

## PRESIDENT SESSION

Abstract | Clinical Science | Endocrine

### A NEW MIRNAS SIGNATURE ASSOCIATED WITH IMPROVED PROGNOSIS VALUE OF THE BRAF STATUS IN THYROID CARCINOMA

E Ruiz, T Niu, E Kandil

**Background:** BRAF mutation in papillary thyroid cancer (PTC) has been correlated with aggressive features making it as a potential prognosis marker. Nevertheless, several reports present contradictory results on the value of prognostic rule of BRAF mutation. Recently, microRNAs are used as prognostic markers in different cancers.

**Objective:** Hence, our objective is to identify a miRNA panel that could improve the prognostic value of BRAF in patients with PTC.

**Methods:** We analyzed 495 PTC samples from The Cancer Genome Atlas database obtained from 19 medical centers. Machine Learning model, Receptive Operative Curve (ROC), Kruskal-Wallis test, spearman correlation, survival R package and hierarchical clustering were used.

**Results:** We identified a panel of miRNAs after performing BRAF mutation stratification of tumors according to the 2015 American Thyroid Association guidelines (Sensitivity=0.728, Specificity=0.967, PPV=0.983, NPV=0.578 and, Area Under Curve of a ROC analysis=0.98). Specifically, miR-146b-3p provided the strongest prediction to classify PTC samples according the BRAF status (AUC=0.94). BRAF status didn't predict Disease-Free Survival (DFS), however, high expression of our panel was associated with a worse DFS (p-value=0.0399). The miRNAs panel is significantly correlated with aggressive features including lymph node metastasis (p-value <0.001), tumor size (p-value <0.001), histological subtype (p-value <0.001) and extrathyroidal extension (p-value <0.001). Furthermore, the miRNAs panel is strongly correlated with cancer stem cell features (correlation=0.73). Finally, the miRNAs panel distinguishes BRAF mutated samples into four clusters based on the presence of aggressive features and predictive recurrence.

**Conclusion:** Our proposed novel miRNAs panel improves the accuracy of the prognostic value of BRAF mutation in patients with PTC.

## PRESIDENT SESSION

Abstract | Clinical Science | Surgical Oncology

### IMPACT OF LAUNCHING A HIGH-RISK BREAST CANCER SCREENING PROGRAM USING THE TYRER CUZICK MODEL

Laura K. Jeter, Raulee Morello, Amy Rivere, Aimee Mackey, Ralph Corsetti, Shayan Azizi

**Background:** The Tyrer-Cuzick (TC) model uses personal and family history to identify patients at increased risk for the development of breast cancer. High-risk patients become candidates for appointments in our breast center to discuss risk reduction strategies and enhanced screening that includes the addition of breast magnetic resonance imaging (BMRI) to annual mammography. We committed to starting a high-risk breast cancer screening program without knowledge regarding the volume of patients that would require clinical evaluation or enhanced screening with BMRI.

**Objective:** The objective of this study was to evaluate the impact of implementing the TC model for high-risk breast cancer screening on referral volume and utilization of our BMRI resource.

**Methods:** All patients referred from September 2018 until September 2019 for an increased risk of breast cancer, defined as a TC score of  $> 20$  were included in the study. TC scores were calculated at the time of screening mammography by the patient and mammography technician and based on age, body mass index, age at menarche and menopause, obstetric history, history of a benign proliferative breast lesion, history of ovarian cancer, use of hormone replacement therapy, and family history of breast cancer. Electronic medical records were reviewed to determine imaging findings, biopsies, surgical interventions, and pathology results.

**Results:** We identified 531 patients referred to our newly created high-risk clinic based on a TC score  $> 20$  during the 12-month study period. These 531 patients were identified from approximately 96,000 patients that were part of our system-wide breast cancer screening program during the study period. After consultation in our breast center, 217 (40.8%) patients did not undergo enhanced screening with BMRI. The rationale for not having a BMRI was a lower TC score after re-calculation by a breast expert at the time of clinical evaluation, patient refusal, and medical or financial impediments to BMRI (e.g. medical hardware or lack of insurance coverage). A total of 314 (59.1%) patients had a breast MRI ordered. Of the ordered BMRI, a total of 169 exams have been completed to date while 145 have been ordered but not yet performed. Based on the findings of the 169 completed exams a total of 19 percutaneous breast biopsies were performed that identified 8 patients that required surgery. The pathologic results of the 8 patients included two patients with invasive ductal carcinoma, three with intraductal cancer (DCIS), two intraductal papillomas and two cases of atypical ductal hyperplasia. Therefore, the rate of detected malignancy in patients with additional MRI screening was 2.96% (5 of 169).

**Conclusion:** The results of this study reveal that the implementation of a high-risk breast cancer screening effort based on the TC model results in a dramatic increase in new patient referrals and use of BMRI screening. The increased screening allowed for earlier detection of breast cancer in our patient population that would have been overlooked with traditional screening methods. Overall even with the considerable resources required for institutions considering launching similar TC based high-risk breast cancer screening programs, the benefits for patients and hospital systems are obtainable.

## PRESIDENT SESSION

Abstract | Clinical Science | General Surgery

### ENDOSCOPIC CLOSURE OF GASTROINTESTINAL FISTULAE AND LEAKS

Mike Q. Tran, Julia W. Hoke, Clairissa D. Mulloy, Michael Cook, Ian A. Hodgdon

**Background:** Historically, the treatment of gastrointestinal fistulae and perforation was either non-operative control of leakage with ostomy bags along with diet restriction and parenteral nutrition, or open surgical intervention. In recent years, endoscopy has gained favor in a multitude of domains due to the reduced morbidity and mortality associated with this technique compared to open surgery. To a limited extent, over-the-scope clips have been employed to close fistulae and leaks, although the role of the endoscopic clip system is evolving remains to be fully elucidated. Porcine models have demonstrated that the endoscopic clip is a safe and effective method of addressing fistulae and perforations, but has not yet been used in human patients for these indications.

**Objective:** We report a case series of six patients with complex gastrointestinal fistulae to evaluate the safety and efficacy of the endoscopic Padlock Clip™ in this clinical domain.

**Methods:** A prospective series evaluating six consecutive cases by two surgeons from May to September 2019 was undertaken at a single academic medical center with high volume complex gastrointestinal surgical pathologies. Patient demographics, comorbidities, and clinical history including prior interventions were detailed. The Padlock Clip™ was evaluated based on technical success, treatment outcome, and post-procedural adverse events including need for salvage procedure over a median follow-up time of 5.5 weeks.

**Results:** Of the six patients, two were male. The median age was 60 years. There was 1 colonic leak, 1 enterocutaneous fistula, 2 gastrocutaneous fistulae, and 2 gastric leaks. Significant comorbidities affecting wound healing including malignancy, obesity, diabetes, malnutrition and chronic infection (hepatitis C), intra-abdominal sepsis were present in the majority of these cases. 4 patients had prior treatments for the presenting pathology, including enterocutaneous fistula excision. The Padlock Clip™ had an immediate technical success rate as visualized in the endoscopy suite of 100%. All fistulae in this study appeared to be closed, based on post-procedural clinical follow-up and radiographic studies. Two of six patients had recurrent abscesses follow endoscopic clipping. As none of these communicated with the GI tract, they were not considered failures or adverse events related to the clip application. Both were managed without major invasive procedures such as bowel resections.

**Conclusion:** The endoscopic Padlock Clip™ is a safe and effective alternative to open surgery or drainage procedures for colonic leaks and closure of gastrocutaneous fistulae. Our results suggest that the Padlock Clip™ can be utilized safely and easily as a first-line intervention for a variety of gastrointestinal defects. Larger prospective studies are now indicated to fully evaluate the use of the Padlock Clip™ in managing complex gastrointestinal fistulae and leaks, including those refractory to prior medical management.

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Case	Technical success	Treatment outcome	Salvage procedure (Surgery, IR)	Salvage procedure outcome	Follow up (wks)
1	Yes	Closure of colonic fistula on CT with rectal contrast	Yes	Recurrent LLQ fluid collection resolved with IR drain	12
2	Yes	Closure of gastrocutaneous fistula - no clinical manifestations	No	None	11
3	Yes	Closure of enterocutaneous fistula on CT with rectal contrast	Yes	Recurrent fluid collection following IR drain removal treated with surgical drainage	7
4	Yes	Closure of chronic gastrocutaneous fistula	No	None	3
5	Yes	Closure of gastric leak - no clinical manifestations; resolution of intra-abdominal abscess	No	None	3
6	Yes	Closure of gastric leak - no clinical manifestations; resolution of intra-abdominal abscess	No	None	4

## PRESIDENT SESSION

Abstract | Clinical Science | Critical Care

### SIMPLIFIED ACUTE PHYSIOLOGY SCORE (SAPS) III AND CORRELATIONS WITH ICU DELIRIUM

J Savoy, K White, N Samra, R Barnes, A Lemus

**Background:** The Diagnostic and Statistical Manual of Mental Disorders V defines delirium as an acute disturbance in attention, awareness, and cognition not explained by a pre-existing neurocognitive disorder. Studies show a wide range of reported incidence of delirium including up to 80% of mechanically ventilated Intensive Care Unit (ICU) patients. There are many known risk factors for the development of delirium including a number relating to postoperative patients. Many elective surgery patients are older, have multiple comorbidities, are mechanically ventilated with deep sedation, and are given opioids for pain control; all of which are risk factors for delirium. Environment plays a prevalent role in the development of delirium as well. High ambient noise, poor lighting, lack of windows and restraints can worsen delirium. More recent management of delirium focuses on prevention rather than treatment. Prevention of delirium is important because delirium is associated with longer lengths of stay, cost of care, days on mechanical ventilation, and mortality

**Objective:** The goal of our study was to show that the current environment of the surgical intensive care unit at Ochsner Louisiana State University Health Shreveport is not optimized to prevent ICU delirium. Overall, we hoped to show that changes are needed within the SICU to better patient care. Our null hypotheses were higher SAPS III scores are not associated with faster onset of delirium and higher SAPS III scores are not associated with longer lengths of delirium.

**Methods:** This was an IRB approved, single site study. A retrospective chart review was performed to obtain medical record numbers of patients which included International Classification of Diseases (ICD) 9 and ICD 10 codes for variations of delirium and psychosis. These charts were then further reviewed to include post-operative patients with surgical intensive care unit stays with documented delirium not attributed to other underlying causes (respiratory failure, infection, etc.). SAPS III scores were calculated using data from the first 24 hours of ICU admission. Spearman correlation coefficient testing was performed comparing SAPS III score and time to onset of delirium. Spearman correlation coefficient test was also performed comparing SAPS III score to length of delirium.

**Results:** A total of 723 charts were reviewed. Trauma patients, patients with previous psychiatric history, prisoners, and minors were excluded from our study. There were 46 patients that met our inclusion criteria. SAPS III calculations ranged from 28 to 73 (mean =  $44.3 \pm 11.6$ ) with predicted mortality ranging from 1-62% (mean =  $15\% \pm 0.15\%$ ) The average time to onset of delirium was 3.09 ( $\pm 2.55$ ) days while the average length of delirium was 3.2 ( $\pm 2.55$ ) days. No significant correlation between SAPS III and time of onset of delirium were found ( $r_s = 0.107$ ,  $p = 0.479$ ) or SAPS 3 and length of delirium ( $r_s = 0.059$ ,  $p = 0.695$ ).

**Conclusion:** Our data shows that there is not a significant correlation between a higher SAPS 3 score and time of onset of delirium and length of delirium. This shows that even less acutely ill post-operative patients can develop delirium as quickly as more severely ill patients and this delirium can last the same amount of time. Use of this knowledge should be applied toward early preventative protocols focused on frequent reorientation, physiologic sleep/wake cycles, early mobilization, limitation of problem medications including opioid pain medication and benzodiazepines.

## PRESIDENT SESSION

Abstract | Clinical Science | Trauma

### MASS SHOOTINGS IN THE UNITED STATES: RESULTS FROM A 5-YEAR DEMOGRAPHIC ANALYSIS

Leonard J, Tedesco A, Schoen J, Greiffenstein P, Moore M, Marr A, Hunt J, Stuke L

**Background:** Gun violence and mass shootings are now being viewed in a public health context. Defining the problem and identifying the risks are paramount to this approach. Only through these methods will we be able to develop prevention strategies.

**Objective:** We sought to describe the demographic characteristics of mass shootings in order to facilitate future public health-based prevention efforts.

**Methods:** The Gun Violence Archive (GVA) is an independent, apolitical research organization that maintains an online database of gun violence incidents in the United States (U.S.) gathered from law enforcement, media, and governmental sources. The GVA database was queried for all mass shootings during the time period of 2014-2018. A mass shooting is defined as any incident in which four or more people are shot or killed (excluding the shooter). Media sources linked from the GVA database, as well as additional online media sites and the Gun Memorial website, were used to collect demographic data of the victims and suspect(s), location and time of the incident, type of weapon used (if available), and outcome (i.e., suspect arrested, escaped, killed). U.S. Census Bureau data was used to calculate the incidence of mass shootings by state.

**Results:** There were 1672 mass shooting incidents in the five-year study period. Nearly four times as many people were injured as killed, with 7098 injured and 1894 killed. Of those killed, 1324 were male and 556 were female, a 2.3 male-to-female incidence. Among the injured, 3673 were male and 1285 female, a 2.8 male-to-female incidence. Most victims (54%) and most perpetrators (76%) were African-American. A perpetrator was not captured or killed in 57% of the incidents. The vast majority of incidents (81%) occurred between 6pm and 6am. The most common locations were street-level (40.5%), residence (30%), and bar (17.5%). The five states with the highest number of mass shootings per capita (per million people) were: Louisiana (2.89), Illinois (2.56), Tennessee (2.04), Mississippi (1.87), and Missouri (1.81). Five states had no mass shootings during this time period: Hawaii, Idaho, New Hampshire, North Dakota, and Wyoming.

**Conclusion:** In the U.S., there is nearly one mass shooting per day. Victims are predominately minority males, with most incidents occurring at night on the street, in a residence, or bar. Future public health-oriented prevention efforts targeting mass shootings should focus on these demographics.

## PRESIDENT SESSION

Abstract | Clinical Science | colorectal surgery

### SCREENING FOR COLORECTAL CANCER: WHEN SHOULD WE START? WHEN SHOULD WE STOP? AN ANALYSIS OF CASES FROM THE SEER PROGRAM

L Hajirawala, C Rosales, G Orangio, J Barton, K Davis

**Background:** The age to begin and cease screening for colorectal cancer (CRC) is debated. The United States Preventative Services Task Force guidelines (USPSTF) recommend that patients between the ages of 50 and 75 obtain screening for CRC.

