assay and cell-based neuroprotection assay. We also tested the physical integrity of PMSC-ECM using INSTRON.

Results

We successfully manufactured and released the product for Phase I safety study (six patients) with no deviations in Standard Operating Procedure. The assay matrix for testing of biological activity demonstrated that the cells and product are still effective. The caspase 3 inhibitory potency assay can be used as a release test for the product. There is no change in the physical integrity of ECM after seeding of PMSCs.

Conclusions

The development of an assay matrix and routine yearly testing, will lead to better understanding of the product and correlation to efficacy seen in patients. Future experiments will include validation of these assays to set an acceptable range of values prior to licensing of the product.

MR. TANISHQ VAIDYA, B.S.c.

Characterizing the protective effect of mitochondria-targeted antioxidant MitoTEMPO against ibuprofen-induced hepatotoxicity

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ABSTRACT

Ibuprofen toxicity is characterized by increased levels of mitochondrial oxidative stress. Prior literature has shown that ibuprofen increased levels of reactive oxygen species (ROS) in HepG2 hepatocarcinoma cells. These changes are theorized be attributed to disrupted cellular homeostasis in the liver due to mitochondria and proteasome dysfunction from the increased ROS generation by ibuprofen. Previous research in our laboratory has also shown that ibuprofen altered key proteins of several pathways such as energy metabolism, protein degradation, and antioxidant system in the livers of ibuprofen-treated mice.

The aim of this ongoing study is to understand better the effects of the antioxidant MitoTEMPO in reversing the oxidative stress caused by ibuprofen in the hepatic system. To test this, 10-week old male mice were evenly distributed to four groups: group 1 received water and was designated the control group, group 2 received 100 mg/kg ibuprofen daily in their drinking water for 7 days, group 3 received 10 mg/kg MitoTEMPO dissolved in saline via i.p injection every 48 hrs for 7 days, and group 4 received 10 mg/kg MitoTEMPO via i.p injection every 48 hrs and 100 mg/kg ibuprofen daily in their drinking water for 7 days.

Several biochemical assays (26S Proteosome) were used to measure the specific proteasome subunit activities and western blotting was used to characterize specific protein concentration changes in the mice's liver. We further utilized western blotting to measure the expression levels of key enzymes involved in detoxifying products of oxidative stress and energy metabolism. Our data revealed significant improvement in GSTA1/2 expression level in the mitoTEMPO group and mitoTEMPO + ibuprofen group. Proteasome activity showed proteasome dysfunction in the livers of ibuprofen-treated mice. These results suggest that MitoTEMPO may be effective against ibuprofen-induced hepatotoxicity, but further experiment(s) are needed for full clarity.

MS. JULIA PERSKY, B.S.

Characterization of the Immune Tumor Microenvironment in Colorectal Carcinoma Patients Undergoing Surgery

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ABSTRACT

Introduction

Colorectal cancer (CRC) is a leading cause of cancer morbidity and mortality worldwide, although immunotherapy has shown remarkable efficacy for microsatellite unstable tumors the vast majority of patients are microsatellite stable and have a resistance to immunotherapy. To investigate novel targets for immunotherapy in CRC we sought to evaluate the immune tumor microenvironment (TME), including natural killer (NK) cells and related positive and negative regulators to assess for predictors of survival.

Methods

Archived tumor tissue from 74 CRC patients from 2016-2020 was analyzed. Immunohistochemistry was performed for T cell markers (CD3, CD8, CD45RO), NK marker (NKp46), inhibitory markers (TIGIT and MHC-I), and tumor infiltrating lymphocytes (TIL). Primary outcome variables were progression-free survival (PFS) and overall survival (OS).

Results

Mean age was 63, 58% were male, 27% were rectal primary, 31% were lymph node positive, and 26% were AJCC stage III. With a median follow up with 36 months, median survival was 125 months. Higher levels of CD3 were linked to increased OS ($p=0.02$), whereas other lymphocyte markers were not. CD3 expression was positively associated with other immune markers, suggesting collinearity of immune subsets. There was also a tight positive correlation of CD3 with MHC-I ($p<0.0001$ $r=0.81$). NKp46 also showed a positive correlation with MHC-I expression (p.002 $r=0.35$), but NKp46 expression was not associated with PFS or OS. Among patients receiving neoadjuvant chemotherapy ($n=26$), there was no significant change in immune infiltrate post therapy.

Conclusion

In this analysis T cell infiltrates were associated with survival in CRC whereas NK cell infiltrates were not. Further characterization of the immune infiltrate in CRC may yield better biomarkers of prognosis and immune targeting in this refractory disease.

MR. SIRJAN MOR, M.S.

Placental Mesenchymal Stem Cells and Extracellular Vesicles on an Extracellular Matrix Improved Motor Function Recovery After Acute Spinal Cord Injury

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ABSTRACT

Introduction

Placental mesenchymal stromal cells (PMSCs) applied in utero improve ambulatory function in an ovine model of spina bifida and have inspired the first-in-human clinical trial for fetal spina bifida. PMSCs and extracellular vesicles (EVs) have neuroprotective properties and we hypothesized that PMSCs and PMSC-EVs would provide a similar neuroprotective effect in spinal cord injury.

Methods

Sprague Dawley rats were given a right C5 hemi-contusion injury and divided into one of the following treatment groups: extracellular matrix (ECM) only patch, 1st trimester placental mesenchymal stromal cells (PMSCs) seeded on ECM, 1st trimester PMSC-EVs seeded on ECM, 2nd trimester PMSCs seeded on ECM, 2nd trimester PMSC-EVs seeded on ECM, and 8 rats serving as sham control. Motor function was assessed using the Irvine, Beatties, and Bresnahan (IBB) Forelimb Recovery Scale and after 8 weeks, rats were euthanized, and tissue collected for histology.

Results

IBB scoring showed that the rats that received 1st trimester PMSC-ECM (P=0.017), and 1st trimester EV-ECM (P=0.015) had significantly improved motor function of the ipsilateral forelimb compared to rats that were treated with ECM only. Additionally, 2nd trimester PMSC-ECM treatment group had a significant increase in motor function (P=0.014) compared to the group treated with ECM only. However, rats treated with 2nd trimester EV-ECM did not show a significant improvement in motor function compared to rats treated with ECM only (P=0.1275). Histology analysis showed increased neuron and microglia counts in rats treated with 1st trimester PMSC-ECM and 1st trimester EV-ECM compared to rats treated with ECM only.

Conclusion

PMSCs and PMSC-EVs improved motor function recovery in a rodent model of SCI. 1st Trimester cells performed better than 2nd trimester cells – leading to increased neuron counts, and greater white matter, and axon preservation.

MS. SYLVIA CRUZ, B.S.

Intratumoral NKp46+ Natural Killer Cells are Spatially Distanced from T and MHC-I+ Cells with Prognostic Implications in Soft Tissue Sarcoma

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ABSTRACT

Soft tissue sarcomas (STS) are a group of rare malignancies with an unmet need for novel immunotherapies. Tumor infiltrating lymphocytes (TILs) have been linked with favorable outcomes in STS, though the contribution of natural killer (NK) cell subsets, including NKp46 and CD56bright/dim, has yet to be investigated in detail. Despite the known role of MHC-I on immunoregulation of NK and T cells, limited data exist characterizing the spatial relationship of NK cells to MHC-I+/- cells and T cells in STS tumor microenvironment (TME).

