POSTER #1A

LUMBAR HERNIA: LAPAROSCOPIC REPAIR WITH DERMAL AUTOLOGOUS NON-EPITHELIALIZED GRAFT (DANG) RE-ENFORCEMENT. A CASE SERIES.

Hymel AE, Lavie J, Cook M

Background

Lumbar hernias account for approximately 1.5% of all hernias. Due to the rarity of this clinical entity and the unique challenges of repair due to location and surrounding anatomy, it is not surprising that there is not a consensus on the optimal surgical approach or technique in repairing these hernias. The most common method of repair is via trans-abdominal approach with prosthetic mesh reinforcement either as underlay or preperitoneal. But mesh repairs have been associated with more pain, and complications such as mesh infection can be costly and require extended hospital care and procedures to correct. Biologics are a second option but are costly from the start, and disappear over time, leading to late recurrence. At our institution was have begun utilizing a new method for hernia repair. Dermal autologous non-epithelialized grafts (DANG) created from full-thickness skin graft from the patient are cheap, incorporate quickly, and we believe will be durable and cause less pain due to less inflammation.

Objectives

The aim of this study is to present a case series of the management of three lumbar hernias via laparoscopic repair with dermal autologous non-epithelialized graft (DANG) re-enforcement as a viable alternative to mesh repair.

Methods

Cases were identified and data was collected from a single academic institution in New Orleans, LA in 2018. Three cases of lumbar hernia were identified- all from traumatic etiology. The diagnosis was confirmed pre-operatively on CT scan.

Results

All three cases were repaired laparoscopically via a trans-abdominal approach. The hernia defects were closed primarily with trans-fascial sutures and the closure was re-enforced with a dermal autologous non-epithelialized graft obtained from full-thickness skin graft from each patient. Donor site was from the groin skin fold in all three patients. At follow-up no recurrences have been identified and no complications detected.

Conclusion

Laparoscopic repair of lumbar hernias with DANG underlay re-enforcement provides a unique alternative to prosthetic mesh hernia repairs with equivalent early outcomes.

POSTER #1B

PREVENTION OF INCISIONAL HERNIA WITH CUTIS AUTOGRAFT AUGMENTATION

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Background

The U.S. healthcare system repairs 400,000 incisional hernias (IH) per year. Currently mesh is the mainstay of IH repair, however, this option is still unsatisfactory due to the inherent risks of pain, infection and mesh extrusion. Biologic grafts have lower rates of removal (4.9%), but the cost is significant with a 150cm2 prosthesis priced at $2,845 - $5311. Additionally, in contaminated cases, recurrence is 23% when repaired with mesh. Studies suggest the use of cutis autografts as a cost-effective option that may have less associated pain, decrease recurrence and graft removal rates.

Objectives

To test the effectiveness of cutis autografts we performed a double-blinded, prospective randomized control trial using a validated rat model.

Methods

400 gram, male Sprague-Dawley rats were randomized into 2 groups: no treatment control group (N=17) and cutis autograft experimental group (N=10). Using a validated rat hernia model, midline incisions were made and no treatment vs a dermal excision and cutis autograft underlay intervention was applied. The abdomen was then closed by a second blinded surgeon.
The primary endpoint was IH formation measured on post-operative day (POD) 28 by surgeons blinded to group assignment. Secondary endpoints included: fascia tensile strength, serum inflammatory markers, tissue inflammatory marker expression and collagen I/III ratio.

Results

The cutis autograft significantly reduced IH formation (10% [1/10] vs. 82.4% [14/17] control; $p<0.00$). Secondary endpoints, including tensile strength showed no difference (1.155 N/mm2 cutis vs 1.219 N/mm2 control; $p=0.37$). Serum CRP & IL-6, as well as tissue IL-6, MMP11 and 13 showed no difference. Collagen I/III ratio trended higher in cutis autograft group but again was not significant.

Conclusion

Cutis autograft underlay augmentation of facial closure reduced IH formation rates in a double-blinded animal RCT. These results establish the preclinical basis for studies in human subjects.