**Objective:** This study aims to review the CRC stages at diagnosis for patients within the current 50-75-year age range and compare them to those patients who are either younger than or older than the recommended screening ages.

**Methods:** CRC cases diagnosed between 2011 and 2015, collected by the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Institute were included in the analysis. Patients with Stage I and II CRC were considered early stage, and Stage III and IV patients were considered as late stage for comparison. The patients were stratified into those within the current screening guidelines (ages 50-74), and patients younger (ages 45-49) or older (ages 75+) than the USPSTF guidelines. The incidence rates of early and late stage CRC were compared among the age groups. Yearly trends in the rate of CRC among the age groups were also evaluated.

**Results:** A total of 156,084 patients with CRC between 2011 and 2015 were included in the analysis. Overall, 49% of patients presented with late stage disease. For the younger group, 58% presented with Stage III or IV CRC, compared to 50% in the screening age range and 45% the older group (Figure 1a). The incidence rate of late stage CRC was significantly higher than that of early stage CRC in the younger age cohort (Table 1).

Patients older than the currently screened cohort account for 33.3% (51,990) of CRC cases (Table 1). The rate of CRC is highest in this group, followed by patients in the screening age cohort, with the lowest in the younger group (Figure 1b). While the rate of CRC is on the decline in both the older than screening age and current screening age populations, the rate of CRC in younger (ages 45-49) patients does not demonstrate a decrease (Figure 1b).

**Conclusion:** Patients who are not screened tend to present at the onset of symptoms from CRC, such as bleeding or obstruction, which often corresponds to later stage at presentation. The rate of CRC in the younger population remains stable through the studied period, in contrast to the declining rates seen in the other two study populations. Screening appears to accomplish the goal of identification of earlier stage cancer, which argues for lowering the screening age for CRC.

Since a significant percent of CRC presents in patients older than the current screening window, and the majority are treated surgically, expanding screening guidelines to these patients as well appears justified. Expanding the age limits for screening for CRC should help capture patients at an earlier stage, thus improving their overall prognosis and survival.

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**Table 1. Incidence Rates<sup>1</sup> and Case Counts<sup>2</sup> of Early vs. Late CRC per Age Group in the U.S. (SEER 18), 2011-2015**

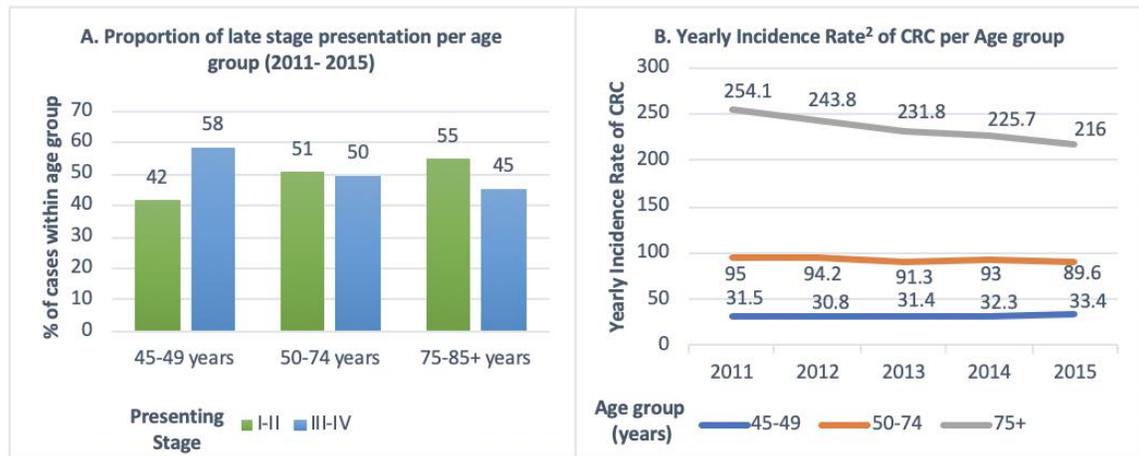
	45-49 years		50-74 years		75-85+ years	
	Rate	Count (%)	Rate	Count (%)	Rate	Count (%)
Stage I-II	12.2	3669 (41.6)	42.2	48114 (50.5)	112.5	28501 (54.8)
Stage II-IV	17.1*	5147 (58.4)	41.0*	47164 (49.5)	92.6*	23489 (45.2)
All Stages	30.2	8,816	86.7	95,278	201.5	51,990

<sup>1</sup>Rates for the U.S. are estimated by the SEER 18 geographic areas. Rates are per 100,000 and age-adjusted to the 2000 US Std Population (19 age groups - Census P25-1130) standard; Confidence intervals (Tiwari mod) are 95% for rates and ratios.

<sup>2</sup>Counts reflect CRC cases in the SEER 18 geographic areas. These counts do not reflect the burden of CRC in the U.S.

\* indicates that the Stage III-IV rate is significantly different than the rate for Stage I-II (p<0.05).

**Figure 1. Presentation of CRC per Age Group in the U.S.<sup>1</sup> (2011-2015)**



**Figure 1.** Proportion and Incidence Rates of CRC per Age Group. **1a** – Proportion of Late stage CRC presentation per age group **1b** - Annual Incidence rate of CRC per Age group

<sup>1</sup>Rates for the U.S. are estimated by the SEER 18 geographic areas. Rates are per 100,000 and age-adjusted to the 2000 US Std Population (19 age groups - Census P25-1130) standard; Confidence intervals (Tiwari mod) are 95% for rates and ratios.

<sup>2</sup>The U.S. is estimated by the SEER 18 geographic areas.

## IMPACT OF BODY MASS INDEX ON REMOTE-ACCESS THYROIDECTOMY: A MULTI-INSTITUTIONAL EXPERIENCE WITH ROBOTIC TRANSAXILLARY AND TRANSORAL ENDOSCOPIC VESTIBULAR APPROACHES

M Razavi, R Liu, C Razavi, M Shalaby, M Shaeer, R Tufano, J Russell, E Kandil

**Background:** Remote-access approaches (RAA) in thyroid surgery have garnered international attention as an alternative to open surgery for patients who wish to avoid an anterior cervical scar. Although international data has demonstrated the safety of such techniques, questions regarding the generalizability given the body habitus of the North American population has limited applications. Here we aim to characterize the safety profile of two remote-access approaches - the transoral endoscopic vestibular thyroidectomy approach (TOETVA) and the robotic transaxillary approach (RTA) - in a North American population, particularly with regards to the impact of body mass index (BMI) on outcomes, in the context of the conventional transcervical approach (TCA).

**Objective:** To characterize the safety profile of RAA in the context of BMI stratification and TCA outcomes using a multi-institutional database.

**Methods:** Cases of TOETVA, RTA, and TCA thyroidectomy (meeting criteria for RAA) were reviewed over a 2-year period across two North American academic institutions. Primary outcomes were postoperative complications. Outcomes were compared between approach cohorts (TOETVA, RTA, and TCA) and within groups across NIH-defined BMI classes (underweight/normal

**Results:** 118 TOETVA, 133 RTA, and 259 TCA cases meeting remote-access criteria were reviewed. Operative times were significantly longer for RAA cohorts than for the TCA cohort for both lobectomies (TOETVA 133 minutes; RTA 130 minutes; TCA 87 minutes;  $p=0.0001$ ) and total thyroidectomies (TOETVA 180 minutes; RTA 166 minutes; TCA 118 minutes;  $p=0.0001$ ). There were no differences in complication rates across the approach cohorts (TOETVA 16.1%; RTA 8.3%; TCA 13.5%;  $p = 0.14$ ). There were also no differences in complication rates with respect to BMI groups within the TOETVA (13.6%; 16.7%; 18.2%;  $p=0.86$ ) and TCA (15.8%; 10.3%; 14.2%;  $p=0.63$ ) cohorts. The RTA cohort did not have any complication within the obese group (8.3%; 15.4%; 0%;  $p=0.04$ ).

**Conclusion:** RAAs, specifically TOETVA and RTA, can be performed safely in a select North American patient population. Given that higher BMI did not lead to increased risk for complication, higher BMI should not preclude candidacy for remote-access thyroidectomy.

## MINI-TALK SESSION I

Abstract | Clinical Science | Surgical Oncology

### BREAST CANCER MORTALITY FOR ELDERLY WOMEN WITH EARLY BREAST CANCER IS HIGHEST AT COMMUNITY CANCER CENTER COMPARED TO COMPREHENSIVE COMMUNITY CANCER PROGRAM AND ACADEMIC RESEARCH PROGRAM

Q Chu, M Hsieh, X Wu

**Background:** Treatment outcomes for elderly women with  $\leq 2\text{cm}$ , ER+ breast cancer across different facilities are not known. We evaluated the impact of facility type on long-term survival for this population.

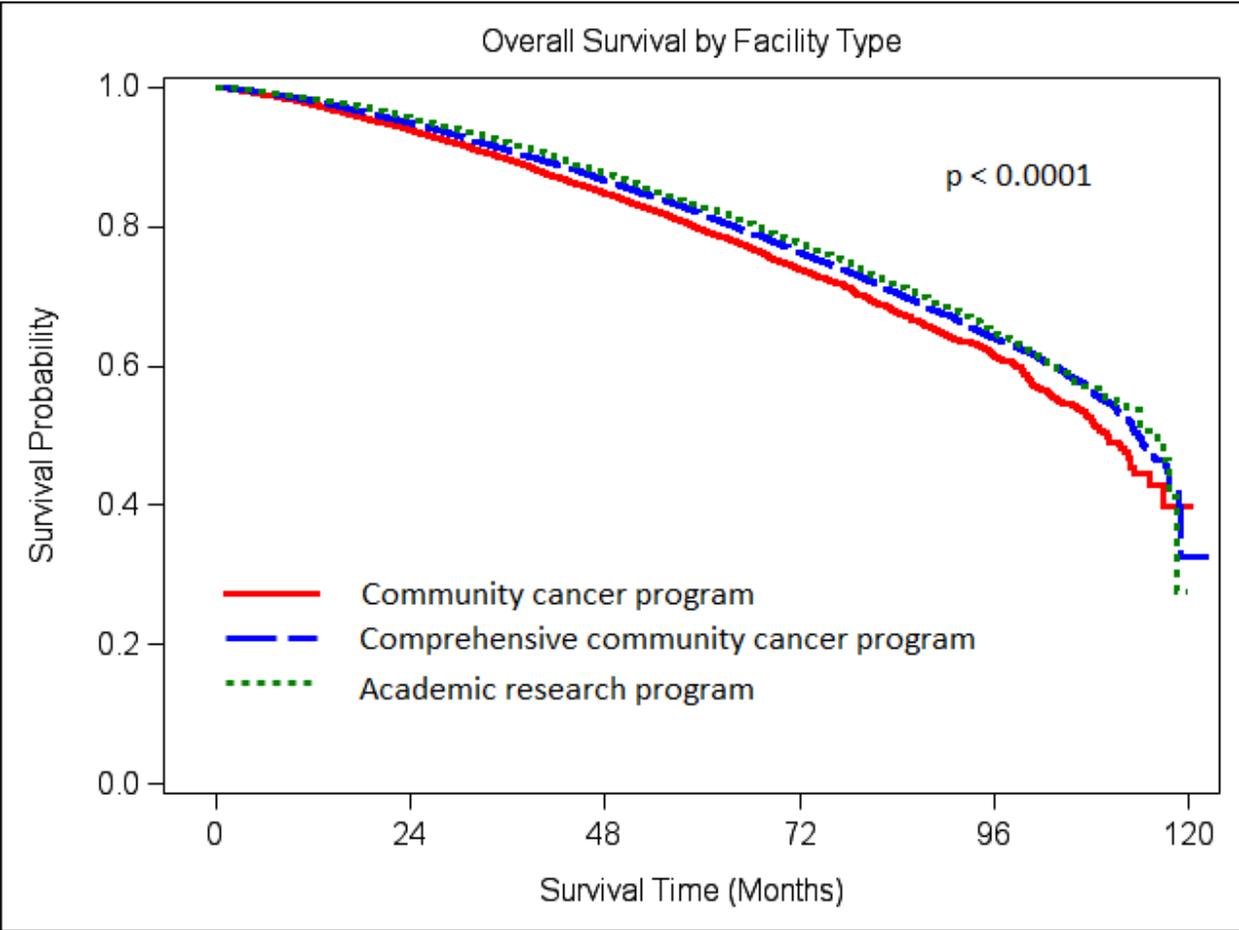
**Objective:** Understand that outcome for elderly women with early breast cancer varies, depending on where women receive their care.

**Methods:** We evaluated a cohort from the National Cancer Database of 95,724 women aged  $\geq 70$  years diagnosed with Stage I, ER+/PR+ breast cancer between 2004 and 2011 and received lumpectomy. Sociodemographic, clinic-pathological, and treatment variables were compared among 3 types of facilities where patients received surgery: (1) community cancer program (CCP), (2) comprehensive community cancer program (CCCP), and (3) academic research program (ARP). Facility volume for breast cancer was categorized as being low ( $<148$  cases/yr.), moderate (148-298 cases/yr.), and high ( $>298$  cases/yr.). The 5-year overall survival (OS) was calculated using the Kaplan-Meier method. Cox regression model was used to assess factors associated with OS. P-value  $\leq 0.05$  is considered significant.

**Results:** In multivariable analysis, facility type was an independent predictor of OS. The 5-yr OS for CCP, CCCP, and ARP was 79.5%, 81.8%, and 82.9%, respectively ( $P < 0.0001$ ) and the median survival time (months) was 109.86, 113.84, and 116.11, respectively. Most CCP were low volume centers (96%) compared to CCCP (33%), and ARP (9%;  $p < 0.001$ ). Positive margin rate was highest in the CCP (5.1%) versus CCCP (4.4%) and ARP (4.3%;  $p < 0.0001$ ).

**Conclusion:** The facility at which elderly women with small, hormone positive breast cancer receive their treatment can have a significant impact on their outcomes

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## MINI-TALK SESSION I

Abstract | Clinical Science | Endocrine

### Robotic Assisted Trans-Axillary Parathyroidectomy: Feasibility and Learning Curves

Deena Hadedeya\*<sup>1</sup>, MD, MHS, Mahmoud Shalaby\*<sup>1</sup>, MD, David Aparício<sup>2</sup>, MD, Grace Lee<sup>1</sup>, MD, FACS, Patrick Aidan<sup>2</sup>, MD, Emad Kandil<sup>1</sup>, MD, MBA, FACS, FACE

**Background:** In many surgical specialties, minimally invasive techniques have replaced the open surgical approaches and become the standard approach, but this is not the case with the parathyroidectomy as the mini conventional trans-cervical approach is still the standard technique. Robotic-assisted parathyroidectomy via trans-axillary approach (RPTA) has been introduced recently by some surgeons in Asia and North America. This approach is still limited to high volume centers and experienced surgeons. Due to lack of large series reports, adopting this approach as a standard to treat primary hyperparathyroidism (PHPT) is quite difficult.