Using STS specimens from 130 patients, we evaluated intratumoral NK cell subsets by immunohistochemistry (IHC), flow cytometry, and immunofluorescence (IF) to assess their impact on overall survival (OS) and metastasis-free survival (MFS). We assessed spatial localization of NK and T cells by multiplex IF, specifically analyzing the effects of MHC-I expression on NK and T cell clustering.

High intratumoral NKp46 expression was associated with improved OS by IHC (P=0.04) and IF (P=0.02). CD56dim NK cells were associated with a survival benefit (P=0.05), while higher infiltrates of CD56bright NK cells predicted a worse prognosis (P=0.05). CD56+ NK cells demonstrated a statistically significant inverse relationship with CD3+ T cells by flow cytometry and IF. Spatial analyses showed NK cells preferentially clustering close to other NK cells with sparse CD3+ T and CD8+ T cells in range (P<0.0001). Additionally, CD3+ T and CD8+ T cells showed significantly greater co-localization with MHC-I+ cells, compared to NKp46+ NK cells (P<0.0001).

Intratumoral NK cell subsets, including NKp46+ and CD56bright/dim NK cells, are prognostic in STS and localize closer to MHC-I- cells than they do to T or MHC-I+ cells. Although both NK and T cells are associated with improved survival in STS, their differential distribution in the TME based on MHC-I expression reinforces inherent opposite but interconnected roles for these cells in anti-tumor surveillance.

MS. MELANIE REUTER, B.S.

Dietary resistant starch supplementation upregulates deoxycholic acid production in mice

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ABSTRACT

Diabetes is a disorder of glucose regulation and insulin production that affects 11.8% of the American population according to the CDC and that number is growing. Despite this, no cure exists for this chronic, sometimes fatal condition. The gut microbiome is an important target for management and prevention of diabetes. The microbiome is a producer of many metabolites involved in glucose regulation and other important metabolic pathways involved in diabetes. Some of the most important and abundant metabolites produced by the gut microbiome are bile acids. Primary bile acids produced in the liver are then converted into secondary bile acids by bacteria in the gut via 7-α-dehydroxylation. These secondary bile acids are strong ligands for bile acid receptors known to improve glycemic regulation. In this study, we hypothesized that feeding mice a diet rich in resistant starch (RS) would alter the makeup of the gut microbiome to favor bacteria capable of executing 7-α-dehydroxylation. To test this, mice were fed a diet supplemented with RS or an isocaloric (IC) control diet. Profiling of gut luminal bile acids show that RS supplementation proportionally increases the production of the secondary bile acid deoxycholic acid (DCA). RS tended to decrease unconjugated cholic acid (CA) concentrations, the substrate for 7-α-dehydroxylation in DCA production, compared to IC-fed controls. Hepatic expression of the enzyme required for production of CA, Cyp8b1, did not differ between groups. Therefore, these data suggest that RS-induced increases in DCA are due to increase gut bacterial conversion of CA to DCA rather than an increase in substrate. This is a tool with which to study the bacterial pathways involved in 7-α-dehydroxylation. Determining which bacteria can carry out this reaction is critical to targeting bacterial bile acid metabolism. The upregulation of this pathway shows promise as a therapeutic target due to its direct downstream effects on glycemic regulation.

DR. KEWA GAO, M.D., Ph.D.

Co-transplantation of mesenchymal stromal/stem cells with endothelial colony-forming cells supported long-term survival and function

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ABSTRACT

Mesenchymal stromal/stem cells (MSCs) derived from adult or perinatal tissues have been recognized as a promising regenerative therapy for various diseases. However, their engraftment rate after transplantation is typically extremely low. Endothelial colony-forming cells (ECFCs) are endothelial precursors that possess potent vasculogenic properties. In this study, we investigated if co-transplanting ECFCs with MSCs could enhance the survival rate of MSCs and establish an effective transplantation strategy for MSC-based therapies.

We subcutaneously co-transplanted ECFCs with MSCs from three different sources, bone marrow (BMSCs), adipose (AMSCs), and placenta (PMSCs) into adult immunodeficient NSG mice. We observed that AMSCs and PMSCs had better survival rates than BMSCs throughout the study period, with transplanted cells surviving for up to 18 weeks using this co-transplantation strategy as observed by in vivo bioluminescence imaging. Co-transplantation of ECFCs with MSCs showed higher survival rates of all three MSC sources compared to transplanting MSCs alone. To investigate the underlying mechanisms, we assessed PMSC proliferation rate by BrdU uptake assay and found that the proliferation rate of MSCs was improved by direct co-culture with ECFCs rather than indirect co-culture with ECFCs. Furthermore, we integrated RNA seq and proteomics data from the co-culture and monoculture of ECFCs and PMSCs to perform the differential gene expression and gene enrichment analysis, including the GO and KEGG pathways. Understanding these mechanisms can lead to designing more effective transplantation strategies that improve MSCs' survival and function.

In conclusion, our study established a co-transplantation strategy of MSCs with ECFCs that significantly improved the long-term survival rate of MSCs and enhanced their therapeutic functions. This approach has the potential to improve the clinical outcomes of MSC-based therapies for various diseases and conditions.

LAUREN FARLEY, B.S.

Cross-Species Characterization of Splenic Natural Killer (NK) Cells Reveals Organ-Specific Heterogeneity with Implications for Cancer Immunotherapy

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ABSTRACT

Although natural killer (NK) cell immunotherapy for cancer is a promising modality, questions of optimal donor characteristics for in vivo function remain. We hypothesized that splenic NK, harbor unique phenotype and function which can inform optimal NK immunotherapy. Matched NK cells were isolated from spleen and blood of 4 human and 3 dog patients. Immune phenotype, proliferation, viability, and apoptosis were assessed pre and post 14 days of co-culture. Differential gene expression was assessed using 3'-Tag-RNA-sequencing. NK cell frequencies in human spleen were lower than PBMCs per live CD45+ cells (9.4±0.3% vs16.7±8.8%, P=0.05) whereas CD3+, and CD8+ were comparable (P>0.05 all). Phenotypically, TIGIT expression was higher in resting human spleen NK compared to PBMCs (39.8±2.4%vs19.0±8.6%), as was CD69 (23.8±8.7% spleen vs14.4±7.6% PBMCs). In dog and human, spleen cells expanded more significantly than PBMCs with human showing 266-fold versus 105-fold expansion. In human, maximal expansion was also greater for spleen NK cells (690±1080 x 10^6) compared to PBMC NKs (111±165 x 10^6). Dog NK expansions were similar. Purity of human NK cells at day 14 was similar for spleen and PBMC-expansions at >90%, and both groups showed similar Ki67 (80%) and Granzyme B (98%). Killing assays against human sarcoma targets showed greater cytotoxicity with spleen-expanded NK cells compared to PBMC-expanded at 10:1 E:T (40-50% vs30-35%). Day 14 canine spleen NK cells showed greater killing compared to PBMC-expanded against multiple cancer targets (45% vs25%). Sequencing results showed an upregulation of pathways of persistence and metabolic fitness for both human and dog spleen. NK cells from spleen show greater activation and expansion compared to PBMC-derived in human and dog. Further characterization of NK cells from spleen may provide novel insights into mechanisms to overcome barriers to successful NK immunotherapy for solid tumors in multi-species models.

MS. JENNIFER LOZA, B.S.