POSTER #1C

TOTALLY LAPAROSCOPIC DISTAL ESOPHAGECTOMY WITH NO CERVICAL OR THORACIC INCISION

Erik A. Green, Kais Rona, Christopher DuCoin

Background

Esophagectomy remains a mainstay of treatment for esophageal malignancies as well as for refractory benign disease. Advances in laparoscopic and thoracosopic surgery have helped promote a variety of minimally invasive esophageal resection procedures. All of these, however, require a thoracic and/or neck incision.

Objectives

Here we describe a case series of patients treated with a totally laparoscopic esophagectomy technique.

Methods

A retrospective review of patients who underwent totally laparoscopic esophagectomy from April 2016 to April 2018 was conducted. Inclusion criteria comprised of benign stricture less than 5cm from the GE junction, adenocarcinoma Siewart classification II-III, and those with T1-T3 disease no evidence of nodal or metastatic disease.

Our standard approach consisted of four surgical ports placed in the upper abdomen. Intra-abdominal and mediastinal dissection was performed laparoscopically. Anastamosis in all 5 cases was achieved with an EEA stapler with the anvil passed trans-orally. Esophagoscopy was used as an adjunct, and a jejunal feeding tube was placed in all cases.

Results

Five patients underwent a totally laparoscopic distal esophagectomy procedure. Median age was 65 years (44-77 years) and the male to female ratio was 2:3. The indication for resection in 3 patients was benign distal stricture, refractory to more conservative treatments. Adenocarcinoma of the distal esophagus was the indication in the other 2 patients. In the 2 adenocarcinoma cases neoadjuvant chemoradiation was given, the initial staging was T2/3N0M0, and both were Siewert type II.

No cases required conversion to an open procedure. The mean operative time was 289 minutes (234-322 min). There was no 30-day mortality. Mean ICU stay was 12.8 days (2-32 days) and mean hospital stay 15.6 days (7-32 days). 3 of 5 patients had an uneventful post-operative course. 2 of 5 patients, including one case of benign stricture and one case of adenocarcinoma, experienced post-operative complications. One patient had respiratory failure with reintubation, and the other a contained leak, both necessitated a prolonged ICU stay. Neither of the two patients required reoperation or revision. R0 resection was achieved in both cases of adenocarcinoma.

Conclusion

We present a case series of 5 patients who underwent a totally laparoscopic transhiatal distal esophagectomy. Our preliminary results suggest it may be a safe alternative for distal benign strictures as well as for select patients with adenocarcinoma of the distal esophagus. Continued refinement of this technique may help decrease the morbidity and mortality of esophagectomy by avoiding a thoracic or neck incision.

POSTER #1D

WEIGHT LOSS AND INTERNAL HERNIA DEVELOPMENT IN ROUX-EN-Y GASTRIC BYPASS PATIENTS

Jessica Koller-Gorham

Background

Laparoscopic Roux-en-Y gastric bypass (LRYGB) continues to be a durable operation for weight loss. Despite its efficacy in weight loss and reducing patients' co-morbid illnesses, internal hernias (IH) remain to be a well-known complication often requiring operative intervention. Identifying patients who are high risk for the development of IH is important for reducing re-operation rates and associated morbidity.

Objectives

We hypothesized that the incidence of IH following LRYGB in patient was higher in patients with greater total body weight loss.

Methods

This was a retrospective study of all LRYGB patients at our institution between 2004-2017. Demographics, clinical characteristics, and operative data were reviewed. Descriptive statistics were performed to characterize the patient population. Logistic regression analysis was used to determine the adjusted odds ratio for increased weight loss and the incidence of internal hernia.

Results

1,055 LRYGB procedures were performed at our institution in this time frame and 967 were included in the study. IH occurred in 3.7% of patients (n=36). There were no statistically significant differences in the baseline characteristics of the patient population. Peterson's defect was closed in significantly fewer IH patients (28.6% of no IH compared to 8.45% of IH, $p=0.007$). Patients who presented with IH lost significantly more of their total body weight (86.7%) than those who did not (36.6%, $p<0.0001$). A multivariate logistic regression identified Peterson's closure as a predictive factor for IH in addition to increased total body weight loss. Patients who lost more than 40% TBWL had a 17.8-fold greater risk of developing an IH than those who had ≤20% TBWL ($p=0.031$).

Conclusion

This large single-center study showed that IH tends to occur with greater frequency in patients who have lost more weight. Knowing that greater weight loss is associated with IH, we can better identify those patients at risk of this well-known complication.