**Objective:** We aimed to report our RPTA available data to evaluate this technique in the management of PHPT.

**Methods:** Data was retrospectively collected from two institutions; one European and one North American. Over 9 years, Patients who underwent RPTA for well-localized PHPT were included. Demographic characteristics and perioperative data including the complications and outcomes were collected. A linear regression model “total operative time versus case number plot” was used to describe our learning curve.

**Results:** A total of 102 patients with PHPT underwent RPTA were included in our study. 80 patients (78%) were females, mean age was  $55.6 \pm 12.4$  years, mean BMI was  $25.5 \pm 6.1$  kg/m<sup>2</sup>, and mean total operative time was  $116 \pm 53$  minutes. Complications were reported in nine patients (8.8 %); one had seroma, one had superficial wound infection, four had transient hypocalcemia, and three had temporary hoarseness. There were no reported cases of permanent vocal cord paralysis. Successful surgery was achieved in all cases via the intended approach except one case converted to trans-cervical approach and underwent contralateral parathyroidectomy. Recurrent or persistent disease was reported in five patients.

Learning curves depicted starting points at 170 and 345 minutes, end points at 90 and 45 minutes, and proficiency cases have been achieved at the eighth and the fourteenth case for both for North American and European institutions, respectively.

**Conclusion:** According to our knowledge, this is the largest reported experience in the Robotic-assisted parathyroidectomy via trans-axillary approach. This procedure considered safe, feasible, and comparable with the conventional trans-cervical approach in selected patients with preoperatively well-localized studies when conducted by experienced parathyroid surgeons.

### EFFICACY OF SLEEVE GASTRECTOMY FOLLOWING LVAD AS BRIDGE TO HEART TRANSPLANT

Danielle Jacks, MD; Jessica Koller Gorham, MD; Nathan Zwintscher, MD; James Wooldridge Jr., MD; William Richardson, MD; Aditya Bansal, MD;

**Background:** Morbid obesity with body mass index (BMI) of 40 kg/m<sup>2</sup> is a contraindication for heart transplant. Bridge to transplant (BTT) with mechanical circulatory support (MCS) such as left-ventricular assist device (LVAD) is a well-established pathway for heart failure patients; however, many patients remain ineligible for heart transplant due to their body habitus. In the past, many surgeons have been hesitant to proceed with surgical weight loss options in LVAD recipients due to concern for significant post operative complications.

**Objective:** The primary goal of this study is to show that laparoscopic sleeve gastrectomy is a safe bariatric surgery option for patients with LVAD. Our secondary goal is to assess whether weight loss after bariatric surgery in this patient population is sufficient to achieve eligibility for heart transplantation.

**Methods:** A retrospective review was performed identifying 26 patients with LVAD who were excluded from heart transplant eligibility due to BMI > 40 kg/m<sup>2</sup> at our institution between 1/2010 and 1/2019. Five of these patients underwent laparoscopic sleeve gastrectomy. Prior to surgery, a perioperative pathway was developed in a multidisciplinary fashion including cardiac surgery, bariatric surgery, heart transplant cardiology, and anesthesia and updated as needed. Perioperative outcomes for these five patients including pre and post-operative BMI, heart function, post sleeve length of stay, OR time, post sleeve complications, blood transfusion, and time to heart transplant listing were collected and evaluated.

**Results:** A retrospective review was performed identifying 26 patients with LVAD who were excluded from heart transplant eligibility due to BMI > 40 kg/m<sup>2</sup> at our institution between 1/2010 and 1/2019. Five of these patients underwent laparoscopic sleeve gastrectomy. Prior to surgery, a perioperative pathway was developed in a multidisciplinary fashion including cardiac surgery, bariatric surgery, heart transplant cardiology, and anesthesia, which was then employed. Perioperative outcomes for these five patients including pre and post-operative BMI, heart function, post sleeve length of stay, OR time, post sleeve complications, blood transfusion, and time to heart transplant listing were collected and evaluated.

**Conclusion:** Laparoscopic sleeve gastrectomy appears safe in stable patients after LVAD with BMI too high to undergo heart transplantation in the setting of our detailed multidisciplinary perioperative protocol. Most patients who were previously excluded from transplant eligibility have met eligibility criteria following LSG due to successful reduction in BMI, including one heart transplant recipient to date. In comparison, many fewer patients who didn't undergo laparoscopic sleeve gastrectomy achieved BMIs that would qualify them for transplant eligibility. Future studies will further compare rate of transplantation and post-transplant outcomes in these two populations.

### SURGICAL MANAGEMENT OF METASTATIC PANCREATIC NEUROENDOCRINE TUMORS AT A SINGLE INSTITUTION: EFFECT OF PATIENT AND TUMOR CHARACTERISTICS ON CLINICAL OUTCOMES

Jace P Landry, MD, Brianne A Voros, MS, Yi-Zarn Wang, MD, DDS, FACS, Robert A. Ramirez, DO, FACP, J Philip Boudreaux, MD, FACS, Eugene A Woltering, MD, FACS, Ramcharan Thiagarajan, MD, FACS

**Background:** Pancreatic neuroendocrine tumors (PNETs) are rare neoplasms that exhibit a wide range of malignant potential. Many patients with PNETs present with advanced disease; therefore, effective treatment for metastatic disease is essential. Recent studies report increased survival in patients with neuroendocrine tumors after surgical cytoreduction. Further studies are needed to evaluate if patients with PNETs benefit from cytoreduction and what factors may affect outcomes.

**Methods:** A retrospective review was performed for a consecutive series of patients with PNET who presented to our tertiary referral center from 1998-2019. Patient and tumor characteristics, treatments, and outcomes were evaluated. Patients with additional malignancies were excluded.

**Results:** In total, 330 patients were included with a median age at diagnosis of 53 years (range, 20-81 years). Median follow-up was 3.6 years (range, 28 days-40 years) and a total of 226 (68%) patients had resection of their primary PNET. By last follow-up, 242 (73%) patients had metastatic disease and 133 (55%) of these patients had surgical cytoreduction of their metastatic disease. Patients with primary tumors >2cm, lymphovascular or perineural invasion, intermediate or high grade tumors, or positive lymph nodes were significantly more likely to present with metastatic disease at diagnosis. On multivariate analysis, patients with male sex (HR: 1.54, P=0.03), high-grade tumors (HR: 4.77, p<0.0001) or metastatic disease at diagnosis (5.88, p<0.0001) had worse overall survival. Median progression-free survival after primary resection was 3.6 years and median overall survival for patients with metastatic disease at diagnosis was 4.3 years. Only patients with high-grade tumors benefited from cytoreduction of their metastatic disease (HR: 0.45, p=0.02) with a median survival of 4.3 vs 1.5 years, respectively. We found no difference in survival by tumor functionality or tumor size in patients with metastatic disease.

**Conclusions:** In our cohort, male sex, metastatic disease, and tumor grade were significant predictors of survival and cytoreduction showed significantly improved survival in patients with high grade tumors.

### LAPAROSCOPIC HERNIA REPAIR WITH CUTIS GRAFT

Alison Moody, MD, MPH, Clint Stillwell, MD, Ian Hodgdon, MD, Michael Cook, MD

**Background:** Cutis grafts have been used as an alternative to mesh for open hernia repair with similar complication rates. At our institution, we pioneered a technique for laparoscopic hernia repair with an underlay cutis graft.

**Objective:** The primary aim of this study was to evaluate for hernia recurrence in our patient series.

**Methods:** Our study was conducted as a case series with a prospective cohort design. All surgeries were performed at a single institution by a single surgeon. Twenty-four patients elected to undergo laparoscopic hernia repair with a full thickness skin graft for an abdominal wall hernia between June 2018 and July 2019 and were considered for our study. Four patients (20.8%) were excluded because they had lumbar hernias. This resulted in a 19 patient case series. We reviewed these patients' medical records and extracted demographic data (age, sex, BMI, smoking status, medical comorbidities) and operative variables (hernia type, hernia size, graft area). Our primary outcome was hernia recurrence. Secondary outcomes included intra-abdominal infection, graft site complications, return to OR, and interventional procedures. Data analysis involved computation of means.

**Results:** Patients averaged 46.9 years (32, 69), had a BMI of 32.5 kg/cm<sup>2</sup> (27.6, 44.8) and were mostly females (n = 15, 78.9%). The hernia type was most frequently incisional (n = 9, 47.4%), followed by recurrent (n=6, 31.6%) and spontaneous (n=4, 21.1%). Average post-op follow-up time was 24.6 weeks (2, 57). Two patients (10.5%) developed a recurrence. Average follow-up time for patients with a recurrence was longer (49 weeks) than for patients without recurrence (21.3 weeks). The patients who experienced a recurrence had larger hernia defects (75cm<sup>2</sup> and 150cm<sup>2</sup>) and required larger skin grafts (both larger than 125cm<sup>2</sup>). Demographic variables such as BMI and smoking status did not appear to play a role in hernia recurrence. Secondary outcomes examined included graft site complications (n=7, 36.8%) and infection (n=3, 15.8%). Graft site complications resolved with local wound care. Surgical site and intra-abdominal infections were managed with drainage and antibiotics.

**Conclusion:** Laparoscopic hernia repair with full thickness skin grafts may be a viable surgical alternative for patients with small (less than 100cm<sup>2</sup>) hernia defects who would prefer to not have a prosthetic mesh.

## SURGICAL POTPOURRI I

Abstract | Clinical Science | Surgical Oncology

### MEDICAL CAPACITY BUILDING IN WAR-TORN NATIONS: KURDISTAN, IRAQ AS A MODEL

G Zibari, R Zibari, A Annamalai, H Shokouh-Amiri, Q Chu, L Smith, T Lagraff, B Guthikonda, S Jha

**Background:** Medical capacity building is an arduous endeavor, particularly in war-torn, politically unstable regions. Regardless, medical capacity can be built through perseverance and careful deliberation. We present our 28-year experience of capacity building in Kurdistan, Iraq.

**Objective:** Appreciate that significant capacity building can be accomplished in war-torn, politically unstable regions of the world.

**Methods:** We annotated our experience with surgical capacity building in Kurdistan, Iraq since 1992. Annually, 1-2 trips were undertaken. Prior to each trip, colleagues with desired surgical expertise were invited. A symposium was also organized at the end of each trip.

**Results:** Over 80% of cholecystectomies are now done laparoscopically, compared to none prior to our arrival. Other advanced laparoscopic operations include adrenalectomy, splenectomy, nephrectomy, Nissen fundoplication, and gynecologic procedures. More than 3,000 renal transplantations have been performed since 2004. Complex neurosurgical procedures such as craniotomy, spinal decompression/stabilization, and complex HPB and surgical oncology operations such as Whipple, liver resections, gastrectomies, and pelvic exenterations are now routinely performed. Care of trauma patients includes prehospital patient care, mass casualty triage, and management of patients exposed to chemical weapons. Other accomplishments include helping local surgeons to gain membership to the American College of Surgeons, supporting the establishment of a medical journal, and assisting with the creation of a new medical school.

**Conclusion:** With good intentions and perseverance, it is possible to empower war-torn nations to build advanced surgical programs. What we have achieved in Kurdistan over two decades is testament to effective and meaningful collaboration with major stakeholders.

## TRAUMA SESSION

Abstract | Clinical Science | Trauma

### PREDICTORS OF INAPPROPRIATE HELICOPTER TRANSPORT

Wajeeh Irfan MD, Jiselle Heaney MD, Jonathan Schoen MD, Christopher Brown MD, Alan B Marr MD\*, Lance E Stuke MD MPH\*, Patrick Greiffenstein MD, Margaret Moore MD\*, John P. Hunt\* MD MPH.

**Background:** The purpose is to investigate specific components of helicopter EMS such as prehospital GCS, Shock index, and fall as factors that may in part or whole explain the under or over triage of helicopter EMS for adults with major trauma because understanding the effectiveness of each may help determine which patients benefit most from this resource.

**Objective:** Helicopter transport has decreased time to life-saving definitive trauma care for large segments of the injured patient population. However, this has come at significant cost with flights often being in excess of \$25,000 per event. Identifying the characteristics of inappropriate helicopter transport prior to dispatch presents an opportunity for significant savings.

**Methods:** The Trauma Registry records of all helicopter transports for a three-year period (2016-2018) to an urban level I trauma center were reviewed. Helicopter transport was defined as inappropriate for patients who were discharged home from the Emergency Department (ED) or had a hospital length of stay (LOS) <1 day, and who did not die. Chi-square analysis and Student's t-test were used for univariate analysis. Predictors with a p-value of less than 0.2 were subject to binary logistic regression analysis. A p-value  $\leq 0.05$  was considered significant)

**Results:** There were 713 patients who had helicopter transport during the study period. One-hundred forty-eight (20.8%) patients were considered inappropriate for helicopter transport. In univariate analysis the following characteristics were not associated with inappropriate helicopter transport: gender, blunt/penetrating mechanism, transport time, and all mechanisms except falls. However, Glasgow Coma Score (GCS) >8, shock index(SI) <0.9, fall mechanism, and age >55 were found to be significantly associated with inappropriate helicopter transport. Transport agency was found to be significant on univariate analysis, but not in multivariate analysis. The crude odds and adjusted odds of significant predictors are as follows in the table uploaded below. The average ISS of the inappropriate helicopter transport group was 3.86( $\pm$ 3.85) compared to 16.80( $\pm$ 11.23) (p=0.0001, Student's t-test).

**Conclusion:** While helicopter transport has benefited many with access to timely trauma care, it has not been without great costs. Helicopter transport of patients with a GCS > 8 was strongly associated with either discharge from the ED or minor injury with a short LOS. A SI < 0.9 and fall mechanism were also associated with inappropriate helicopter transport while age < 55 was not associated with inappropriate transport. Triage of helicopter transport has the potential to decrease unnecessary helicopter transports and reduce healthcare costs.