Analysis of Donor and Recipient Characteristics in Donation after Circulatory Death Kidney Transplants Resulting in Delayed Graft Function Compared to Primary Non-Function

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ABSTRACT

Donation after circulatory death (DCD) kidney transplantation remains underutilized due to concerns for associated complications including delayed graft function (DGF) and primary non-function (PNF). While DGF, defined as the need for dialysis within 7 days of transplantation, is a temporary graft dysfunction that eventually recovers, PNF is a more permanent graft dysfunction requiring the resumption of maintenance dialysis and possible re-transplantation. Thus, we investigated factors that contribute to the progression of DGF to PNF in DCD kidney transplants.

We performed a retrospective, single-center review of adult patients who underwent isolated DCD kidney transplantation from 2016-2021. Donor and recipient characteristics were compared between patients that developed DGF with recovered graft function and PNF (Table 1). 344 patients received DCD kidneys, 41.9% were female and the median age was 56 years. 153 patients (44.5%) developed DGF but recovered graft function by 90 days post-transplant. Excluding technical complications, 22 patients (6.4%) developed PNF. Cold ischemia time (CIT), warm ischemia time, Kidney Donor Profile Index ≥85%, donor acute kidney injury (Cr ≥2.0 mg/dL), and use of machine perfusion were not significantly different between the groups (Table 2). However, older donor age and longer CIT have an increased association with PNF (Table 3).

Our study shows that few donor and recipient characteristics are associated with DGF kidneys' progression to PNF. These findings highlight the need to develop biomarkers to identify at-risk DGF kidneys. Further studies including histopathological and multi-omics analyses of our time-zero tissue samples may yield further insight into the mechanisms that allow kidney recovery and identify biomarkers for kidneys at risk of failure.

Table 1. Donor and Recipient characteristics	PNF (n = 22)	DGF (n = 153)	p
Donor Age, y	47.1 [44.5–52.8]	41.8 [32–51]	0.009
Donor Female	7 (31.8%)	68 (31.4%)	0.966
Donor BMI, kg/m²	26.7 [22.1–30.1]	24.9 [24–32.7]	0.179
Donor Ethnicity			0.079
Asian	0 (0%)	6 (3.9%)	
Black	1 (4.5%)	7 (4.6%)	
Hispanic	4 (18.2%)	18 (11.8%)	
White	15 (68.2%)	120 (78.4%)	
American Indian/Alaska Native	2 (9.1%)	1 (0.65%)	
Multiracial, Non-Hispanic	0 (%)	1 (0.65%)	
American Indian/Alaska Native	2 (9.1%)	1 (0.65%)	
Multiracial, Non-Hispanic	0 (%)	1 (0.65%)	
Recipient Age	59.5 [53–67]	54.1 [47–63]	0.043
Recipient Female	7 (31.8%)	58 (37.9%)	0.589
Recipient BMI, kg/m²	26.9 [22.9–30]	27.5 [24.2–30.8]	0.570
Recipient Ethnicity			0.960
Asian	5 (22.7%)	39 (25.5%)	
Black	5 (22.7%)	29 (19.0%)	
Hispanic	6 (27.3%)	47 (30.7%)	
White	6 (27.3%)	32 (20.9%)	
American Indian/Alaska Native	0 (0%)	1 (0.65%)	
Multiracial, Non-Hispanic	0 (%)	4 (2.6%)	
Recipient History of Previous Transplant	1 (4.5%)	23 (15.7%)	0.042
Recipient EPTS at Transplant	59.0 [47.8–74.5]	54.7 [28–85]	0.520
Recipient CPRA	18.5 [0–32]	32.5 [0–66]	0.110
Recipient Pre-transplant Dialysis	21 (95.5%)	146 (95.4%)	0.995

Continuous variables are shown as mean [interquartile range] and categorical values are shown as number (percentages). BMI, body mass index; EPTS, estimated post-transplant survival; CPRA, calculated panel reactive antibody.

Table 2. Univariate Analysis	PNF (n = 22)	p	DGF (n = 153)	p
CIT, h	29.1 [23.9–34.4]	0.227	26.5 [20–32.5]	0.227
Total WIT, min	30.8 [18.3–33.8]	0.342	35.4 [18–41]	0.342
KDPI ≥ 85%	1 (4.5%)	0.929	9 (5.9%)	0.471
Terminal SCr ≥ 2.0	1 (4.5%)	0.836	11 (7.2%)	0.226
Machine Perfusion	19 (86.4%)	0.425	121 (79.1%)	0.425

CIT, cold ischemia time; WIT, warm ischemia time; KDPI, kidney donor profile index; SCr, serum creatinine

Table 3. Multivariate Analysis	OR	95% CI	p
PNF			
Donor Age	1.05	1.01 – 1.09	0.013
CIT	1.03	1.00 – 1.10	0.045
DGF			
Donor Age	1.02	1.00 – 1.03	0.014
Donor Sex (F vs M)	0.58	0.37 – 0.92	0.021
CIT	1.03	1.00 – 1.06	0.039
Machine Perfusion (Y vs N)	0.40	0.21 – 0.75	0.004
Recipient BMI	1.06	1.01 – 1.11	0.012

CIT, cold ischemia time; BMI, body mass index

BRIAN LUONG

Identification of a Threshold Toe Arm Index to Predict Wound Healing in Patients Undergoing Vascular Intervention

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ABSTRACT

The Society for Vascular Surgery (SVS) guidelines recommend non-invasive vascular lab evaluation to follow perfusion after revascularization for chronic limb threatening ischemia (CLTI). However, the value of toe arm index (TAI) as a clinical indicator of wound healing potential in patients with lower extremity wounds has not been well established. A retrospective review was performed of vascular patients with lower extremity wounds that underwent peripheral vascular intervention between 2014-2019. Data regarding patient demographics, comorbidities, TAI, and SVS WIfI score were collected. A total of 173 patients (67.7 ± 10.9 years; 71.1% male) were identified. Mean preoperative TAI was 0.21 ± 0.16 and mean SVS WIfI score was 3.02 ± 1.08. Most patients underwent endovascular intervention (77.5%). Patient were followed for a median of 416 (IQR 129-900) days. The mean postoperative TAI was 0.36 ± 0.20. Nine percent (15) of patients healed within 1 month of revascularization without need for major amputation, while 44.8% (69) healed within 6 months of revascularization and 65.5% (97) healed within 1 year of revascularization. Those that healed within 1 year without major amputation did not differ from those that did not heal based on age, gender, race, comorbidities, periprocedural medications, or procedures performed. However, patients that healed without major amputation had a higher postoperative TAI (0.38 versus 0.30, p=.03). This was similar in the subset of patients with diabetes (0.37 in healed versus 0.28 in non-healed, p=.01). A Youden index was calculated and identified a TAI value of 0.30 that optimized sensitivity and specificity for wound healing. Over half of patients healed without major amputation by 1 year after revascularization despite high initial WIfI scores and poor preprocedural perfusion status. The TAI value of 0.30 may be a clinically important threshold to identify wound healing potential in patients with CLTI.

MS. ANASTASIYA STASYUK, B.S.

Prevalence of Co-Existing Esophageal Findings in Patients with Zenker's Diverticulum

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ABSTRACT

Introduction

Persistent dysphagia after repair of Zenker's diverticulum (ZD) is well-described but its causes are not completely understood. This study examines the prevalence of co-existing esophageal findings in patients with ZD and assesses differences in postoperative swallowing outcomes compared to patients without esophageal abnormalities (ZD-only).