POSTER #2A

FIVE YEAR REVIEW OF POST LEFT VENTRICULAR ASSIST DEVICE (LVAD) IN RELATION TO BODY MASS INDEX (BMI)

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Background

Assumption in the medical community is that patients with a higher BMI are at an increased risk for complications post device implantation. Purpose of this study was to analyze outcomes by grouping patients using BMI at a large quaternary care center.

Objectives

To investigate the relationship of BMI and post operative outcomes in patients with left ventricular assist devices.

Methods

Retrospective review of data was done utilizing INTERMACS registry, and the implanting institution's EMR after obtaining IRB approval from October 2010- September 2016. Data abstraction was limited to implantation of primary LVAD patients greater than 18 years of age and who completed 12 month follow up. A total of 182 primary implants where included for this study. Patients were grouped according their pre-operative BMI into six categories: underweight (< 18.5); normal weight (BMI 18.5 to 24.9); overweight (BMI 25.0 to 29.9); obese – Class 1 (BMI 30 to 34.9); obese – Class 2 (BMI 35 to 39.9); and severe obesity – Class 3 (40 ≤ BMI).

Results

Normal weight patient (n=51) experienced the highest percentage of mortality of 27% (at 12 mths) and neurological events of 22%. Overweight patient (n=67) had the highest percentage of driveline infections 12%. Obese-class 2 patients (n=15) did have the highest percentage of device malfunction 40%. In our study none of these findings achieved statistical significance ($p<0.05$). Patients across all BMI had a weight increase of 10 to 22% by the 12-month follow-up post implantation.

Conclusion

Common myth in the medical community about obesity is not validated from our experience. However interesting findings from our study reveal that there is a trend for increased device malfunction in obese individuals and also all group of patient's experienced weight gain after implantation. The drawbacks of this study include, retrospective nature, single center and low volumes in underweight and severe obesity group. Multi institutional studies are needed to address this important issue in the VAD community.

POSTER #2B

INCIDENCE OF RIGHT VENTRICULAR FAILURE: A SINGLE CENTER EXPERIENCE

Danielle Jacks, MD; Patrick Parrino, MD; Aditya Bansal, MD

Background

In patients who have progression of heart failure despite optimal medical therapy, implantation of a mechanical circulatory support device can support cardiac function either as a bridge to transplant or a destination therapy. Our study compares the incidence of right heart failure following implantation of the Heartware HVAD, a newer LVAD design which is a small intrapericardial centrifugal flow device, as compared to the HeartMate II, a mechanical-bearing continuous-flow pump.

Objectives

The aim of this study was to compare the difference in the incidence of right heart failure following implantation of HeartMate II versus Heartware HVAD

Methods

From January 2011 to December 2013, 87 patients with chronic heart failure were implanted with a continuous LVAD (77 patients received a HeartMate II, 14 patients received Heartware HVAD, 6 patients received BIVAD/TAH). For the purpose of this study we excluded BIVAD/TAH patients and patients in INTERMACS profile 1. A total of 13 patients where in profile 1, of which 9 received Heartmate II while the remaining 4 received BIVAD support. Patient's demographic, medical history, baseline hemodynamic and follow-up data were retrospectively reviewed. Incidence and risk of RV failure post- implantation was defined as the need for inotropic support after 14 days of LVAD implantation or temporary RVAD insertion.

Results

Patients implanted with a HeartMate II and HVAD were similar in terms of demographic, medical history, lab values, and hemodynamic parameters. There is a trend of higher proportion of males receiving a HeartMate II but the difference was not statistically significant. After LVAD implantation, the incidence of RV failure was 5/68 (7%) in patients with a HeartMate II and 6/14 (43%) in patients implanted with an HVAD. This difference was statistically significant (p-value <0.0001). The difference remained statistically significant after adjusting for gender. At mean follow up of 12 months, the survival was 59/68 (87%) for the HeartMate II and 8/14 (57%) for the HVAD patients.

Conclusion

These results suggest that at our center the HVAD is associated with a higher incidence of post-operative RV failure. These observations are based on retrospective data analysis collected from small number of patients. Further prospective studies are warranted to confirm these findings and understand the cause of this difference in the incidence of RV failure between the HeartMate II and Heartware HVAD pumps.