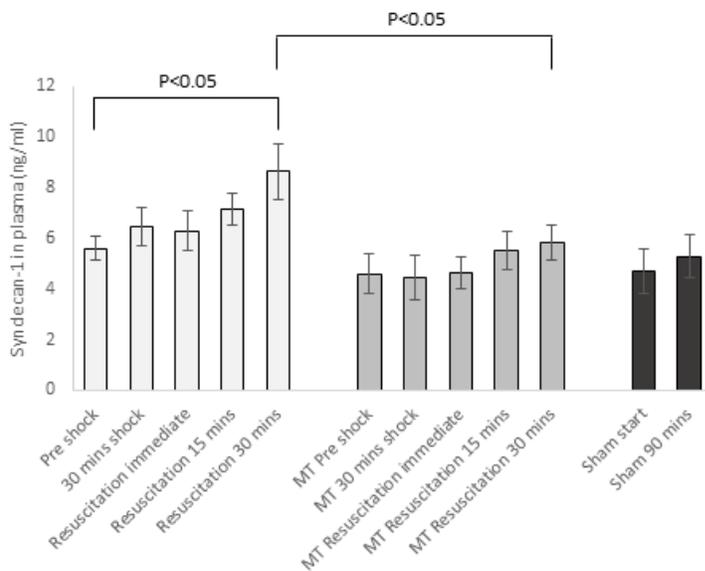
**MITOCHONDRIAL REACTIVE OXYGEN SPECIES MEDIATE GLYCOCALYX SHEDDING AND IMPAIRED VASOREACTIVITY IN A RAT MODEL OF HEMORRHAGIC SHOCK**

**Introduction:** Hemorrhagic shock leads to endothelial surface layer (ESL) damage, disordered coagulation, and impaired vasomotor tone. We have reported that hypoxic ESL shedding in cultured endothelial cells is exacerbated by reoxygenation and reversed by scavenging mitochondrial reactive oxygen species (mROS). The objective of this study was to determine if a period of reperfusion was necessary for ESL damage and impaired vascular contractility in rat hemorrhagic shock.

**Methods:** Rats were hemorrhaged to 40 mmHg MAP for 30 minutes, followed by resuscitation with lactated Ringer’s for 30 minutes (H/R). Some rats were treated with mROS scavenger MitoTEMPOL (5 mg/kg) during resuscitation. Blood was collected at multiple timepoints. Plasma syndecan-1 levels were tested by ELISA. Abdominal muscle was frozen and sectioned, and glycocalyx quantified using fluorescence microscopy. Mesenteric artery segments were isolated after resuscitation, cannulated and pressurized in a myography chamber, and contractility to phenylephrine was assessed using videomicroscopy.

**Results:** Syndecan-1 was not elevated in the plasma after 30 minutes of hemorrhage but was increased after 30 minutes of resuscitation. MitoTEMPOL significantly reduced this increase in syndecan-1. Sham operated animals did not display glycocalyx shedding after 1.5 hours. Glycocalyx was decreased in abdominal muscle capillaries after H/R. H/R reduced vascular contractility to phenylephrine, and MitoTEMPOL (MT) prevented this dysfunction.

**Conclusions:** Mitochondrial ROS produced during resuscitation are a unifying pathophysiologic mechanism for both glycocalyx shedding and impaired vascular contractility in an animal model for hemorrhagic shock. Development of therapies which target this pathway during the resuscitation phase should be a priority to reduce mortality.





## TRAUMA SESSION

Abstract | Basic Science | Trauma

### INTERLEUKIN-22 HAS AN ANTI-INFLAMMATORY EFFECT AFTER ACUTE LUNG INJURY

Sharven Taghavi, Olan Jackson-Weaver, Sarah Abdullah, Juan Duchesne, Derek Pociask, Jay Kolls

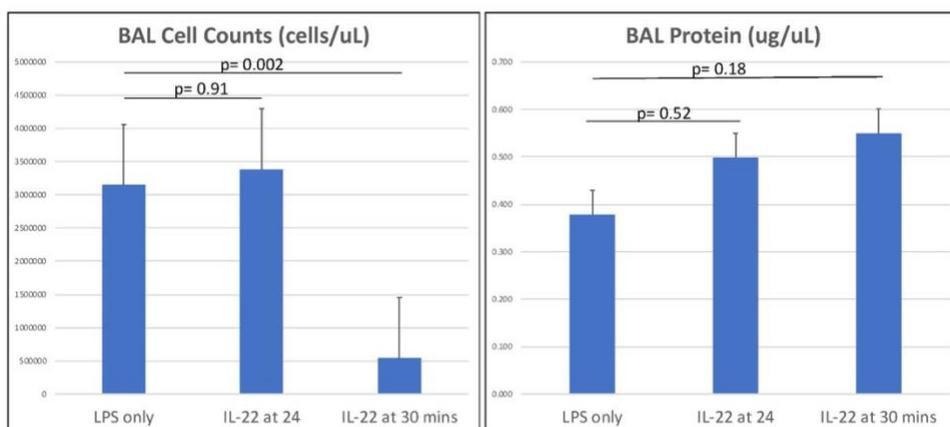
**Background:** Acute respiratory distress syndrome (ARDS) continues to have high morbidity and mortality. Currently, treatment for ARDS remains primarily supportive with lung protective ventilation. Interleukin-22 (IL-22) has been shown to play an integral component in healing of the injured lung after injury from influenza. We hypothesized that IL-22 would help mitigate acute lung injury/ARDS.

**Objective:** To determine if IL-22 has an anti-inflammatory effect after acute lung injury.

**Methods:** C57BL/6 mice were given acute lung injury via 100 ug of intra-tracheally administered lipopolysaccharide (LPS). IL-22 was administered via tail vein injection 30 minutes after injury (n=11) and at 24 hours (n=5), then compared to sham (n=8). The animals were sacrificed on post-injury day 4 after bronchoalveolar lavage (BAL) was obtained for cell counts and protein concentration.

**Results:** Animals receiving IL-22 tail vein injection at 30 minutes had significantly lower cell counts as compared to sham (539,636 vs 3,147,556 cells,  $p=0.02$ ). Protein concentration in animals receiving IL-22 at 30 minutes was not different when compared to sham (0.55 vs. 0.38 ug/uL,  $p=0.18$ ). Animals receiving IL-22 at 24 hours did not have lower cell counts at sacrifice when compared to sham (3,385,400 vs. 3,147,556 cells,  $p=0.91$ ). Protein concentration in BAL was also not different (0.50 vs. 0.38 ug/uL,  $p=0.52$ )

**Conclusion:** IL-22 administered early after acute lung injury has an anti-inflammatory effect, however, this did not decrease the amount of protein leak. Late administration of IL-22 did not decrease inflammation. IL-22 may be a novel therapy for trauma patients with acute lung injury/ARDS and the mechanism for this anti-inflammatory effect needs further investigation.



## TRAUMA SESSION

Abstract | Basic Science | Trauma

### ORGAN-SPECIFIC GLYCOCALYX DAMAGE DURING A RAT MODEL OF HEMORRHAGIC SHOCK AND RESUSCITATION

M Karim, S Abdullah, M Legendre, L Rodriguez, J Friedman, C Guidry, S Taghavi, J Duchesne, O Jackson-Weaver

**Background:** We previously reported that hypoxia followed by reoxygenation increases endothelial glycocalyx damage in human umbilical vein endothelial cells as compared to hypoxia alone. We further elucidated that the observed increase in glycocalyx damage was a result of mitochondrial reactive oxygen species. Here we aim to determine the effects of hemorrhagic shock and resuscitation on the endothelial glycocalyx in an in vivo setting.

**Objective:** To assess in vivo changes in endothelial glycocalyx levels across multiple organs in the context of hemorrhage/resuscitation and sham groups using a rat model.

**Methods:** Rat surgeries were performed to induce hypovolemic shock. Femoral arteries were cannulated for blood pressure measurements and hemorrhage. The right jugular vein was cannulated for resuscitation. Mean arterial blood pressure (MAP) was reduced to 40mmHg during the shock period (30 minutes). Additional blood was drawn during this period to maintain this pressure. During the subsequent resuscitation period, Ringer's lactate solution was used to recover pressure and maintain MAP at 60mmHg or higher for a further 30 minutes. Sham control animals underwent the same surgery but were not hemorrhaged or resuscitated. Organs were harvested and flash-frozen following the resuscitation period. Kidneys, small intestine, and abdominal muscle were cryosectioned followed by methanol fixation and the glycocalyx staining intensity was quantified by Wheat Germ Agglutinin staining. Student's t-test was used to assess differences in the glycocalyx levels between hemorrhage/resuscitation (H/R) (n=4) and sham (n=4) groups.

**Results:** Glycocalyx levels were significantly decreased in the muscle capillaries ( $p=0.044$ ) and intestinal wall arteries ( $p=5.471 \times 10^{-7}$ ) of H/R models compared to sham rats but increased ( $p=0.004$ ) in kidney arteries. Glycocalyx levels in the glomeruli were significantly increased ( $p=7.231 \times 10^{-7}$ ) in H/R relative to the sham group.

**Conclusion:** Our study demonstrates that in a physiological setting, H/R causes glycocalyx damage. This glycocalyx damage appears to be tissue dependent. Our results suggest that the kidneys and glomeruli may have the potential to regenerate glycocalyx given the increased glycocalyx staining intensity after resuscitation. Future studies will investigate potential mechanisms leading to tissue-dependent effects of H/R on glycocalyx integrity and will determine the clinical relevance of these differences on patient care during hemorrhagic shock.

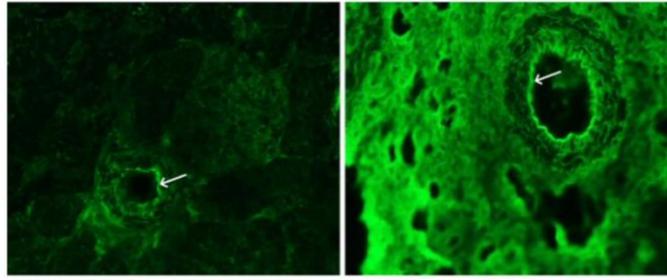


Figure 1. Kidney arteries stained with Wheat Germ Agglutinin. Measurements of staining intensity were taken from the outer muscle layer crossing the endothelial glycocalyx (innermost bright layer indicated with arrows) and into the lumen. The glomerulus was analyzed by tracing the perimeter and measuring the staining intensity within the enclosed area. Image on the left depicts a kidney artery and glomerulus in a sham model. Image on the right depicts a kidney artery in a hemorrhage/resuscitation model.

## TRAUMA SESSION

Abstract | Clinical Science | Trauma

### GENDER DIFFERENCES IN THE MASSIVELY TRANSFUSED TRAUMA PATIENT

Sharven Taghavi, Danielle Tatum, Alison Smith, Patrick McGrew, Charles Harris, Chrissy Guidry, Rebecca Schroll, Juan Duchesne

**Background:** Recent studies have suggested the female hypercoagulable state may have a protective effect in trauma. However, whether this hypercoagulable profile confers a survival benefit in massively transfused trauma patients has yet to be determined. We hypothesized that females would have better outcomes than males after traumatic injury that required massive transfusion protocol (MTP).

**Objective:** To determine if females have a survival benefit during MTP.

**Methods:** All trauma patients that underwent MTP at an urban, level 1, academic trauma center were reviewed from November 2007 to October 2018. Female MTP patients were compared to their male counterparts.

**Results:** There were a total of 643 trauma patients undergoing MTP. Of these, 90 (13.8%) were female and 563 (86.2%) were male. Presenting blood pressure, heart rate, shock index, and injury severity score (ISS) were not significantly different. Overall mortality and incidence of venous thromboembolism (VTE) were similar. Complication profile and hospital stay were similar. On logistic regression, female gender was not associated with survival (HR: 1.04, 95%CI: 0.56-1.92,  $p=0.91$ ). Variables associated with mortality included age (HR: 1.02, 95%CI: 1.05-1.09,  $p=0.03$ ) and ISS (HR: 1.07, 95%CI: 1.05-1.09,  $p<0.001$ ). Increasing GCS was associated with survival (HR: 0.85, 95%CI: 0.82-0.89,  $p<0.001$ ). On subset analysis, pre-menopausal women (age $<50$ ) did not have a survival advantage in comparison to similar aged males (HR: 0.68, 95%CI: 0.36-1.28,  $p=0.24$ ). However, on subset analysis, each unit of blood transfused, conferred a mortality risk for males, but not females (table).

**Conclusion:** Gender differences in coagulation profile may result in lower mortality risk for females per unit of blood when MTP is required.

Logistic Regression Examining Variables Associated with Mortality			
	Odds Ratio	95% Confidence Interval	p Value
Subset Analysis of Females Only			
Age	0.99	0.96-1.03	0.59
Injury Severity Score	1.04	0.99-1.08	0.06
Presenting Systolic BP	1.01	0.98-1.04	0.55
Presenting Shock Index	2.35	0.36-15.20	0.37
GCS	0.85	0.76-0.96	0.01
Each Unit pRBC	1.02	0.99-1.01	0.24
Subset Analysis of Males Only			
Age	1.02	1.01-1.04	0.004
Injury Severity Score	1.07	1.05-1.10	<0.001
Presenting Systolic BP	0.99	0.99-1.01	0.62
Presenting Shock Index	0.65	0.32-1.30	0.22
GCS	0.84	0.80-0.88	<0.001
Each Unit pRBC	1.02	1.01-1.04	0.004

## TRAUMA SESSION

Abstract | Clinical Science | Trauma

### PRE-INJURY USE OF MARIJUANA AND OUTCOMES IN TRAUMA

Sharven Taghavi, MD, MS, MPH; Saúl Ramirez, BS; Juan Duchesne, MD, FACS, FCCP, FCCM; Danielle Tatum, Ph.D.

**Background:** Marijuana is the most commonly used illicit drug in the United States and its prevalence among trauma patients is increasing. Although recent studies have examined the effects of marijuana or its psychoactive component, tetrahydrocannabinol (THC), in various patient populations, there has been limited research on the effect of marijuana use in severely injured trauma patients. We hypothesized that pre-injury use of marijuana is associated with improved outcomes in trauma patients.

**Objective:** To determine the effect, if any, of pre-injury use of marijuana on outcomes after traumatic injury

**Methods:** All adult (18+ years) Level I and Level II trauma activations who presented to 2 large regional trauma centers between 2014-2018 were reviewed. Subjects were classified as THC negative (THC-) if the absence of drugs was confirmed by testing and as THC+ if testing confirmed THC without another drug present. Those not drug tested or those who tested positive for multiple drugs were excluded for this analysis.

**Results:** A total of 14269 patients met inclusion criteria. Of these, 3461 (24.2%) were confirmed THC- and 1845 (12.9%) were THC+. Compared to the THC- group, the THC+ cohort was significantly younger (median age 43 vs 28, respectively), had a significantly higher proportion of males (73% vs 81.8%, respectively), and was significantly more likely to be injured by penetrating mechanism (19.8% vs 43.2%, respectively) ( $P < 0.001$  for all). THC+ patients had significantly shorter median (IQR) length of stay (LOS) [2 days (1-5) vs 2 days (1-7), respectively;  $P < 0.001$ ] and ICU LOS [0 days (0-2) vs 0 days (0-3), respectively;  $P < 0.001$ ] compared to THC- subjects. Mortality rate was significantly lower in the THC- group (4.3% vs 7.6%,  $P < 0.001$ ); however, on multivariate analysis, THC+ was not associated with mortality. On subset analysis of patients with traumatic brain injury (TBI), there were no differences in ICU LOS, ventilator days, or mortality; however, THC+ subjects with TBI had significantly shorter hospital LOS compared to THC- [3 days (2-13) vs 5 days (2-13), respectively;  $P < 0.025$ ]. In patients with ISS  $\geq 16$ , THC+ patients had significantly lower ICU LOS [3 days (2-7) vs 4 days (2-9), respectively;  $P = 0.019$ ] and mortality (19.1% vs 25.2%, respectively;  $P = 0.038$ ).