Methods

A retrospective review of patients undergoing endoscopic repair of ZD at UC Davis between 2014 and 2021 was performed. Esophageal findings were collected from preoperative videofluoroscopic swallow studies, esophagrams, and esophagoscopy procedures. Patient-reported swallowing outcomes were measured using Eating Assessment Tool (EAT-10) scores. Changes in EAT-10 scores were assessed by t-test analysis.

Results

Of 55 patients (23 women, mean age 73.25 years) undergoing endoscopic repair of ZD, 43 had co-existing esophageal findings (78.18%). Hiatal hernias were most frequently reported (n=31, 56.36%), followed by dysmotility (n=26, 47.27%), esophageal ring or web (n=16, 29.09%), gastroesophageal reflux (n=13, 23.63%), strictures (n=6, 10.91%), and esophagitis (n=5, 9.09%). Postoperative EAT-10 scores were significantly improved overall (18.71 vs 4.87, $P < .05$). After combining all patients with co-existing esophageal findings, those with findings compared to those without trended toward worse postoperative EAT-10 scores (5.5 vs. 2.5, P=.21), indicating worse dysphagia.

Conclusion

We found ZD repair improves patients' dysphagia, and appropriate ZD repair should be offered to thoughtfully selected patients. The prevalence of concurrent esophageal findings in patients with ZD is markedly high and may contribute to worse dysphagia outcomes. Further work to assess how co-existing esophageal findings impacts persistent postoperative dysphagia in ZD patients is needed. Comprehensive esophageal testing in patients with ZD is vital and can improve preoperative counseling on postoperative expectations.

JOHN ARRIOLA, M.D.

Assessing Instrument Tray Utilization in Living Donor Renal Transplant (LDRT): Unused Instruments? Potential for a Leaner Tray

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ABSTRACT

Process improvement and waste reduction are integral parts of being an environmentally conscious surgeon. The operating room (OR) accounts for significant amounts of waste within the medical system. The cost of sterilization is an estimated $0.77 USD per instrument, making reduction of unutilized instruments an easy target for cost and waste reduction.

This pilot study audited 10 living donor renal transplants by 5 surgeons over 3 months at the University of California, Davis was performed following a validated Lean-5S (Sort, Simplify, Sweep, Standardize, Self-discipline) model. Total instrument use, table set-up times, and instrument count times were recorded. Variance in instrument selection between surgeons was also calculated.

Each surgeon performed a minimum of 1 case. There were 115 unique types of instruments and 205 total instruments per tray. Average total instrument use was 82.7 ± 10.2 (40.3% ± 5.0%) instruments per case. Of the total instruments available, 55/205 (26.8%) were never used in any case, 41 (20.0%) were used in <25% of cases, 42 (20.5%) used in 25-50%, 16 (7.8%) used in 50-75%, and 51 (24.9%) were used in 75-100%. Average table set up time was 31.9 ± 11.0 min with an average instrument count time of 8.7 ± 2.1 min (2.5 ± 0.6 seconds per instrument). Average unique instrument use was 41.8 ± 4.5 (36.3%, s2 = 20.8) unique instruments.

Instrument utilization was low in this pilot study with less than half of the total instruments being used on average. Variance in unique instrument selection was relatively low suggesting the group has a uniform approach to the procedure. Over 25% of the tray could be eliminated immediately with potential for an additional 20% of low use (<25%) instruments being eliminated with consensus on standard instrument utilization amongst the group. At average LDRT volume, there is a potential annual reduction of $4,500 USD in sterilization costs and time annual savings of 7 hours for this single procedure.

DR. NATALIYA BAHATYREVICH, M.D.

An Analysis of Thoracic Surgery Patients to Identify Predictors of Need for Home Health Services at Discharge

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ABSTRACT

Introduction

In patients undergoing general thoracic surgery, need for home health (HH) services at discharge increases hospital length of stay. We sought to identify predictors of HH needs for this patient population.

Methods

This is a single institution, retrospective analysis of all patients undergoing non-ambulatory thoracic surgery procedures from January 2017 through June 2021. Surgeries were categorized as “Lung”, “Esophagus” and “Other”. We analyzed preoperative characteristics, intraoperative events, and postoperative complications between HH and No-HH cohorts. We performed a multivariable logistic regression analysis to identify preoperative predictive factors for HH need.

Results

We identified 429 patients, with 324 patients (75.5%) discharged without HH and 105 patients (24.5%) discharged with HH. The average length of stay for the No-HH cohort was 3.5 days compared to the HH group of 7.9 days ($p<0.0001$). A multivariable analysis revealed age (adjusted odds ratio [aOR] 1.11, CI 1.10-1.16), clinical cancer stage II (aOR 6.40, CI 2.13-19.23) and clinical cancer stage III and higher (aOR 3.94, CI 1.12-13.84), preoperative opioid use (aOR 10.30, CI 2.24-47.35), higher CMI Vizient score (aOR 1.72, CI 1.26-2.35), and Esophageal operation (aOR 18.75, CI 4.70-74.81) as predictors of need for HH.

Conclusions

Using a multivariable logistic regression model, we identified older age, advanced clinical cancer stage, preoperative opioid use, higher CMI Vizient score, and esophageal operation as predictors of need for HH services at the time of discharge. These data may allow for identification of at-risk patients in the preoperative clinic, and initiate HH logistics prior to admission.

MR. ERIC ROBLES GARIBAY, B.S.

Association of Large Venous Vessel Invasion with Recurrence in Early-Stage Colon Cancer

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ABSTRACT

Introduction
Large venous vessel invasion (LVVI) is associated with distant recurrence and poor survival in later stage colon cancer (CC), but the significance of LVVI in early-stage CC has not been reported. Identification of LVVI is technically challenging and often not reported initially: prior studies have shown that with pathology re-evaluation, detection rates of LVVI increase from 15% to 40%. We aim to identify whether LVVI reporting can be improved with re-evaluation of pathology slides and whether LVVI is associated with worse prognosis in patients with early-stage CC. We hypothesize that re-evaluation of cases will identify more cases with LVVI than designated by the original pathology report, and that patients with LVVI will have higher recurrence rate, shorter progression free survival and overall survival compared to patients without LVVI, independent of other known prognostic markers. While surgical resection is curative therapy for early CC, recurrence rates range from 5% (Stage I) to10% (Stage II). Better surveillance strategies and predictive markers of recurrence are needed.

Methods
Pathology slides from a UCD surgical pathology database consisting of Stage I and II (pT3N0) CC cases diagnosed at our center between 2000 – 2020 were re-evaluated. Patient data for the cases was retrieved from the electronic medical record to determine recurrence rates and survival outcomes.

Results/Conclusion
On re-evaluation of 136 cases in the UCD database, 4 cases were found to have LVVI when this was not originally reported. Patient follow-up data was missing from the electronic medical record; thus, data was obtained from the California Cancer Registry (CCR) to correlate outcomes for these cases. Currently, CCR data is being defined and undergoing analysis to gain a complete follow of clinical information. This study could lay the groundwork for a larger prospective clinical trial that could change standard treatment and surveillance for early-stage CC.

EMILY XU, B.S.

Improving Abdominal Aortic Aneurysm Surveillance for Women Using Natural Language Processing

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ABSTRACT

Introduction

In the United States, there are more than 200,000 new abdominal aortic aneurysms (AAA) diagnosed each year. Aortic growth weakens the vessel wall and can cause rupture if not diagnosed and treated. Currently, healthcare providers utilize the United States Preventive Services Task Force (USPSTF) guidelines to screen patients for aneurysms, which does not recommend screening for AAA in women.