POSTER #2C

INTEGRATED TEAM APPROACH IMPROVES ECMO OUTCOMES

Danielle Jacks, MD; Eugene Parrino, MD; Vincent Adolph, MD; Aditya Bansal, MD

Background

Extracorporeal Membrane Oxygenation (ECMO) is a therapeutic option increasingly used in the management of patients with cardiorespiratory failure that is refractory to maximal conventional treatment. This support may facilitate therapeutic intervention, bridge to recovery, bridge to a long-term support device, heart or lung transplantation, or bridge to palliation.

Objectives

The aim of this study was to compare the rate of patients successfully weaned from ECMO when a multidisciplinary team approach is used for the selection process and development of protocols.

Methods

We reviewed single institution data (Ochsner Main Campus) for adult patients treated with ECMO (VA or VA ECMO) from 1995 to 2015 with data obtained from the ELSO registry.

Results

In total, 43 patients were placed on veno-arterial or veno-veno ECMO from 1995 to 2015. From 1995-2012, 1/14 (0.07%) of patients were successfully weaned from ECMO. In 2013, 4/10 (40%) of patients were successfully weaned from ECMO. In 2014, 2/8 (33.33%) of patients were successfully weaned. In 2015, 8/11 (72.73%) of patients were successfully weaned.

Conclusion

Initially, due to lack of any integrated approach, missing clinical practice guidelines, and lack of point person poorer outcomes were seen. However, with a multidisciplinary selection process, proper patient selection, and adherence to protocols, improvement in survival was seen. Even with low annual volume of ECMO patients, an integrated team approach under a central leadership can lead to better utilization of services with improved patient outcomes.

POSTER #2D

IS PRE-OPERATIVE COLONOSCOPY SCREENING FOR LVAD THERAPY NEEDED FOR HIGHER INTERMACS PROFILE PATIENTS IN THE CURRENT ERA?

Danielle Jacks, MD; Krista Marz RN, CCRN; Nathan Zwintscher, MD; Sapna Desai, MD; Aditya Bansal, MD,

Background

Pre-operative colonoscopy screening is used to exclude the presence of large intestinal lesions that could possibly complicate anticoagulation after implantation of a left ventricular assist device (LVAD). Colonic preparation needed for colonoscopy can be challenging and unattainable in patients with higher INTERMACS profile due to hemodynamic instability or presence of temporary mechanical support devices. The medical community continues to hesitate in proceeding with LVAD therapy without getting a negative colonic evaluation.

Objectives

The aim of this study was to evaluate safety of LVAD therapy without a pre-operative colonoscopy in higher INTERMACS profile (Profile 1 and 2) patients.

Methods

187 patients underwent an LVAD implantation between January 2014 to April 2017. Inclusion criteria for study included: Inability to meet American College of Gastroenterology (ACOG) guidelines for colonoscopy to rule out colorectal malignancy prior to LVAD implantation. All patients had a recent (< 3 months) abdominal CT scan performed prior to an implant. 123 patients met the ACOG criteria for need of colonoscopy. Of these, 14 patients met the inclusion criteria.

Results

14 patients were extremely sick (INTERMACS Profile 1 and 2) and could not have or did not have a prior pre-operative colonoscopy. 92.86% were male (13/14) and 57.14 %(8/14) were African Americans. Average age was 58.92 years (50-68 years). All 14 patients were tolerating anticoagulation post implant and underwent colonoscopy at 3 months after LVAD implantation. At the time of colonoscopy no concerning lesions for malignancy were identified. This finding correlated with absence of any colonic lesions on pre-operative CT scans. Of the 109 patients who had colonoscopy prior to LVAD implant also did not have any identifiable colonic lesions.

Conclusion

High resolution CT scan can screen pre-operatively intra colonic pathology with significant reliability. Pre-operative colonoscopic evaluation in higher INTERMACS profile (1 and 2) patients should not be mandatory. Patients can safely proceed to receive a destination LVAD and can complete colonic evaluation at time of listing for heart transplant.