**Conclusion:** While pre-injury use of marijuana does not improve survival in trauma patients, it may provide some improvement in outcomes. This benefit appears to be seen in patients with TBI and those that are more severely injured (ISS  $\geq 16$ ). The mechanism behind this finding needs further evaluation.

Table. Multivariable logistic regression examining the patient and injury variables with odds of mortality.

<b>Mortality predictor</b>	<b>Odds ratio</b>	<b>95% Confidence Interval</b>	<b>P</b>
Age in years	1.042	1.034 – 1.051	< 0.001
Injury severity score	1.110	1.095 – 1.125	< 0.001
Penetrating injury	2.933	2.025 – 4.249	< 0.001
Traumatic brain injury	6.870	4.980 – 9.479	< 0.001
Shock Index	1.684	1.107 – 2.561	0.015
THC +	0.759	0.525 – 1.098	0.144

## MINI-TALK SESSION II

Abstract | Clinical Science | Plastic Surgery

### HEALTH DISPARITIES IN INCISIONAL HERNIA REPAIR: AN ANALYSIS OF HCUP-NIS 2012-2014

A Yoo, R Hoffman, C Mulloy, D Danos, F Lau

**Background:** The average incidence of incisional hernias (IH) is 12% and peaks at 73% for high-risk patients. The resulting 500,000 IH repairs performed annually represent a major, recurring burden on patients and the healthcare system. Prior studies have shown that racial minorities, women, and lower socioeconomic status (SES) patients present more frequently with surgical emergencies.

**Objective:** The aim of this study is to grow the body of literature on health disparity in IH.

**Methods:** Data on inpatient admissions related to incisional hernias were obtained from the Healthcare cost and Utilization Project National Inpatient Sample (HCUP NIS) for 2012-2014. Patients with a primary ICD-9 diagnosis of incisional hernia and complete demographic information were included. Analyses were completed using survey specific procedures in SAS version 9.4 and accounted for HCUP NIS sampling design. Sample characteristics were reported via SurveyFreq procedure. Type of admission (elective versus non-elective) within groups was compared via Rao-Scott Chi-square tests. The probability of an elective admission was modeled via SurveyLogistic Procedure.

**Results:** 39,296 cases met study eligibility requirements. Overall, 61.5% of admissions related to incisional hernia were elective. The proportion of elective admission was lower in patients over 65 (59.1%) and females (59.7%). White patients had the greatest proportion of an elective admission (64%) compared to other races. Among insurance types, self-paying patients had the lowest proportion of elective admission (35.7%). Using fully adjusted logistic regression, racial disparities in the type of admission remained significant after adjusting for age, sex and insurance. Compared to white patients, the odds of an admission being elective were significantly lower for black [OR (95%CI): 0.61 (0.57, 0.65)], Hispanic [OR (95%CI): 0.72 (0.66, 0.78)], and other [OR (95%CI): 0.83 (0.73,0.95)] patients.

**Conclusion:** IH are amongst the most common surgical complications following laparotomies. The data from this study show that nearly all at-risk patient populations are less likely to undergo elective repair, instead presenting as urgent admissions. These include older, female, non-white, and uninsured/self-pay patients. Efforts to improve access to elective IH repair, or to prevent IH entirely, should be undertaken to ameliorate these health disparities.

*Graph on next page*

			Elective Admission	
	N	Proportion of Population (%)	Percent (%)	Pr > ChiSq
All	39,296		61.5	
Age				<.0001
<25	253	0.6	64.8	
25-44	5,662	14.4	61.8	
45-64	18,285	46.5	63.4	
65 and Over	15,096	38.4	59.1	
Sex				<.0001
Male	14,366	36.6	64.8	
Female	24,930	63.4	59.7	
Race/Ethnicity				<.0001
White	29,762	75.7	64.0	
Black	4,182	10.6	51.3	
Hispanic	3,830	9.7	54.5	
Other	1,522	3.9	58.8	
Insurance				<.0001
Medicare	17,981	45.8	60.1	
Medicaid	4,380	11.1	56.2	
Private	14,050	35.8	67.7	
Self-pay	1,412	3.6	35.7	
Other	1,473	3.7	61.4	

## MINI-TALK SESSION II

Abstract | Clinical Science | Trauma

### PATIENT CONTACT TIME AND PREHOSPITAL INTERVENTIONS IN HYPOTENSIVE TRAUMA PATIENTS: SHOULD WE RECONSIDER THE "ABC" ALGORITHM WHEN TIME IS OF THE ESSENCE?

Scott Ninokawa BS EMT, Jessica Friedman MD, Alison Smith MD PhD, Sharven Taghavi MD, Patrick McGrew MD, Juan Duchesne MD

**Background:** There is considerable disagreement in the trauma community concerning the extent to which emergency medical services (EMS) should perform on-scene interventions. Additionally, in recent years the classic "ABC" algorithm has been questioned in hypotensive patients.

**Objective:** The objective of this study was to quantify the delay introduced by different on-scene interventions, stratified by mechanism of injury and injury severity score (ISS) in hypotensive trauma patients.

**Methods:** This was a retrospective analysis of consecutive hypotensive trauma patients brought in to an urban Level 1 trauma center by EMS from 2007-2018. Patients with severe head injuries, suicide attempt, or death prior to EMS arrival were excluded. Two-sample t-test and ANOVA were used to compare mean on-scene times.

**Results:** There were 671 patients, 54% with blunt and 46% with penetrating injury. Average EMS contact time prior to departure was 6.57 minutes. In patients with penetrating trauma and ISS of 16-25, intubation (4.4 vs 11.0 mins;  $p < 0.05$ ), and drug administration (4.1 vs 8.0 mins;  $p < 0.05$ ) increased scene time. In patients with blunt trauma and ISS 10-15, IV access (4.9 vs 8.5 mins;  $p < 0.05$ ) and intubation (7.4 vs 14.5 mins;  $p < 0.05$ ) increased scene time. Tourniquet use, IO access, and needle decompression did not increase scene time in any group.

**Conclusion:** In our study the intervention which caused the greatest increase in EMS patient contact time was intubation, doubling scene times in some groups and increasing total contact time beyond that which is recommended by some experts. As investigation surrounding prehospital interventions continues, it will be important to consider each intervention separately to determine if that particular intervention is warranted on-scene. In some cases, this may require alterations to the traditional "ABC" algorithm.

*Graph on next page*

ATLS Algorithm	Mean EMS Patient Contact Time in Minutes – Penetrating Trauma						
	Intervention	ISS					
		10-15		16-25		26+	
	No	Yes	No	Yes	No	Yes	
Airway	Intubation	-	-	4.4 (0.3)*	11.0 (3.5)*	4.8 (0.4)	6.6 (1.2)
Breathing	Needle Decompression	-	-	4.9(0.4)	3.5(0.8)	5.1(0.4)	5.1(0.7)
Circulation	IV Access	4.9 (1.3)	4.6 (0.6)	6.7 (1.1)*	4.0 (0.3)*	5.4 (0.8)	5.0 (0.4)
	IO Access	4.8 (0.6)	4.3(1.2)	4.4(0.4)	5.7(1.1)	5.2(0.5)	4.9(0.6)
	Tourniquet	4.7 (0.6)	5.0 (2.1)	4.7 (0.4)	4.2 (0.7)	5.1 (0.4)	7.0 (2.0)
Disability	Spinal Immobilization	4.7(0.6)	4.9(1.3)	4.4(0.4)	5.4(1.0)	4.6(0.3)	5.7(0.7)
Other	Drug administration	-	-	4.1 (0.3)*	8.0 (1.6)*	4.8 (0.4)	6.7 (1.2)
	Wound care	3.8 (0.7)	5.7 (0.8)	4.2 (0.6)	5.0 (0.5)	4.8 (0.6)	5.3 (0.5)

Mean time in minutes (standard error); \* P < 0.05

ATLS Algorithm	Mean EMS Patient Contact Time in Minutes – Blunt Trauma						
	Intervention	ISS					
		10-15		16-25		26+	
	No	Yes	No	Yes	No	Yes	
Airway	Intubation	7.4 (0.6)*	14.5 (8.5)*	7.6 (0.9)	10.8 (3.8)	6.4 (0.5)	8.2 (2.0)
Breathing	Needle Decompression	-	-	7.8(0.9)	9.0(6.0)	6.6(0.5)	8.6(3.4)
Circulation	IV Access	4.9 (1.1)*	8.5 (0.8)*	9.0 (2.3)	7.2 (0.7)	6.5 (0.9)	6.8 (0.6)
	IO Access	7.4(0.6)	12.0(5.5)	8.3(1.0)	4.3(1.0)	6.6(0.5)	7.3(1.5)
	Tourniquet	-	-	7.7(0.9)	12.0(1.0)	6.7(0.5)	7.7(2.2)
Disability	Spinal Immobilization	8.0(1.9)	7.7(0.7)	11.0(4.3)	7.4(0.9)	7.6(2.2)	6.7(0.5)
Other	Drug administration	7.4(0.6)	10(3.2)	7.8(1.0)	7.7(2.0)	6.6(0.6)	7.1(1.2)
	Wound care	8.0(0.7)	6.6(1.8)	8.4(1.1)	6.3(1.3)	6.2(0.5)*	9.3(1.4)*

Mean time in minutes (standard error); \* P < 0.05

## MINI-TALK SESSION II

Abstract | Clinical Science | Plastic Surgery

### FREE TISSUE TRANSFER IN PRESSURE ULCER RECONSTRUCTION

Chelsi Robertson, Charles Patterson, MD, Frank Lau, MD

**Background:** Pressure ulcers (PU) are common, particularly in paraplegic patients. Stage III/IV PU that are refractory to nonsurgical interventions often require local flap reconstruction. Unfortunately, PU recurrences are common, with reported incidences of 33-82% at 1-year following reconstruction.

**Objective:** Multiple reports of free tissue transfer for PU reconstruction exist but to our knowledge no systematic review has been performed. Here, we report the results of a systematic literature review and offer guidelines for the use of free tissue transfer for PU reconstruction. Additionally, we provide an analysis of the free flap and pressure ulcer reconstruction cost literature to determine if free flaps would significantly increase the cost of PU reconstruction.

**Methods:** A systematic review of available English-language, peer-reviewed literature was conducted using the following electronic databases over the period 1900-2019 to identify pertinent publications: PubMed/MEDLINE, Google Scholar, Scopus, EMBASE, and the Cochrane Database of Systematic Reviews. The literature search was conducted using the following combination of terms: "free flap" AND "pressure ulcer". The articles were individually screened for relevance based on their titles, abstracts, and full texts.

**Results:** Our systemic review found 30 cases of free flap reconstruction for ischial pressure ulcers. Successful coverage of ischial pressure ulcers and overall reduction in recurrence was reported at 30 months mean follow up. Overall, 94% of the flaps healed well with no recurrence. Only two cases of recurrence were reported. The average recurrence rate following free flap reconstruction for pressure ulcers was 5%, compared to the 38% average recurrence rate following pressure ulcer reconstruction with fasciocutaneous and myocutaneous flaps.

**Conclusion:** Compared to local flaps, free tissue transfer for PU reconstruction yielded increased success rates, reduced recurrence rates, and less complications. Free tissue transfer costs more initially due to longer operation times, but prove to be more cost-effective due to reduced post-operative complications and long-term wound closure. We recommend considering free flaps when conservative measures, local flap reconstruction, and alternative therapies result in a recurrent PU.

## MINI-TALK SESSION II

Abstract | Education Science | Education

### HOW DO WE REALLY FEEL ABOUT SCORE?

R Moreci, A Awe, T Lairmore, G Caldito, K White, N Samra

**Background:** The Surgical Council on Resident Education (SCORE) curriculum has been adopted by the majority of surgical residency programs as the didactic surgery program for surgical residents. Research suggests that a subscription to SCORE and its web Portal prepares residents to perform better and pass their surgery boards at the conclusion of their residency programs. ABS and ACS have invested millions of dollars into SCORE and the resources that it provides to residents continues to evolve and improve.

**Objective:** The purpose of this study is to evaluate the resident response to how the SCORE curriculum is used within the surgery department at LSU Shreveport as the adopted structured program for general surgery residents, and what areas can be improved to make the program more effective in preparation for ABSITE and ultimately the surgery board exam.

Our null hypothesis is that a large percentage of the surgical residents (e.g. more than 50% or more than 40%) do not feel the SCORE curriculum is an effective tool used for resident education or preparation for ABSITE.

**Methods:** An anonymous voluntary 10 question Likert scale survey was given to 25 surgery residents to evaluate how they feel about the SCORE curriculum. Residents answered 'Strongly Agree', 'Agree', 'Undecided', 'Disagree', or 'Strongly Disagree' to each question. The normal approximation to the binomial test was used to test the null hypothesis; that is, for each questionnaire item, we tested whether more than 50% or more than 40% 'Disagree or 'Strongly Disagree' with the item. For each item, 'Strongly Agree and Agree' were combined as 'Agree'; likewise, 'Disagree' and 'Strongly Disagree' were combined as 'Disagree'.

**Results:** The proportion of residents who 'Disagreed' with an item was >40-50% for three of the ten items (1, 4, and 5). The observed proportion for Item 1 (0.76) was significantly larger than 0.5 (p-value=0.026). While item 4 (0.67) was not significantly larger than 0.5 at 5% level, it was significantly higher than 0.5 at the 10% level (p-value=0.076). Item 5 did not have a >50% response. These items were all significantly greater than 0.4 (p-values = 0.002, 0.007, and 0.034 respectively).

**Conclusion:** To make the SCORE curriculum more effective at LSU Shreveport, improvements need to be made in relation to Items 1, 4, and 5 of our questionnaire. This study will help guide our resident educators in better utilizing and supplementing how we use this curriculum within our program.

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### How Do We Really Feel About SCORE?