Methods

We sought to use Natural Language Processing (NLP), a form of machine learning, to review patient imaging records to improve rates of identification of diseases like AAA. Within the UC Davis tertiary care system, 2.5 million radiology reports were reviewed and 11,353 patients were identified as having a possible AAA. After exclusions, we analyzed a cohort of 1934 patients, comprised of 445 (23%) female and 1489 (77%) male patients.

Results

Women were generally excluded by USPSTF screening guidelines (100% vs 31% in males) and were more prone to miss screening within the window (age 65-75) recommended by the Society for Vascular Surgery (SVS) compared to men (28.8% vs 23.7%). Subsequent death was the most frequent reason for closing identified AAA cases (44% vs 41% of males). 66% of the total cohort was comprised of 825 patients (43%) with an aneurysm that was identified incidentally and 451 patients (23%) were identified after previous loss to follow-up. Among these patients, women more frequently had aneurysms found incidentally on imaging (45.7% vs 41.9% of males).

Conclusion

While SVS guidelines recommend AAA screening in women smokers, many non-vascular providers defer to USPSTF guidelines, resulting in a screening gap that predominantly impacts women. NLP software offers an elegant solution, using existing EMR data to address these gaps in AAA screening and surveillance, ultimately enhancing the detection of aneurysms in female patients.

DR. LESLIE VUONCINO, M.D.

How Triage of Elderly Anticoagulated Falls Impacts Hospital Flow

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ABSTRACT

Introduction

Emergency department (ED) overcrowding is a challenge at many hospitals. Triage algorithms can impact patient flow and are evaluated for overall appropriateness, but the correct triage of anticoagulated patients ≥65 years of age with ground level falls is unknown. We hypothesized the triage category of these patients impacts ED throughout.

Methods

From July 2019-December 2021 ground level falls in patients ≥65 years old on anticoagulants were activated as Level 2 (trauma team managing patients) on even months and as Level 3 (emergency medicine managing patients) on odd months in a prospective cohort study. Outcomes included admission rate, time to admit orders, ED length of stay, abdominal CT rate and mortality. Data was compared using Mann Whitney and Chi-squared or Fisher's exact tests for small sample sizes.

Results

447 trauma activations were captured (Level 2=346, Level 3=101). The median injury severity score was 2 (IQR 1-5) in Level 2 and 1 (IQR 1-6) in Level 3 patients. Admission rates were similar for Level 2: 59% (95% CI 54-64%) and Level 3: 50% (95% CI 40-61%), p=0.13. Median time to admit orders was faster for Level 2 at 5.94 hours (95% CI 6.70-8.16) than Level 3 at 7.33 hours (95% CI 7.47-11.53) p=0.01. Median ED length of stay was shorter for Level 2 at 8.33 hours (95% CI 9.02-10.11) than Level 3 at 9.22 hours (95% CI 10.64-14.87), p=0.05. In admitted patients, the abdominal CT rate was higher for Level 2: 72% (95% CI 65-78%) than Level 3: 49% (95% CI 35, 63%), p=0.002. No difference in mortality was identified (Level 2=3, Level 3=2, p=0.32).

Conclusion

Admission and death rates were similar in this patient population regardless of trauma activation level. More abdominal CTs were obtained for Level 2 activations. However, a significant decrease in time to admit orders and ED length of stay was identified in patients triaged as second-tier activations. Triage categories not only mobilize resources but also impact ED patient flow.

DR. SU YEON LEE, M.D.

Developmentally delayed children are more likely to present with perforated appendicitis

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ABSTRACT

Introduction
Developmentally delayed children can have impaired communication that may complicate diagnosis of medical conditions. Appendicitis is one of the most common surgical diagnosis in children. We hypothesize that children with developmental delay are associated with delayed presentation of appendicitis, and therefore higher incidence of perforation.

Methods
The American College of Surgeons National Surgical Quality Improvement Program Pediatric appendectomy Participant User File was obtained from 2015 to 2020. Primary outcome was perforated appendicitis. Outcomes were compared between children with and without developmental delay.

Results
97236 cases were included with 2573 patients undergoing interval appendectomy at significantly higher rates in those with developmental delay compared to those without (4.19 vs 2.62%, $p<0.01$). Of remaining 94013 children, 27.9% had perforated appendicitis identified during surgery. Patients with perforated appendicitis were significantly more likely to be female (40.17 vs 39.51%, $p=0.05$), Hispanic (31.08 vs 25.42%, $p<0.01$), developmentally delayed (2.17 vs 1.65%, $p<0.01$), and younger (10.23 vs 11.62 years, $p<0.01$). On multivariable regression, developmental delayed status was significantly associated with perforated appendicitis after adjusting for sex, race, age, and transfer status. (OR 0.832, 95% CI 0.750-0.922, $p<0.01$). Developmentally delayed children presented significantly more often with septic shock (0.53 vs 0.09%, $p<0.01$), preoperative pressor requirement (0.3 vs 0.06%, $p<0.01$), and preoperative transfusion requirement (0.36 vs 0.09%, $p<0.01$) than those without delay.

Conclusion
Children with developmental delay were more likely to present with perforated appendicitis and higher disease severity than those with typical development. This association persisted on multivariate analysis. Clinicians should strongly consider perforated appendicitis in these children when they initially present for appendicitis.

MS. KARIMA ALGHANNAM, B.S.

Outcomes from Donation After Circulatory Death Kidneys with Prolonged Warm Ischemia Times are Comparable to All Deceased Donor Kidney Transplants

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ABSTRACT

Efforts to address the severe shortage of donor organs include increasing the use of renal allografts from donors after circulatory death (DCD). While warm ischemia time (WIT) is an important factor in DCD kidney evaluation, few studies have compared the effect of WIT on DCD kidney outcomes and transplant center WIT acceptance practices remain variable. We evaluated the impact of varied WIT (defined as withdrawal of life support to cross clamp) in controlled DCD donors by comparing kidney allograft and transplant recipient outcomes between high WIT (> 60min), low WIT (≤ 60min), and kidneys transplanted from donors after brain death (DBD).

We conducted a single-center retrospective review of all adult patients who underwent isolated deceased donor kidney transplantation from 2000-2021. We compared post-transplant outcomes between the three groups. Kaplan-Meier estimator with a log-rank test was used for survival analysis. Data is presented as medians [interquartile ranges] and numbers (percentages).

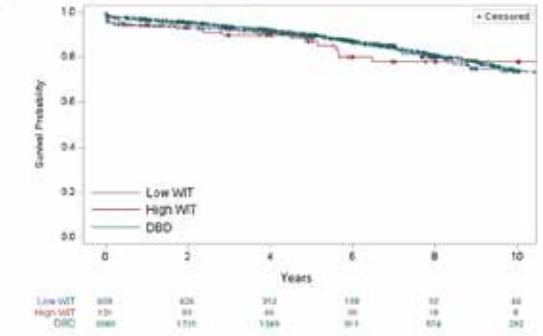
2,809 patients were identified, 608 received low WIT DCD, 121 received high WIT DCD, and 2,080 received DBD kidneys. The WIT range in the low group was 8-60 and 61-128 minutes in the high group. Donor and recipient characteristics are presented in Table 1. Donor and recipient age, sex, and BMI were not significantly different between groups. Although DGF (p<0.0001) and one-year eGFR (p<0.0001) were significantly higher in both DCD groups compared to the DBD group, long-term transplant outcomes were similar, with death censored graft (p= 0.63), and patient (p= 0.38) survival shown in Figure 1.