POSTER #3A

TREATMENT OF ERYTHROMELALGIA AND FROSTBITE: A CASE REPORT

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Introduction/Objective

Erythromelalgia is an exceedingly rare disorder, with less that 30 primary cases reported in the United States. Individuals present with burning, erythema, and severe pain to the extremities. The lower extremities are most commonly affected with cases of severe wounds and even amputation. The disease presents either as a primary disorder or secondary with an associated myeloproliferative disorder.

Case Presentation

Patient JK is a 17-year-old male who had been suffering from primary erythromelalgia for greater than ten years. He had been treated by multiple medical professionals with a variety of medications resulting in limited relief of symptoms. Ultimately his only source of control for the burning pain was to soak his feet in ice water for up to eighteen hours daily. This caused him to develop frostbite which became a necrotizing soft tissue infection complicated by severe chronic pain, deconditioning and impaired mobility, 60-pound weight loss, and psychosocial disorders.

Discussion

Patient JK was treated using the burn center's multidisciplinary approach with experts from burn care, dermatology, acute pain, chronic pain, physiatry, plastic surgery, and therapy. He underwent excision of the infected tissue and placement of allograft. Initially his pain was not well controlled despite a multimodal pain regimen with 10 different agents including ketamine infusions, so the patient cooled his feet resulting in a mycotic infection. This required revision excision and negative pressure wound therapy with intermittent instillations of amphotericin and mafenide acetate and subsequently had a 1:1 split-thickness autograft. The remarkable part of his care was the resolution of his erythema, all manifestations of pain, and any evidence of erythromelalgia following epidural placement and transition to methadone and medications that altered the sodium channels. At the time of discharge, he was ambulating over 350 feet, able to complete self-care with minimal assist, 100% graft take, and pain scores <3.

Conclusion

While source control of a necrotizing soft tissue infection is a well understood principle, this case demonstrates two further points which may be applied to similarly complex patients in the future. First, patients with erythromelalgia have challenging wounds frequently managed with amputation, referral to vascular surgery, or chronic wound care centers when disease management might best be served holistically at a burn center. Secondly, placement of an epidural catheter resulted in complete resolution of symptoms and possible remission of a disease with cutaneous manifestations. The use of a long-term epidural with an implantable pain pump or spinal cord stimulator may serve as a viable means to control the disease process and pain associated with erythromelalgia.

POSTER #3B

AN ANALYSIS OF THE CURRENT EDUCATIONAL COURSES OFFERED TO VASCULAR TRAINEES

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Background
While there is increasing evidence that short educational courses provide a valuable supplement to vascular surgical training, there is little data regarding the prevalence, content, and educational goals of these programs.

Objectives
Our objective was to catalog the available extra-residency experiences available to vascular trainees in North America.

Methods
All educational programs offered to vascular trainees and conducted between 2014 and 2018 were identified and categorized in conjunction with the respective course directors. Data obtained included timing and location of course, number of trainees, number of applicants, target audience, course objectives, and educational tools. Programs where the curriculum and content were solely provided by industry were excluded.

Results
Twenty-eight programs were identified and all participated in the project. Most of the courses provided medical didactics (86%, 24/28), with the most common exceptions being mock oral programs. Endovascular simulation training was provided in 61% (17/28) of the programs, with 43% (12/28) also offering open simulation. Cadaver training was included in 29% (8/28) of courses. The total number of trainees participating annually increased from 777 in 2014 to 1169 in 2018. This followed an increase in interest from 868 applicants in 2014 to 1472 in 2018. Using United States Census definitions, there are more fixed location programs in the South (8) than Northeast (4), Midwest (3) or West (4). The South annually holds more courses featuring cadaver dissection (5) than all other regions combined (3). Programs had low faculty to trainee ratios with a median of 1 to 3 and a maximum of 1 to 10. While the majority of courses had specific target attendees (86%, 24/28), few were targeted specifically to mid/junior residents PGY 3 or less (25%, 7/28). Only 14% (4/28) of the programs provided formative feedback to the attendees' program director.

Conclusion
Between 2014 and 2018, there has been an increase in interest and participation in vascular surgery educational courses. While further research is needed on the cost-effectiveness and outcomes of these programs, there seems to be deficiency of junior level specific educational opportunities and of programs that provide formative feedback. Additionally, since the majority of high fidelity open training opportunities are in the South, some regionalization may be appropriate.