1. The SCORE curriculum prepares me adequately for the ABSITE exam.  
 1- Strongly Agree    2- Agree    3- Undecided    4- Disagree    5- Strongly Disagree
2. We use SCORE effectively.  
 1- Strongly Agree    2- Agree    3- Undecided    4- Disagree    5- Strongly Disagree
3. I like TWIS as a pre-lecture activity.  
 1- Strongly Agree    2- Agree    3- Undecided    4- Disagree    5- Strongly Disagree
4. I completed all the SCORE questions prior to ABSITE.  
 1- Strongly Agree    2- Agree    3- Undecided    4- Disagree    5- Strongly Disagree
5. SCORE explains the concepts covered adequately.  
 1- Strongly Agree    2- Agree    3- Undecided    4- Disagree    5- Strongly Disagree
6. We have time to use SCORE.  
 1- Strongly Agree    2- Agree    3- Undecided    4- Disagree    5- Strongly Disagree
7. The 2 year curriculum cycle is too long.  
 1- Strongly Agree    2- Agree    3- Undecided    4- Disagree    5- Strongly Disagree
8. The SCORE too verbose.  
 1- Strongly Agree    2- Agree    3- Undecided    4- Disagree    5- Strongly Disagree
9. The amount information to cover in weekly SCORE topics is reasonable to complete.  
 1- Strongly Agree    2- Agree    3- Undecided    4- Disagree    5- Strongly Disagree
10. SCORE is a good guideline to use to cover topics covered on ABSITE.  
 1- Strongly Agree    2- Agree    3- Undecided    4- Disagree    5- Strongly Disagree

Number (Proportion) of Residents who 'Disagree' with An Item (P) and P-Value for Testing Proportion who Disagree

Item	No. of respondents	Disagree	p-value for Ho: P<=0.5 vs P>0.5	p-value for Ho: P<=0.4 vs P>0.4
1	17	13 (0.76)	0.026*	0.002**
2	16	7 (0.44)	0.773	0.48
3	22	6 (0.27)	0.991	0.925
4	24	16 (0.67)	0.076 <sup>+</sup>	0.007**
5	19	12 (0.63)	0.179	0.034*
6	21	7 (0.33)	0.96	0.8
7	17	6 (0.35)	0.928	0.739
8	17	8 (0.47)	0.688	0.363
9	22	6 (0.27)	0.991	0.925
10	17	5 (0.29)	0.974	0.873

## MINI-TALK SESSION II

Abstract | Clinical Science | Endocrine

### ULTRASOUND ELASTOGRAPHY PREDICTS THYROID NODULE VOLUME REDUCTION RATE AFTER PERCUTANEOUS ETHANOL ABLATION

M Abdelgawad, H Shalaby, M Akkera, L Grace, E Kandil

**Background:** Percutaneous ethanol ablation (PEA) may be utilized to treat thyroid nodules, particularly in patients who may not be amenable to surgical treatment. There is a paucity of North American studies that evaluate predictive factors for successful outcome of this modality. We hypothesize that ultrasound (US) elastography can predict successful outcomes in PEA for non-malignant thyroid nodules.

**Objective:** To examine the factors that affect the efficacy of PEA based on volume reduction rate (VRR), ultrasound elastography, and nodule consistency of the thyroid nodules. We also aimed to assess safety of PEA by evaluating post-procedural complications.

**Methods:** This is a retrospective cohort study of all patients with thyroid nodules undergoing PEA by a single surgeon in a North American academic institution. Study variables included are demographics, thyroid nodule characteristics, fine needle aspiration (FNA) findings, US elastography, presence of compressive symptoms, thyroid function test, and post-procedural complications. A subgroup analysis was also performed on benign thyroid nodules.

**Results:** A total of 34 thyroid nodules in 22 patients were evaluated. The mean age was  $66.18 \pm 11.45$  years with 86.36% of patients being female. All 34 thyroid nodules underwent an FNA and were classified according to Bethesda classification: non-diagnostic (5.88%), benign (55.88%), atypia of undetermined significance (17.65%), follicular lesion of undetermined significance (8.82%) and suspicious for malignancy (11.76%). Based on US elastography, the nodules were classified into the stiff (34.38%), the mixed (43.75%), and the soft (21.88%) categories. A significant VRR was found for the soft thyroid nodules at 6 months ( $42.15 \pm 31\%$ ), compared to the stiff nodules with  $30.92 \pm 91.53\%$ ,  $p$

**Conclusion:** To the best of our knowledge, this is the largest series of PEA for thyroid nodules in the United States. Ultrasound elastography can be a useful adjunct in predicting the success of PEA for non-malignant thyroid nodules. PEA is both a safe and effective alternative procedure to surgery for nodule volume reduction and relief of compressive symptoms in select high-risk patients.

## CANCER SESSION

Abstract | Clinical Science | Surgical Oncology

### DOES DISTANCE TO TREATMENT AFFECT MORTALITY RATE FOR SURGICAL ONCOLOGY PATIENTS?

M Garstka, D Monlezun, E Kandil

**Background:** Patients often travel large distances to referral centers for surgical treatment of malignancies.

**Objective:** Using the National Cancer Database, we seek to analyze the relationship of patient distance to hospital of treatment on mortality trends after surgery.

**Methods:** A retrospective cohort study of the National Cancer Database (NCDB) from 2004-2013 was performed and patients with gastrointestinal, melanoma and head and neck primary site tumors who underwent surgery were included. We excluded cases with no recorded mortality status or distance from the hospital. Multivariable logistic regression was conducted with adjustments for population density, treating facility location, age, race, gender, education, income, insurance, comorbidities (Charlson-Deyo score), days from diagnosis to treatment, positive margin, tumor stage and grade, and lymph or vascular invasion.

**Results:** A total of 1,424,482 patients were included. Overall median distance to hospital was 9.7 miles (range 4.2-23.7 miles); 696,647 (48.91%) of the sample traveled a distance greater than 10 miles to the institution where the procedure was performed. Multivariable regression analysis demonstrated overall lower mortality for those patients travelling a longer distance to care for multiple tumor types, including: liver (OR 0.87, 0.77-0.99,  $p=0.032$ ), pancreas (OR 0.82, 0.76-0.89,  $p<0.001$ ), colon (OR 0.92, 0.89-0.95,  $p<0.001$ ), rectum (OR 0.90, 0.83-0.96,  $p=0.003$ ), melanoma (OR 0.83, 0.79-0.88,  $p<0.001$ ), and tumors of the larynx (OR 0.80, 0.69-0.94,  $p=0.005$ ).

**Conclusion:** Increased distance traveled for surgical treatment has a significant correlation with decreased odds of mortality for multiple cancers, highlighting the importance of centralized referral patterns for oncology care.

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**Table 1. Multivariable regression of mortality by  $\geq 10$  miles versus  $< 10$  miles from home to hospital by tumor type\***

Mouth	0.91 (0.81-1.03; p=0.128)	1.42 (0.82-2.47; p=0.216)	1.02 (0.76-1.37; p=0.904)
Stomach	0.91 (0.83-1.00; p=0.052)	0.85 (0.69-1.05; p=0.139)	0.87 (0.75-1.01; p=0.066)
Liver	<b>0.87 (0.77-0.99; p=0.032)</b>	0.94 (0.70-1.25; p=0.666)	<b>0.79 (0.63-0.99; p=0.037)</b>
Small Intestine	0.94 (0.83-1.07; p=0.371)	1.16 (0.87-1.56; p=0.307)	1.02 (0.82-1.28; p=0.861)
Pancreas	<b>0.82 (0.76-0.89; p&lt;0.001)</b>	<b>0.73 (0.59-0.90; p=0.004)</b>	<b>0.70 (0.60-0.82; p&lt;0.001)</b>
Colon	<b>0.92 (0.89-0.95; p&lt;0.001)</b>	<b>0.92 (0.86-0.99; p=0.018)</b>	<b>0.91 (0.86-0.96; p=0.001)</b>
Recto-Sigmoid Junction	0.92 (0.83-1.03; p=0.156)	0.88 (0.67-1.16; p=0.362)	0.81 (0.65-1.01; p=0.065)
Rectum	<b>0.90 (0.83-0.96; p=0.003)</b>	0.83 (0.67-1.04; p=0.106)	0.93 (0.79-1.09; p=0.362)
Anus	0.84 (0.65-1.07; p=0.157)	0.74 (0.17-3.24; p=0.699)	0.47 (0.21-1.04; p=0.062)
Melanoma	<b>0.83 (0.79-0.88; p&lt;0.001)</b>	1.25 (0.84-1.86; p=0.268)	0.91 (0.73-1.12; p=0.362)
Lip	0.78 (0.54-1.12; p=0.172)	0.07 (0.00-1.29; p=0.075)	0.30 (0.09-1.01; p=0.052)
Nasal	0.76 (0.56-1.03; p=0.079)	3.81 (0.26-54.95; p=0.326)	1.44 (0.63-3.26; p=0.385)
Saliva Gland	0.84 (0.70-1.01; p=0.067)	0.96 (0.34-2.76; p=0.944)	0.91 (0.52-1.57; p=0.722)
Tongue	0.93 (0.83-1.05; p=0.261)	1.40 (0.76-2.57; p=0.283)	1.18 (0.84-1.66; p=0.338)
Tonsil	0.98 (0.80-1.21; p=0.863)	1.29 (0.48-3.48; p=0.613)	1.48 (0.84-2.61; p=0.180)
Nasopharynx	6.24 (0.61-64.00; p=0.123)	NA	NA
Oropharynx	0.80 (0.49-1.31; p=0.381)	NA	3.33 (0.71-15.74; p=0.129)
Pharynx	NA	NA	NA
Hypopharynx	0.71 (0.49-1.04; p=0.080)	0.36 (0.05-2.49; p=0.298)	1.47 (0.56-3.87; p=0.437)
Larynx	<b>0.80 (0.69-0.94; p=0.005)</b>	1.09 (0.57-2.07; p=0.799)	1.10 (0.74-1.65; p=0.611)

\*Fully adjusted by population density, treating facility location, age, race, gender, education, income, insurance, comorbidities (CSS), days from diagnosis to treatment, positive margin, tumor stage and grade, lymph or vascular invasion.

## CANCER SESSION

Abstract | Clinical Science | Surgical Oncology

### MANAGEMENT OF APPENDICEAL NEUROENDOCRINE TUMORS: METASTATIC POTENTIAL OF SMALL TUMORS

J Landry, B Voros, D Beyer, Y Wang, R Ramirez, J Boudreaux, E Woltering, R Thiagarajan

**Background:** Appendiceal neuroendocrine tumors (ANETs) are rare neoplasms usually discovered incidentally during appendectomy. ANETs

**Objective:** Our aim was to evaluate the metastatic potential of ANETs

**Methods:** A comprehensive retrospective review was performed for patients with ANET who presented to our tertiary referral center from 1998-2019. Demographics, tumor characteristics, treatment, and clinical outcomes were evaluated. Patients with additional malignancies were excluded.

**Results:** In total, 114 patients were included. Median follow-up was 3.3 years (range, 21 days-15 years). At last follow-up, 34 (30%) patients had positive regional lymph nodes and 20 (18%) patients had metastatic disease. Patients with older age and ANETs with serosal invasion, lymphovascular invasion, higher tumor grade, or positive lymph nodes were significantly more likely to present with metastatic disease at diagnosis. On multivariate analysis, patients with metastatic disease at diagnosis had worse overall survival (HR=24.4, p=0.008). We found no significant difference in the rate of lymph node metastasis, metastatic disease at diagnosis, or overall survival when stratified by tumor size or type of resection.

**Conclusion:** In our cohort, tumor size was not a significant risk factor for metastatic disease or worse outcome as many patients with ANETs

Factors	Univariate		Multivariate	
	HR (95%CI)	P value	HR (95%CI)	P value
Sex (male vs female)	8.59 (1.76-41.31)	0.002	4.75 (0.83-27.10)	0.08
Surgery (appendectomy only vs RH)	2.59 (0.63-10.72)	0.17		
Primary tumor size (<2 vs ≥2cm)	3.29 (0.74-14.54)	0.23		
Primary tumor invasion depth				
Subserosa	Ref			
Mesoappendix	0.20 (0.03-1.52)	0.12		
Serosa	0.76 (0.16-3.56)	0.72		
Lymphovascular invasion	4.30 (0.92-19.96)	0.06		
Perineural invasion	3.45 (0.66-18.11)	0.13		
Mesoappendiceal invasion	1.12 (0.27-4.59)	0.88		
Tumor grade (intermediate vs low)	11.55 (1.43-93.12)	<0.0001	5.14 (0.95-27.80)	0.06
Regional lymph node involvement	6.39 (1.10-37.18)	0.04	3.11 (0.52-18.7)	0.22
Metastasis at diagnosis	29.99 (5.11-175.9)	<0.0001	24.38 (2.34-253.54)	0.008
Abbreviations: RH, right hemicolectomy				

## CANCER SESSION

Abstract | Basic Science | Surgical Oncology

### CONCOMITANT NUCLEAR TRANSLOCATION OF BRAF-V600E AND HMOX-1 IS ASSOCIATED WITH DRUG RESISTANCE AND POOR PROGNOSIS IN MELANOMA PATIENTS

K Ibrahim, A Attia, M Zerfaoui, E Ruiz, E Kandil

**Background:** BRAFV600E mutations (mBRAF) was reported in up to 70% of cutaneous melanomas and is associated with melanoma progression, reduced survival and poor prognosis. Selective mBRAF inhibitors, such as Vemurafenib (PLX-4032), have been established as a standard therapy for metastatic melanoma harboring mBRAF. Although the successful targeting of mBRAF in these patients improves overall survival, de novo resistance developed in up to 20% of patients. We recently showed that changes in mBRAF cellular localization may provide a sheltering mechanism, and herein we are reporting a novel and unexpected interaction with other partners.

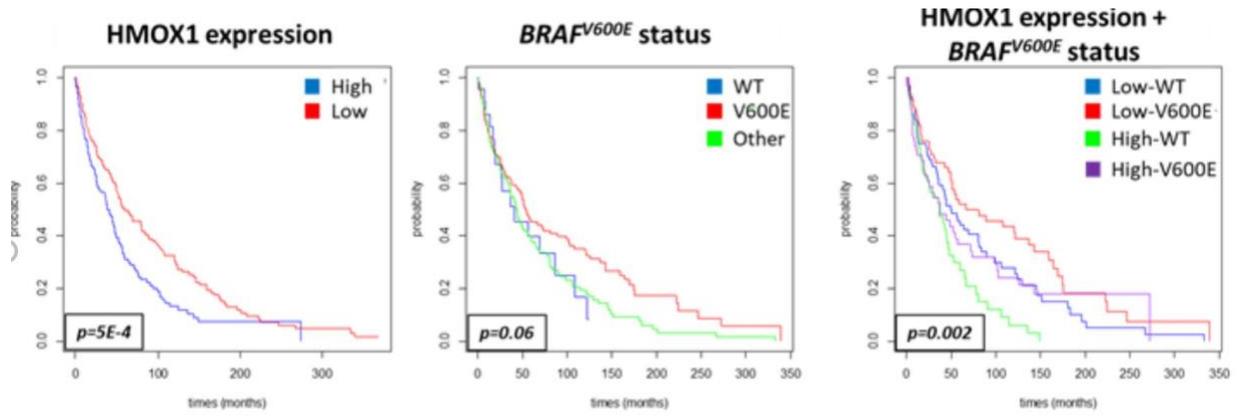
**Objective:** HMOX-1 has been proved to be associated with tumor aggressivity and poor prognosis in various cancers. Our study provides the first evidence to demonstrate the concomitant relationship of nuclear BRAFV600E localization and HMOX-1 in terms of cell resistance and aggressiveness.