Despite differences in WIT, DCD kidneys have equivalent 1-year graft function, death censored graft and patient survival and in carefully selected donors, achieve similar outcomes to DBD kidneys. Increased acceptance of kidneys from prolonged WIT DCD donors may present an opportunity to increase kidney utilization while preserving outcomes.

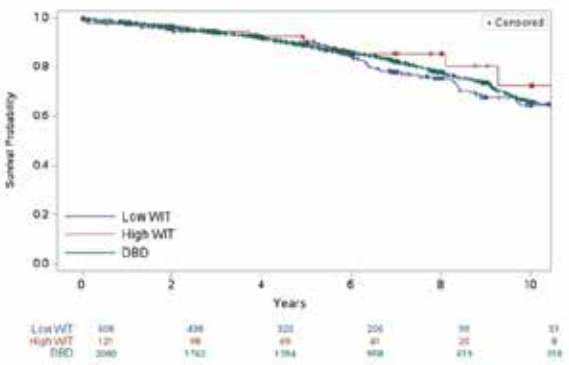
Table 1: Sig (*) is defined as p<0.05

	DCD Low WIT (≤ 60 min) N=608	DCD High WIT (> 60 min) N=121	DBD N=2050
Donor Age	25 [20-34]	71 [65-81]	41 [27-53]
Donor Terminal Cr≥2 mg/dl*	45 (7)	4 (3)	486 (23)
Cold Ischemia Time (hours)*	25.3 [19-34]	28.4 [21-37]	23.4 [15-31]
KDPI (%)*	54 [33-70]	30 [19-54]	43 [19-64]
KDRI*	1.36 [1.11-1.60]	1.07 [0.96-1.30]	1.22 [0.96-1.49]
DGF, No (%)*	273 (45)	48 (40)	462 (22)
PNF, No (%)*	27 (4)	3 (2)	30 (1)
One-year Serum Cr (mg/dL)	1.36 [1.08-1.70]	1.33 [1.09-1.68]	1.30 [1.04-1.59]
One-year eGFR (mL/min/1.73m²)*	78.3 [62-99]	79.7 [64-100]	85 [67-106]
Recipient Age	56 [46-63]	55 [45-64]	55 [43-64]

A) Death-censored Graft Survival (p=0.63)



B) Patient Survival (p= 0.38)



Building a Culture of Support at a Pediatric Surgery Center Through Multidisciplinary Peer Support

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ABSTRACT

Introduction

Surgeons and peri-operative staffexperiencehighrates ofburnout manifesting as exhaustion, depersonalization, and lack of achievement. Consequences include increases in errors and adverse patient events. Little data exists regarding the effectiveness of multidisciplinary peer support systems in combatting burnout. We sought to improvestaffmorale through establishment of a formally trained, multidisciplinary peer support team.

Methods

Self-selected surgeons, anesthesiologists, and nurses were formally trained as Peer Responders as part of an institutional peer support program. All peri-operative staff at our pediatric surgery center (n = 120) were surveyed before initiation of the program and then 1-month and 12-months after initiation. Primary outcomes wereunit morale,unitsupport, and peer approachability. A Welch's t test was done to compare outcomes pre- and post-implementation with alpha of 0.05. Institutional IRB approval was waived.

Results

The survey response rates were 57.5%, 32.5%, and 37.5% chronologically. After one year, there were statistically significant increases in unit support ($p = 0.008$) and peer approachability ($p < 0.001$). The percentage of staff who rated unit morale as high/very high increased from 44.7% on the pre-survey to 52.5% at one year ($p = 0.0487$). On subgroup analysis by staff role, surgeons were least likely to utilize peer support.

Conclusions

A multidisciplinary peer support team is an effective and easily reproducible means of building a culture of support and improving morale among peri-operative staff. Surgeons were least likely to seek interprofessional peer support. Consequently, surgeon-specific strategies may be necessary. Further investigations are ongoing regarding secondary effects on staff burnout rates, patient safety, and quality of care.

DR. ANNA XUE, M.D.

Marking Subcentimeter Pulmonary Nodules for Resection Utilizing Robot-Assisted Bronchoscopy with Radial Endobronchial Ultrasound

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ABSTRACT

Introduction

Centrally located subcentimeter pulmonary nodules suspicious for malignancy are difficult to localize and resect minimally invasively and often require more extensive resection to ensure adequate margins and complete resection of disease. The introduction of robot-assisted navigational bronchoscopy with radial endobronchial ultrasound (r-EBUS) has allowed for the identification and subsequent sublobar resection of these pulmonary nodules. We evaluated the utility of this innovative technology to mark and resect pulmonary nodules that would otherwise be unresectable without more extensive resections.

Methods

Preoperative dedicated high-definition computerized tomography (CT) was performed in all patients. Virtual bronchoscopic images were then generated using the planning software and lung registration points were marked on the virtual image intraoperatively. Next, the navigation phase is initiated to locate the target lesion and robot-assisted bronchoscopy is used to position the transbronchial needle. Fluoroscopy and r-EBUS are then used to guide the transbronchial needle to inject a mixture of indocyanine green and methylene blue to mark the target lesion and to create a track for coil or fiducial marker placement, allowing subsequent minimally invasive sublobar lung resection.

Results

Robot-assisted bronchoscopy with r-EBUS localization of pulmonary nodules via delivery of dye agents, placement of coils, and/or fiducial markers have aided in multiple successful minimally invasive sublobar resection of subcentimeter and partially solid pulmonary nodules. Intraoperative visualization of the marked lesions allows for precise resection of the target lesions with appropriate margins on pathology.

Conclusions

This emerging technology has enabled successful minimally invasive lung sparing sublobar resection with appropriate margins for partially solid subcentimeter pulmonary nodules in all segments of the lung that traditionally are difficult to locate.

MR. JORDAN PITMAN, B.S.

Pharmacotherapy Alone is Insufficient to Manage Metabolic Dysregulation in Patients with Severe Obesity

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Dr. Sean Adams, Ph.D., M.S.[1] • Dr. Mohamed Ali, M.D., F.A.C.S.[1]

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Abstract

Patients with medically complicated obesity exhibit a broad continuum of biochemical laboratory data. We developed a system to stratify metabolic comorbidities by severity score but discovered that assessing comorbidities by traditional biochemistry and pharmacotherapy may underestimate severity. We hypothesize that patients with obesity-related comorbidities cannot truly achieve disease control with pharmacotherapy alone.

We prospectively evaluated 39 women undergoing bariatric surgery and identified 13 metabolic health markers (including HbA1c, insulin, LDL, AST) as inputs into unsupervised predictive models; medication was excluded from this model to assess their efficacy. The model output was compared to clinical status with the expectation that patients with excellent pharmaceutical control of metabolic diseases should cluster with 'healthy' patients with obesity.

Clinical assessment identified 22 patients without T2DM and 17 patients on medications for T2DM. Using unsupervised predictive modeling, all 17 treated patients (100%) segregated into the 'unhealthy' group with 95% confidence, while only 1 non-medicated patient (4.5%) segregated into this group. The most influential variables in driving this discrimination were HbA1c, FPG, and LDL. Despite improved biochemical profiles when patients are medicated, pharmacotherapy alone could not achieve true metabolic health.