POSTER #3C

EFFICACY OF ULTRASOUND ELASTOGRAPHY IN PREDICTING THE SUCCESS RATE OF ETHANOL ABLATION OF NON-MALIGNANT THYROID NODULES

M Abdelgawad, H Shalaby, Y Rashad, E Kandil

Background:

Percutaneous Ethanol ablation (PEA) has been utilized as a modality to treat some thyroid nodules, especially in patients who are not good surgical candidates.

There is a scarcity of studies that evaluate factors associated with successful outcomes of this modality in North America.

We hypothesize that ultrasound (U/S) elastography can predict successful outcomes in PEA for non-malignant thyroid nodules.

Materials and Methods:

This is a retrospective cohort study of all consecutive patients with thyroid nodules undergoing PEA by a single surgeon in North American academic institute. Demographics, (U/S) elastography, peri- and post-interventional compressive symptoms, thyroid nodules characteristics, FNA findings, thyroid function, and complications were studied. A subgroup analysis was performed on non-malignant thyroid nodule.

Results:

A total of 22 patients with 34 thyroid nodules were enrolled in this study (mean [SD] age, 66.18 [11.45] years; 19 female [86.36%]). 21 out of 34 nodules (61.76%) of the thyroid nodules were non-malignant.

According to (U/S) elastography, baseline thyroid nodules were classified into stiff (19.04%), mixed (52.38%), and soft (28.57%). There were a significant volume reduction rates (VRRs) for stiff thyroid nodules at 6 months (47.82 % ± 19.27, p=0.0157).

Volume reduction rate (VRRs) was also more significant in cystic nodules (89.14 ± 5.69, P=0.0014). At 6 months, 36.84% of the thyroid nodules exhibited a VRR>70% (84.09 % ± 9.97, p <0.0001). We found out that the TSH was not affected by PEA. Compressive symptoms resolved in all 3 patients who reported it. Post-procedural complications were absent in all the patients.

Conclusion

Elastography has proven to be a useful tool in predicting the success rate of PEA for non-malignant thyroid nodules. VRR was significant in stiff nodules (Vs. soft nodules) and in cystic nodules.

Ethanol Ablation is both safe and effective in terms of nodule volume reduction rate, relief of compressive symptoms. It is proven to be an alternative to surgical resection.

POSTER #3D

OPERATIVE PARATHYROIDECTOMY ON NORMO-HORMONAL VS. CLASSIC PRIMARY HYPERPARATHYROIDISM

M Abdelgawad, H Shalaby, E Alameer, S Al Awwad, Y Rashad, E Kandil

Background
Primary hyperparathyroidism (PTH) is very variable disease ranging from asymptomatic to complicated, life-threatening conditions. Classically diagnosed with elevated PTH and Ca levels. Another nonclassical disease can show up with high Ca level in spite of normal or upper normal PTH.

Objectives
To review our surgical experience in parathyroidectomy and to assess its cure rate in the normo-hormonal primary hyperparathyroidism (NHPHPT) vs. classic primary hyperparathyroidism (CPHPT).

Methods
This is a retrospective cohort study of patients with (PHPT) undergoing parathyroidectomy between January 2014 and February 2018 by a single surgeon. Patients with (NHPHPT) are compared to patients with (CPHPT). The two groups were analyzed in the matter of demographics, imaging studies, intraoperative parathyroid hormone (IOPTH) and the outcome of the patients.

Results
Out of 277 patients who underwent parathyroidectomy, 128 patients met our study criteria (PHPT); 24 had (NHPHPT), and 104 had (CPHPT). Negative sestamibi scans were seen more in the normo-hormonal vs. classic group, (77.78 vs. 47.92 % P50% drop in the (IOPTH) vs. the 103(99.04%) among the 104 (CPHPT) patients. The cure rate in the normo-hormonal vs. classic groups was (87.5% vs. 96.15%, p

Conclusion
Operative parathyroidectomy on patients with (NHPHPT) showed almost equivalent success as the (CPHPT). Cure rates are similar to classic PHPT when pre-operative PTH is above 56 pg/ml.

POSTER #4A

VENTILATOR ASSOCIATED PNEUMONIA: HOW DO THE DIFFERENT CRITERIA FOR DIAGNOSIS MATCH UP?