**Methods:** Human XL Oncology Array was used to assess protein expression on parental A375 and vemurafenib resistant A375-NRAS. Then, we performed a bioinformatic analysis of 364 melanoma samples collected from 19 cancer centers with known BRAFV600E status, to estimate the correlation between novel partner and mBRAF. Immunofluorescence was performed to show a prominent nuclear BRAFV600E localization in A375-NRAS compared to the parental cells. Immunoprecipitation has been used for protein-protein interaction between BRAFV600E and novel partner. MTT was done for cell viability and effect of Vemurafenib on parental A375 and resistant A375 NRAS.

**Results:** The screening of the protein lysates of resistant and parental cells identified proteins that were markedly elevated in the A375 (nuclear mBRAF)-expressing resistant cells, when compared to (cytoplasmic mBRAF)-expressing sensitive cells. Among these up-regulated proteins, HMOX-1 increased 10.3-folds. Remarkably, about 68% of the A375-NRAS resistant cells were sensitive to Vemurafenib treatment when combined to HMOX-1 inhibitor. HMOX-1 inhibition alone was able to eliminate about 53.2% of NRAS resistant cells compared to control. Combined treatment with the two inhibitors BRAFV600E and HMOX-1, showed the lowest cell viability percentage (32.5%) ( $p < 0.01$ ). The bioinformatic analysis confirmed that high expression of HMOX-1 is associated with worse disease-free survival (Hazard ratio (HR) = 0.65, CI-95% HR = 0.50-0.83,  $p = .0005$ ), and higher risk of lymph node metastasis ( $p = 0.035$ ). Additionally, high expression of HMOX1 in m-BRAF samples has poor prognosis than low expression ( $p = 0.003$ )

**Conclusion:** Nuclear colocalization of m-BRAF and HMOX-1 is associated with worse prognosis in melanoma patients. For the first time, we are showing here that specific inhibition of HMOX-1 can overcome the resistance to selective BRAFV600E inhibitors.

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**Fig. 5. BRAF V600E and HMOX1 are associated to predict a worse prognosis.**

Kaplan Meier curve showing disease-free survival (DFS) analysis on 364 melanoma samples from the cancer genome atlas (TCGA).

## CANCER SESSION

Abstract | Clinical Science | Endocrine

### IMPACT OF SURGEON-PERFORMED ULTRASOUND ON TREATMENT OF THYROID CANCER PATIENTS

M Shalaby, D Hadedeya, R Munshi, M Akkera, A Elnahla, K Ibraheem, L Grace, E Kandil

**Background:** Although the 2015 American Thyroid Association (ATA) Management Guidelines for Adult Patients with Thyroid Nodules recommend sonographic evaluation of thyroid nodules to include comprehensive characterization of thyroid nodules and presence/absence of any suspicious cervical lymph nodes in the central/lateral compartments, this extent of sonographic assessment is still not routinely done.

**Objective:** We hypothesized that an endocrine surgeon-performed ultrasound (SUS) significantly enhances diagnosis, appropriate surgical planning, and treatment outcome in thyroid cancer patients when compared to pre-consultation referral ultrasound (RUS).

**Methods:** We conducted a retrospective review study of thyroid cancer patients' records (N= 267), who had undergone a thyroid surgery +/- central/lateral neck dissection at a single academic institution. All 267 patients had undergone a SUS, but only the patients with both pre-consultation RUS and SUS (N= 130) were included in this study to assess the impact of SUS on subsequent management.

**Results:** Out of those 130 patients, 26 patients (20%) were noted to have suspicious thyroid nodules which warranted an FNA based on SUS but were missed on RUS. 12 patients had Bethesda III/IV, 14 patients had Bethesda V/VI on FNA, and all 26 patients were confirmed to have malignancy on final pathology. 38 patients (29.2%) were noted to have suspicious central/lateral neck findings on SUS but did not have them reported on RUS. Subsequently, 18 patients (13.8%) underwent a central +/- lateral neck lymph node dissection at the time of index thyroid surgery. Additionally, 8 patients (6.1%) were found to have a parathyroid adenoma based on SUS and required a concurrent parathyroidectomy.

**Conclusion:** A comprehensive neck ultrasound performed by an endocrine surgeon significantly enhances the appropriate assessment, treatment, and outcome of thyroid cancer patients. This finding highlights the critical need for education and improvement in routine neck ultrasonography exams performed in the community and the importance of ultrasonography expertise in endocrine surgeons.

## CANCER SESSION

Abstract | Clinical Science | Surgical Oncology

### TREATMENT AT A HIGH VOLUME ACADEMIC RESEARCH PROGRAM MITIGATES RACIAL/ETHNIC DISPARITIES IN PANCREATIC ADENOCARCINOMA

Q Chu, M Hsieh, G Zibari, H Shokouh-Amiri, J Gibbs, X Wu

**Background:** African Americans (AA) have lower overall survival (OS) rates from pancreatic adenocarcinoma compared with Caucasians (C). Socioeconomic status and biology are attributable factors. There is a paucity of data to show which factor(s) will mitigate such disparities. We determined whether treatment at a high-volume center and an academic research program reduces the racial disparity in pancreatic cancer outcomes..

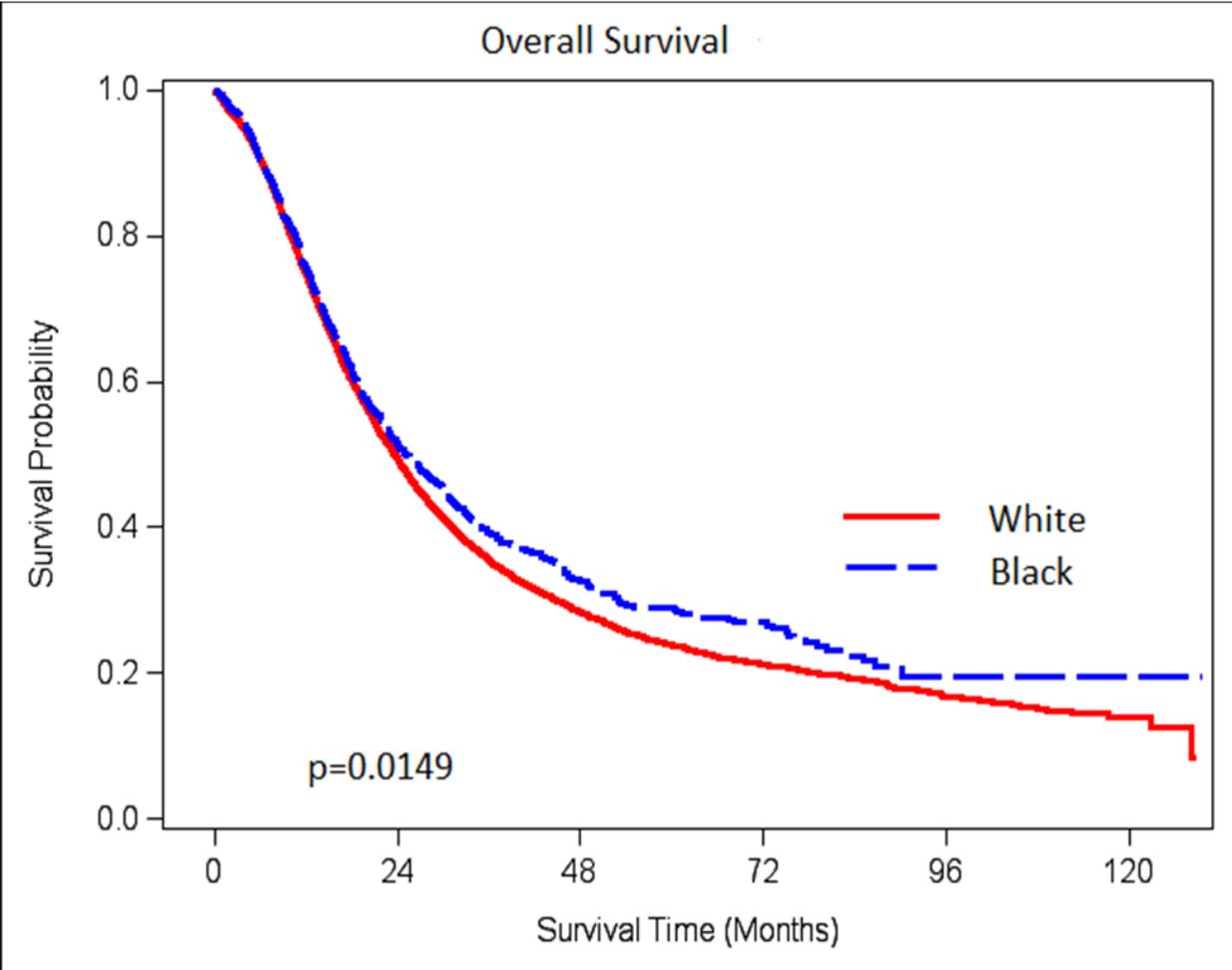
**Objective:** Understand that there is parity in outcome for resected pancreatic cancer between African-American and Caucasian patients when treatment occurs at a high volume academic research program

**Methods:** A cohort of 12,950 patients diagnosed with Stage I-III pancreatic adenocarcinoma from 2003-2011 and treated at high-volume ( $\geq 12$  cases/year) academic research programs (ARP) were evaluated from the National Cancer Database. Sociodemographic, clinico-pathological, and treatment variables were compared between AA and C. The 5-year overall survival (OS) was calculated using the Kaplan-Meier method. Cox regression model was used to assess factors associated with OS. P-value  $\leq 0.05$  was considered significant.

**Results:** In univariable analysis, race was a predictor of OS; AA (N=1,127) had a significantly higher OS than C (N=11,823), despite having significantly lower income, lower education level, more stage III disease, more Medicaid recipients, and higher comorbidity index ( $P < 0.0001$ ). The 5-yr unadjusted OS for AA and C was 28.6% and 23.9%, respectively and the median survival time (months) was 25.2 and 23.7, respectively ( $P < 0.015$ ). There was no significant difference in surgical margin status or receipt of chemoradiation between the two cohorts. In multivariable analysis, race was not a significant predictor of OS ( $P = 0.096$ ).

**Conclusion:** Treatment at a high volume, academic research program can mitigate racial/ethnic disparities in pancreatic cancer.

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## CANCER SESSION

Abstract | Clinical Science | Surgical Oncology

### LYMPHEDEMA AFTER SENTINEL LYMPH NODE BIOPSY OF UPPER EXTREMITY CUTANEOUS MALIGNANCIES IS RARE AND QUESTIONS THE VALUE OF REVERSE AXILLARY MAPPING FOR BREAST CANCER PATIENTS

Raulee T.S. Morello, MD; Laura K. Jeter, MD; Ralph Corsettie, MD; Aimee Mackey, MD; Sean Higgins, MS4; Nrusheel Kattar MS3

**Background:** Sentinel lymph node (SLN) mapping and biopsy for upper extremity cutaneous malignancy identifies the first draining lymph node in the axilla. This is technically the same node that is identified during the breast cancer staging procedure known as axillary reverse mapping (ARM) where the first draining node from the upper extremity is identified during breast cancer axillary surgery and avoided so that the risk of subsequent lymphedema may potentially be reduced. We performed this study to determine the risk of lymphedema after SLN biopsy for upper extremity cutaneous malignancy and its implications for adding ARM to axillary breast cancer surgery.

**Objective:** To identify the rate of lymphedema after axillary sentinel lymph node biopsy of upper extremity cutaneous malignancies.

**Methods:** We reviewed the electronic medical records of a single surgeon's treatment of all patients with upper extremity cutaneous malignancies that underwent sentinel lymph node biopsy. Lymphedema was defined as evidence of swelling, edema, or lymphedema of the extremity on physical exam. No objective assessment to make a diagnosis of lymphedema was used for this study. Six patients subsequently had a complete axillary lymph node dissection and were also included in the study. For patient that had a complete lymph node dissection, the presence of lymphedema was determined prior to these patients after sentinel node biopsy but before a full axillary dissection was performed. The number of lymph nodes resected and the length of follow up were included.

**Results:** A total of 69 patients were identified between 2012 and 2018. Only a single patient demonstrated lymphedema after sentinel lymph node biopsies (1.45%). Of the six patients that went on to have full axillary lymph node dissections two developed lymphedema (rate of 33.3%). The mean number of lymph nodes resected for the sentinel lymph node biopsy was 2.6 with a range of 1-12. The mean follow-up was >2 years with a range of 2-368 weeks.

**Conclusion:** The rate of lymphedema after axillary sentinel lymph node biopsy for upper extremity cutaneous malignancies is low (1.45%). The benefit of ARM in reducing the rate of lymphedema is not conclusive. This low rate of lymphedema after resection of the primary draining node of the upper extremity questions the value of ARM during SLN biopsy for breast cancer.

## SURGICAL POTPOURRI II

Abstract | Clinical Science | Colorectal Surgery

### ROBOTIC, LAPAROSCOPIC AND OPEN COLECTOMIES: A COMPARISON OF OUTCOMES USING THE ACS NSQIP

L Hajirawala, M Miller, G Orangio, K Davis, J Barton

**Background:** The robotic platform is gaining popularity in colorectal surgery.

**Objective:** This study aims to analyze trends in adoption of robotic surgery over a five-year period using the American College of Surgery National Surgical Quality Improvement Program (ACS-NSQIP).

**Methods:** ACS-NSQIP general and colectomy specific databases were combined for 2013-2017. Colorectal procedures were categorized as robotic, laparoscopic, planned open, and unplanned open. The proportion of cases performed robotically was calculated for each year. It was further categorized into age, sex, body mass index (BMI), low pelvic cases, rectal cancer and American Society of Anesthesiology (ASA) Classification.

**Results:** Of the 147,804 cases analyzed, 10,168 (6.4%) were performed robotically. 72,202 (49%) cases were performed laparoscopically, and 53,475 (37%) were planned open cases. The proportion of planned open resections decreased from 40% to 33%, and from 30% to 22% for coloproctostomies. The percentage of laparoscopic resections and unplanned open cases remained stable. The proportion of robotic colon resection rose, from 2.8% in 2013 to 9.4% in 2017. The prevalence of robotic rectal cancer resections increased from 9.6% to 23.9% (Figure 1). The proportion of robotic approach increased each year across all age groups except 65-79y, all BMIs, and all ASA groups except ASA 5 (Figure 2).