Although metabolic health would be far worse without medication, predictive modeling indicates that medications do not achieve disease control to the point of restoring normal metabolic health. In contrast, bariatric surgery typically drives complete or near complete remission of cardiometabolic disease, suggesting surgery normalizes core systems that are foundational to disease onset and progression. Our findings highlight the need for intensive characterization of metabolic comorbidities in clinical settings and support bariatric surgery as the best treatment for obesity-related conditions.

MS. GOLDDY SALDANA, M.S.

Poor Availability and Readability of Spanish Patient Educational Materials for Cleft Lip and Palate — Review of the Nations' Top Children's Hospitals

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ABSTRACT

Introduction

Cleft lip with or without cleft palate (CL/P) occurs at higher incidences in Hispanic communities, representing 18.9% of the US population.1 We analyzed the availability and readability of Spanish-written patient education materials (PEM) on CL/P from top-ranking US children's hospitals.

Methods

This study is a descriptive analysis of online Spanish PEM on CL/P from top-ranked children's hospitals (per 2021-2022 US News & World Report).

Availability was assessed via Google search and authorized hospital websites. For each hospital, a Google search was conducted using the phrase, "labio leporino y/o paladar hendido (translation: CL/P) + name of the children's hospital." Additionally, independently written Spanish text was distinguished from a basic English translation.

English PEM readability was assessed using SMOG, a formula that calculates the reading grade level of a text. Spanish PEM readability was assessed using SOL, the SMOG formula converted for the Spanish language. Unpaired two-tailed t-tests were used to compare readability.

Results

51 children's hospitals met inclusion criteria; five were excluded due to lack of PEM on CL/P. Only 35.3% (n=18) of hospitals had some form of Spanish PEM: 89% (n=16) available on google search, 78% (n=14) on official website, 89% (n=16) on both. Only 10.9% (n=5) were independent Spanish texts. There was a significant difference in reading levels between Spanish and English PEMs; SOL = 9.6 and SMOG = 11.3 (p-value= 0.001).

Conclusion

There is a paucity of Spanish PEM for CL/P among the nation's top children's hospitals. English and Spanish PEMs are both provided at unacceptably high reading levels.

1. "U.S. Census Bureau Quickfacts: United States." United States Census Bureau, https://www.census.gov/quickfacts/fact/table/US/RHI725221.

DR. ALEXANDRA JOHNS, M.D., M.P.H.

Outcomes After Bariatric Surgery in Patients with Pulmonary Comorbidities and Risk Factors

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ABSTRACT

Introduction

Obesity is associated with altered respiratory mechanics and pulmonary dysfunction. This study aims to evaluate the effects of pulmonary comorbidities/risk factors on postoperative outcomes in patients undergoing laparoscopic Roux-en-Y gastric bypass (LRYGB) and sleeve gastrectomy (LSG).

Methods

The 2015-2018 MBSAQIP database was analyzed. Multivariable logistic regression analyses were performed controlling for preoperative characteristics including age, body mass index, ASA status, and surgery type to determine the risks of complications.

Results

Between 2015-2018, 96,870 underwent LRYGB or LSG. Preoperatively, 41% of patients had obstructive sleep apnea (OSA), 1.8% of patients had chronic obstructive pulmonary disease (COPD), 8.4% of patients smoked, and 0.9% of patients were oxygen dependent. Patients with COPD were at increased risk of requiring ventilation for >48 hours (OR 2.46, 95%CI 1.24-4.87) and pneumonia (OR 2.51, 95%CI 1.47-4.28). Patients who smoked were at increased risk of pneumonia (OR 1.64, 95%CI 1.11-2.43). Patients with OSA were at increased risk of any complication (OR 1.19, 95%CI 1.10-1.29). Admission to the ICU was more likely for patients with OSA (OR 1.27, 95%CI 1.10-1.46), COPD (OR 1.61, 95%CI 1.20-2.15), smoking history (OR 1.29, 95%CI 1.03-1.60), and oxygen dependence (OR 2.25, 95%CI 1.62-3.12). Mortality was only increased in oxygen-dependent patients (OR 2.77, 95%CI 1.17- 6.56).

Conclusions

Although COPD and oxygen dependence were less common than OSA and smoking history, these comorbidities were associated with more significant adverse outcomes. Patients with COPD were at greatest risk of pulmonary complications, while those with oxygen dependence were at greatest risk of non-pulmonary complications. Preoperative optimization is essential given the increased risk and magnitude of postoperative complications.

ARAIYE L. MEDLOCK, B.S.

Outcomes of Pulmonary Function after "Race De-correction" for Patients Undergoing Surgery for NSCLC

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ABSTRACT

Introduction

Pulmonary function tests (PFTs) in the US undergo a race correction for patients identified as Black (increase of 10-15%) or Asian (increase of 4-6%), which may lead to misclassification of lung disease severity. We determined if a) Black and Asian (B&A) patients have similar outcomes to their comparative cohort and b) if race de-correction would have led to less B&A eligible for surgery.

Methods

A retrospective cohort analysis from February 2007 to December 2020, compared B&A patients undergoing lobectomy/bilobectomy for primary lung cancer to all other patients ("non-B&A") and predicted postoperative forced expiratory volume in 1 second (ppo) FEV was calculated. PFTs were "de-corrected" by 12% for Black patients and 5% for Asian patients and we identified B&A patients who, after de-correction, had ppoFEV1 <40% or <30%, prominent guideline thresholds for surgical candidacy.

Results

592 patients, 34 B&A (6%) and 558 Other (94%), were studied. There was no 30-day mortality amongst B&A patients compared to 8 (1.4%) amongst non-B&A patients. Seven (20%) B&A patients experienced pulmonary complications, compared to 123 (22%) non-B&A patients. Three (8.8%) B&A patients were discharged on home O2 compared to 31 (5.5%) non-B&A patients. Four percent (n=23) and 0.5% (n=3) of non-B&A underwent surgery with a ppoFEV1 <40% and <30% respectively, compared to zero B&A patients. After de-correction, 3 (8%) of B&A patient's undergoing surgery had ppoFEV1 <40% and zero B&A patients had a ppoFEV1 <30%.

Conclusion

De-correction in B&A patients in our cohort would have led to 8% of B&A patients falling below the ppoFEV1 <40% guideline concordance threshold, though none fell below the alternate guideline concordance threshold of ppoFEV1 <30%, and there were no deaths in the B&A patients with de-corrected ppoFEV <40%. Before blanket elimination of race correction for PFTs, guidelines are needed to educate and direct thoracic surgeons to prevent health inequities.

DR. KATHRYN DILOSA, M.D., M.P.H.

Use of Lithotripsy for Treatment of Circumferential Calcification during TCAR for high-risk patients

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ABSTRACT

Introduction

Transcarotid artery revascularization (TCAR) is a safe alternative to traditional endarterectomy (CEA) in high-risk patients. Utilization is limited by severe target vessel eccentric or circumferential calcification. Here we describe intravascular lithotripsy (IVL) prior to stenting in patients with prohibitive calcific disease.

Methods

We retrospectively identified seven patients who underwent TCAR with IVL for circumferential/ eccentric carotid calcification between 2020-2022. In all cases, IVL combined with balloon angioplasty for treatment of severely calcified vessels prior to stent deployment. Patient demographics, procedural details, and safety were reported.

Results

Seven patients (71% Male, 76±9 years) underwent TCAR, three (43%) for symptomatic disease. (Table 1) All patients had anatomy or comorbid conditions favorable for TCAR over CEA. Anatomic factors included hostile neck (N=1, 14%), contralateral carotid occlusion (1, 14%), or high cervical stenosis (5, 71%), and comorbidities included age >75 years (3, 43%), congestive heart failure (1, 14%), severe COPD (1, 14%), or uncontrolled diabetes (2, 29%). (Table 2)

Five patients (71%) had eccentric calcification, five (71%) had nearly circumferential calcification. Mean calcific lesion thickness was 3.87 mm (range 2.3-6.3). Mean procedure time was 100±30 minutes, with mean flow reversal time 31±25 minutes (range 8-77). Excluding the first procedure early in our institutional IVL use, mean flow reversal time was 23±15 minutes. Mean hospital stay was 2.3±.5 days (ICU 1.6±.5 days). Technical success was achieved in 100% of cases. There were no perioperative complications during index hospitalization or stent related complications including restenosis, stroke, or dissection at one month follow up.

Conclusions

In our experience, intravascular lithotripsy sufficiently remodels calcified carotid vessels to facilitate stent deployment for treatment of carotid disease in high-risk patients.

Table 1: Patient characteristics

Characteristic	N (%)
Age, years	76 ± 9 years
Age >70 years	5 (71)
Male sex	5 (71)
Hypertension	7 (100)
Coronary artery disease	5 (71)
Diabetes	2 (29)
Chronic renal insufficiency	0 (0)
Arrhythmia	3 (43)
Congestive Heart Failure	2 (29)
COPD	1 (14)
Prior Coronary Intervention	1 (14)
Race	
White	6 (86)
Black	1 (14)
Asian	0
Native American	0
Pacific Islander	0
Other	0
Ethnicity	
Hispanic	0
Non-Hispanic	7 (100)

Table 2: Indication for TCAR

Anatomic Factors	N (%)
Contralateral Occlusion	1 (14)
High Cervical Stenosis	5 (71)
Hostile Neck	1 (14)
Comorbid Factors	N (%)
Age >75 years	3 (43)
Congestive Heart Failure	1 (14)
Severe COPD	1 (14)
Uncontrolled Diabetes	2 (29)

MR. BRIAN HOWARD, B.S.

Rates of Approval for Kidney Transplant Listing at a Single Center Across Different Racial Groups

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ABSTRACT

Introduction

Racial disparities exist across all aspects of the kidney transplantation process in the United States. In order to further examine access to kidney transplantation, we analyzed the ethnic composition of patients that were referred to our center and underwent formal evaluation.

Method

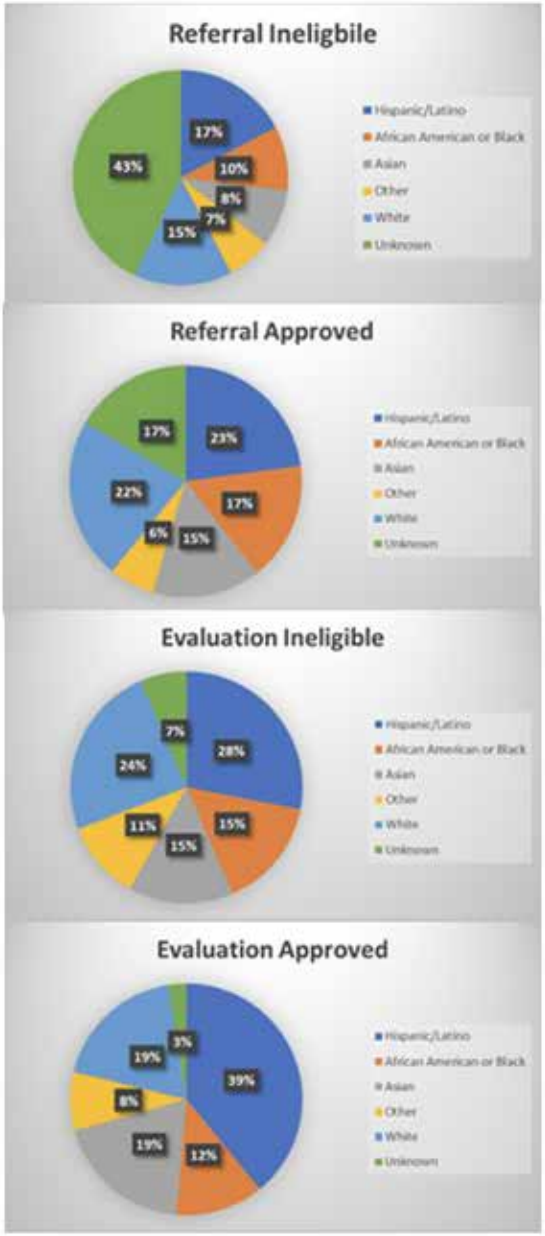
We analyzed EMR data from patients who were referred and evaluated for a kidney transplant at our center from January 2020 to February 2023. Self-identified race and ethnic information was collected and used to categorize patients into the following groups: Hispanic/Latino, African American or Black, Asian, White, Other, and Unknown. Data is classified as continuous variables and represented percentages.

Results

4,001 patients were referred to our center and 2,701 patients were evaluated. Of the referrals, 3346 patients were ineligible, 384 declined referrals, and 281 have been approved. Out of the evaluated patients,1547 were ineligible,182 declined an evaluation, and 977 were approved for transplantation.

Conclusion

Overall, the largest group referred for evaluation and approved to be transplanted following an evaluation were Hispanic-identifying patients at 23% and 39%, respectively. The higher rates of minority approval following referral and evaluation at our transplant center, specifically with Hispanic identifying patients, contrasts the low rates of kidney transplants in minority groups nationally. The higher rates of approval for kidney transplant listing in Hispanic identifying patients may represent established practices that have reduced barriers to receive care in our area.



DR. MATTHEW VUONCINO, M.D.

Complications of Varicose Vein Interventions in the Vascular Quality Initiative

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ABSTRACT

Introduction

The prevalence of procedural complications during varicose vein interventions and risk factors for adverse events are not well described. This study aims to evaluate patient and procedural factors associated with complications following varicose vein interventions.

Methods

We performed a retrospective review of the Varicose Vein Registry from 2014 to 2018. Major periprocedural complications were defined as severe allergic reaction, stroke, pulmonary embolism, or death. Major long-term procedural complications were defined as bleeding requiring intervention, deep vein thrombosis, wound infection, or intervention-associated skin ulcers noted during follow up.

Results

12,176 procedures were analyzed. Major peri-procedural complications were associated with use of general anesthesia (80% versus 18.9%, p=0.004) and interventions performed at an ambulatory surgery center (80% versus 13.3%, p=0.006). BMI was higher in procedures with major periprocedural complications (44.9 vs 30.2 kg/m2, p<0.001). Major long-term procedural complications were associated with male gender (48.8% male versus 28.7% male, p<0.001), prior DVT (p=0.04), prior phlebitis (p=0.03), treatment of more veins during the procedure (mean 2.1 versus 1.8, p=0.03), continued use of compression (p=0.001) and anticoagulation (p<0.001) at follow-up. Patients who were treated with radiofrequency ablation (RFA) (0.9% versus 0.5%, p=0.03) and phlebectomy (0.9% versus 0.6%, p=0.03) experience more complications. After multivariate logistic regression, gender, RFA, phlebectomy, chronic anticoagulation, and continued compression remained independent risk factors for long-term procedural complications.

Conclusion

This study is the largest dataset describing major complications following treatment of venous insufficiency. Peri-procedural complications stem primarily from surgical environment while long-term complications are associated with patient factors and procedure type.

PROGRAM NOTES

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