**Conclusion:** The rate of open colorectal resection continues to decline, with concomitant rise of the robotic platform. This is even more evident for low pelvic cases for rectal cancer. The robotic platform is increasingly utilized in colorectal surgery and used for higher risk, more obese and older patients.

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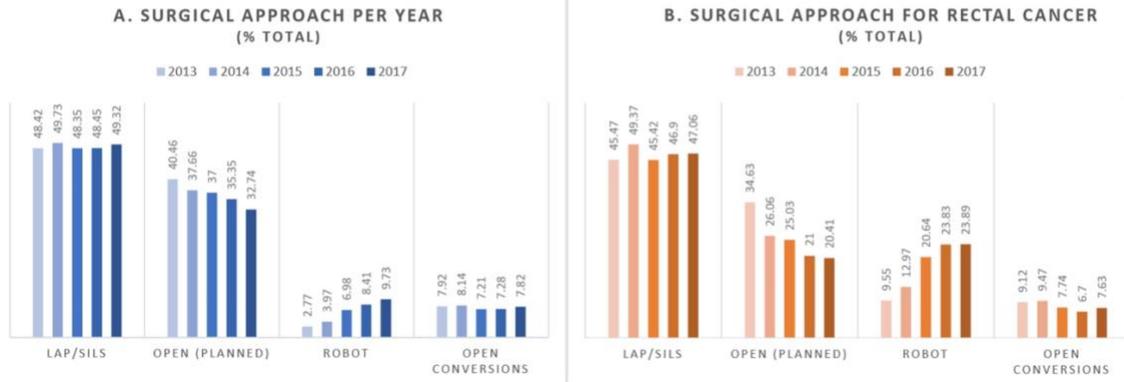


Figure 1.

A. Overall surgical approach per year

B. Surgical approach for rectal cancer cases involving coloproctostomy per year

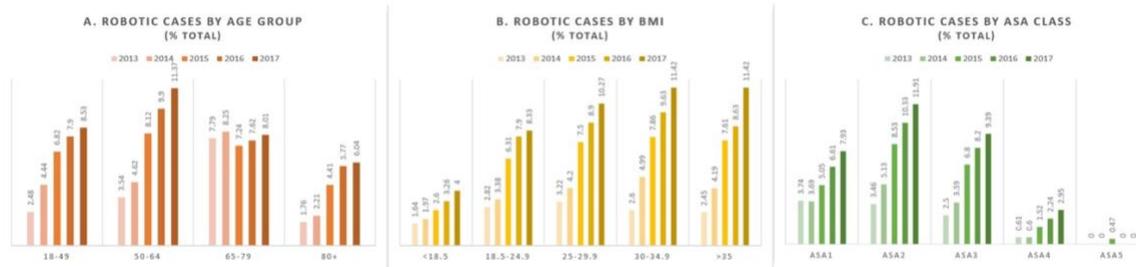


Figure 2.

A. The proportion of robotic cases per age group

B. The proportion of robotic cases per BMI group

C. The proportion of robotic cases per ASA class

### COMPLICATIONS RELATED TO PULMONARY CONTUSIONS IN SURGICAL STABILIZATION OF RIB FRACTURES: A CASE SERIES

Tumminello M, McGrew P, Smith A, Moore MM, Greiffenstein P

#### Background

Pulmonary contusion (PC) has been cited as a relative contraindication to surgical stabilization of rib fractures (SSRF). However, the reported experiences and clinical data regarding this topic remain limited. The objective of this study is to describe the experience treating patients with moderate to severe pulmonary contusions undergoing SSRF and identify risk factors for pulmonary complications, in particular post-operative Acute Respiratory Distress Syndrome (ARDS). We hypothesize that post-operative ARDS is most closely related to intraoperative aspiration of blood from the contused lung to the unaffected lung due to intraoperative positioning.

#### Methods

The trauma registry of a Level 1 trauma center was reviewed from 2012-2019, and patients who underwent SSRF were assessed. Computerized tomography was examined, and PC score was calculated in those with a documented PC by a researcher and verified by a board-certified radiologist. Demographic, clinical and outcomes data were analyzed and reported. Patients were categorized by severity of PC, timing of SSRF, and intraoperative lung isolation versus single lumen endotracheal intubation.

#### Results

Ninety-two patients were included in the initial analysis as having undergone SSRF in the study period. Nine patients with PC underwent SSRF. Two patients developed ARDS immediately postoperatively. None of the other patients had significant postoperative respiratory complications. Both patients who developed ARDS were noted to have undergone SSRF within 48 hours of arrival and single lumen intubation. Of the remaining patients, two underwent SSRF within 72 hours of admission with intraoperative lung isolation. The remainder (5) underwent SSRF greater than 6 days after admission.

#### Discussion

This case series highlight the relative risk of SSRF in patients with significant pulmonary contusion. Early SSRF in patients with moderate to severe PC was associated with ARDS when patients did not undergo intraoperative lung isolation. In patients with severe PC in whom the contusions themselves did not produce respiratory failure on admission, intra-operative positioning resulted in aspiration of bloody secretions from the contused lung into the unaffected lung causing severe post-operative ARDS. Suggested measures to prevent future events may include isolating the contused lung intraoperatively or delaying SSRF until contusion has resolved, if feasible.

#### Keywords

Rib plating; flail chest; acute respiratory distress syndrome

### UBIQUITIN LIGASE SIAH2: A NOVEL REGULATOR OF WELL-DIFFERENTIATED VS. DEDIFFERENTIATED LIPOSARCOMAS

R Tiongco, L Yuan, L Brown, J Taylor, T Dang, Z Floyd, F Lau

**Background:** Liposarcomas (LPS) are the most common soft tissue sarcomas. Well-differentiated and dedifferentiated LPS (WDLPS/DDLPS) are the most common subtypes. Despite similar genetics, five-year survival rates dramatically differ: 90% in WDLPS vs. 40% in DDLPS. Histologically, a key difference is that WDLPS is adipocyte-rich whereas DDLPS largely consists of stromal cells. Inducing adipogenic differentiation in DDLPS is therefore a potential therapeutic strategy. The master regulator of adipogenesis is peroxisome proliferator-activated receptor- $\gamma$  (PPAR $\gamma$ ). In DDLPS, PPAR $\gamma$  is downregulated. In a previous animal study, we showed that deletion of the mammalian homolog of Seven in absentia 2 (SIAH2), an ubiquitin ligase, regulated PPAR $\gamma$  expression. These data indicated that SIAH2, upstream of PPAR $\gamma$ , regulates the commitment of progenitor cells to the adipocyte lineage.

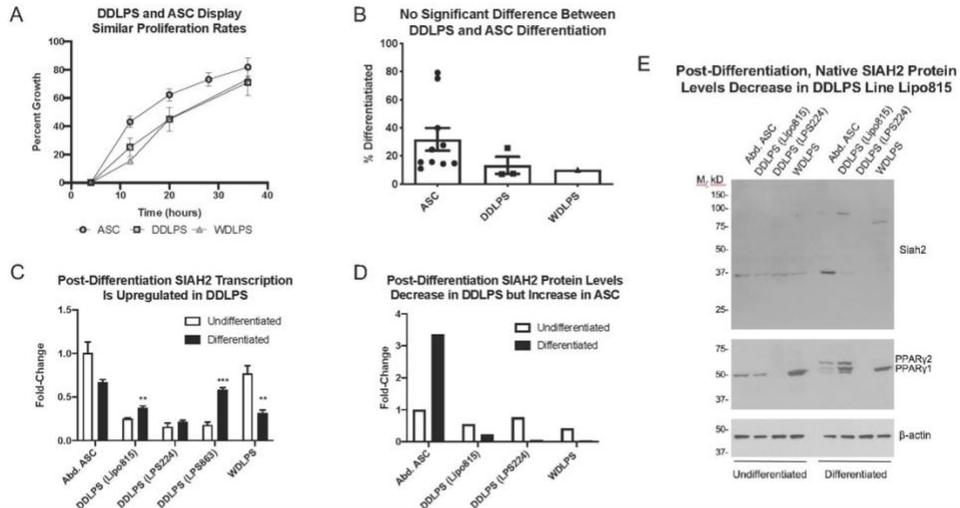
**Objective:** SIAH2 is a known tumor suppressor and a potential therapeutic target in other cancers. However, its role in LPS is entirely unstudied. The specific aim of this study was to quantify SIAH2 expression in LPS.

**Methods:** Cell lines derived from DDLPS (n=3) and WDLPS (n=1) were compared to human subcutaneous adipose-derived stromal cells (ASCs, n=10) as controls. Log-phase proliferation rates were quantified by live-cell analysis (Incucyte) at 12- and 36-hours. Adipogenic differentiation was induced for 3 weeks using preadipocyte differentiation medium (PromoCell) with 3% fetal bovine serum. Differentiation efficiency was quantified using Nile Red staining and flow cytometry. Following differentiation, SIAH2 gene expression was quantified via qRT-PCR. SIAH2 protein levels were semi-quantitatively analyzed with Western blots and algorithmic analysis (ImageJ). Statistical analysis was performed using unpaired t-tests (GraphPad Prism 8).

**Results:** Percent growth after 36 hours did not differ in DDLPS (mean 71.0%  $\pm$  9.2%) vs. ASCs (mean 81.8%  $\pm$  6.4%, p=0.42, Fig. 1A). Adipogenic differentiation was not significantly different between DDLPS (mean 13.4%  $\pm$  6.1%) vs. ASCs (mean 31.8%  $\pm$  8.0%, p=0.26, Fig. 1B). Post-differentiation SIAH2 mRNA levels significantly increased in DDLPS lines Lipo815 (p=0.006) and LPS863 (p=0.0006), but not in ASCs (Fig. 1C). Post-differentiation SIAH2 protein levels of DDLPS lines Lipo815 and LPS224 decreased by 4.5-fold at the native molecular weight (MW) and 19.9-fold overall respectively; ASCs increased by 3.4-fold (Fig. 1D-E). Also, Lipo815 and WDLPS lanes exhibited higher MW bands on the Western blot post-differentiation (Fig. 1E).

**Conclusion:** ASC and DDLPS cell lines proliferated at equivalent rates. However, DDLPS differentiated poorly; this is consistent with the clinical behavior of DDLPS. Surprisingly, SIAH2 was transcriptionally upregulated in DDLPS, but native protein levels decreased. This suggests that in DDLPS, an unknown mechanism may promote SIAH2 protein modification and inhibit adipogenic differentiation. Future studies will seek to identify this mechanism: a potential therapeutic target.

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**Fig. 1 | Results suggest that an unknown mechanism, in DDLPS, modifies native SIAH2 protein levels. A)** DDLPS (n=3) and ASC (n=10) cell lines exhibited no significant difference in 36-hour percent growth rates. **B)** DDLPS and ASC lines exhibited no significant change in adipogenic differentiation. **C)** DDLPS lines Lipo815 and LPS863 exhibited significantly increased post-differentiation mRNA levels. Abdominal-derived ASCs showed no significant changes. **D)** Semi-quantitative analysis of the Western blot in **E** shows that DDLPS lines Lipo815 and LPS224 exhibited significantly decreased post-differentiation SIAH2 protein levels (4.5-fold and 19.9-fold respectively); abdominal-derived ASCs showed a 3.4-fold increase. **E)** The Western blot suggests that levels of native SIAH2 protein decrease in DDLPS line Lipo815 after differentiation, but overall SIAH2 protein levels decrease in DDLPS line LPS224. After differentiation, an approximately 90 kD band is seen in the Lipo815 lane with a decrease in the 35 kD band's intensity; the LPS224 lane only shows a decrease in the 35 kD band's intensity. WDLPS exhibits a 90 kD band post-differentiation with a decrease in its 35 kD band density as well. Error bars in **A** & **B** represent mean  $\pm$  s.e.m. of biological replicates. Error bars in **C** represent mean  $\pm$  s.e.m. of technical replicates. Statistical analyses in **A-C** were performed using unpaired t-tests. Semi-quantitative analysis in **D** was performed with algorithmic analysis. \*\*p  $\leq$  0.01, \*\*\*p  $\leq$  0.001

### PROGNOSTIC FACTORS OF MORTALITY IN VIBRIO VULNIFICUS SEPSIS AND SOFT TISSUE INFECTIONS: META-ANALYSIS

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**Background:** *Vibrio vulnificus* (*V. vulnificus*) is a rare life-threatening infection, which affects the population near warm coastal areas. This infection could be fulminant and rapidly progress to severe sepsis and necrotizing soft tissue infection. Early diagnosis and treatment are critical to save patients' lives.

**Objective:** The aim of our meta-analysis is to assess the prognostic factors and treatment modalities of *Vibrio vulnificus* infection.

**Methods:** In accordance with PRISMA guidelines, a systematic search of PubMed, Embase and Cochrane library databases by two independent reviewers, studies evaluating prognostic factors and treatment outcomes of *Vibrio vulnificus* infections were included and Comprehensive Meta-analysis version 3.0 was used.

**Results:** Two hundred and eleven studies were identified. Of those, eight studies were included. Our meta-analysis revealed having any of the following factors on presentation were significantly associated with higher mortality rates; concomitant liver disease (OR: 4.12, 95% CI: 2.30 to 7.41,  $P = 0.000$ ), renal disease (OR: 3.90, 95% CI: 1.73 to 11.12,  $P = 0.011$ ), Septic shock (OR: 2.82, 95% CI: 1.84 to 4.31,  $P = 0.000$ ), higher APACHE II score (OR: 3.40, 95% CI: 2.26 to 5.12,  $P = 0.000$ ), elevated band cells count (OR: 2.61, 95% CI: 1.13 to 6.0,  $P = 0.024$ ), hypoalbuminemia (OR: 3.41, 95% CI: 1.58 to 7.35,  $P = 0.002$ ), and infection involving multiple limbs (OR: 4.36, 95% CI: 1.72 to 11.07,  $P = 0.002$ ). Interestingly, different antibiotic regimens did not have any significant impact on outcomes, however, delayed surgical intervention after the first 12 or 24 hours was significantly associated with higher mortality rates (OR: 2.64, 95% CI: 1.39 to 5.05,  $P = 0.003$ ) and (OR: 2.99, 95% CI: 0.84 to 4.52,  $P = 0.001$ ), respectively.

**Conclusion:** *Vibrio vulnificus* is a fatal infection, having the following factors; liver or renal disease, higher APACHE II scores, septic shock, hypoalbuminemia, or elevated band cell on presentation, should alert the physician to the higher risk of mortality and urgent surgical intervention should be considered.