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Background

Ventilator associated pneumonia (VAP) is the most common nosocomial infection in the ICU. It occurs more than 48 hours following endotracheal intubation or tracheostomy and affects up to 30% of these patients. It has been associated with increased ICU and hospital stay and morbidity and mortality. VAP that occurs early following intubation has been shown to have better outcomes as it less often involves organisms resistant to treatment.

Objectives

We identified factors associated with prolonged latency of VAP and evaluated the effects of those same factors on survival, number of days on the ventilator, overall length of stay, and length of ICU stay. We also determined the sensitivity of various clinical definitions of VAP, including the new CDC 2013 criteria, for predicting our confirmed cases. We hypothesized that the CDC 2013 criteria would be too restrictive.

Methods

We collected data on 102 subjects who developed VAP between 2012-2017. We conducted a Kaplan-Meier survival analysis with Cox proportional hazards regression stratified by each of the dichotomous and categorical variables. Then we ran generalized linear models/ANOVA to look at predictors of time to event for VAP, total vent days, total hospital length of stay, and length of ICU stay. Finally, we ran multivariate models for each outcome adjusting for variables identified as significant in the unadjusted models. We determined which cases met various clinical criteria for VAP including CPIS +/- BAL, ACCP, TQIP, CDC 2002, and CDC 2013 criteria.

Results

In multivariate model, COPD and cancer were significantly positively associated with time to VAP. White patients, nonsurgical patients, patients with renal failure, altered mental status, increased fi02, and increased peep had significantly worse overall survival. Trauma patients, patients with positive sputum cultures, and patients with suspected pneumonia had significantly better survival. CHF, positive sputum cultures, positive blood cultures, and time to VAP were significantly positively associated with vent days. Positive sputum cultures and time to VAP were significantly positively associated with length of ICU stay. Sensitivities of CPIS +/-BAL, ACCP, TQIP, CDC 2002, and CDC 2013 criteria for correctly detecting VAP in our study subjects were 0.98, 94.1, 74.5, 95.1, and 44.1 percent respectively.

Conclusion

Many ICUs have protocols in place for primary prevention of VAP that include screening with daily chest x-rays, antibiotic prophylaxis, and judicious sputum culture, although much remains to be learned about the effects of these programs on survival. Our results confirm that early diagnosis of VAP in patients with few medical comorbidities results in better outcomes. This further emphasizes the importance of having a high index of suspicion for VAP in ventilator-dependent patients. In our study subjects, only ACCP, TQIP, and CDC 2002 criteria were able to detect a majority of VAP cases. The 2013 CDC criteria failed to detect 55.9 percent of confirmed VAP cases. These results are concerning, as undetected VAP can have devastating consequences for patients.

POSTER #4B

ASSOCIATION OF CENTERS FOR MEDICARE & MEDICAID SERVICES HOSPITAL STAR RATINGS WITH OUTCOMES IN GENERAL TRAUMA: INSIGHTS INTO PATIENT CHARACTERISTICS, LENGTH OF STAY, HEALTHCARE UTILIZATION AND OUTCOMES

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Background

The Centers for Medicare and Medicaid Services (CMS) Hospital Compare Star Ratings has emerged as a notable public-reporting system to gauge hospital quality. In addition to objective adverse events [mortality, readmissions], these ratings consider subjective patient-reported measures such as patient experience, effectiveness and timeliness of care, hospital cleanliness. As proposed reforms, the Medicare Access and CHIP Reauthorization Act, advocate integration of subjective measures into future reimbursement models, assessment of these measures on general trauma outcomes are pertinent.

Objective

To investigate the association of subjective CMS hospital star-ratings with objective outcomes in patients with general trauma.

Methods

The Nationwide Inpatient Sample 2009-2011 was queried for adult patients that incurred emergent hospitalization for general trauma using appropriate ICD-9 codes (800-959). The cohort was merged with data from "Hospital Compare," that rates hospitals (1 to 5 stars) based upon a mix of subjective-objective measures. Primary endpoints were mortality, discharge disposition, length of stay (LOS), hospital charges, and complications. Hospitals were labeled as a high-star hospital (HSH) [ratings≥4] or low-star hospital (LSH) [overall star-rating 1-3] based upon 75th percentile cutoffs. Multivariable logistic and ordinary least-square models investigated the association of HSH with primary endpoints.

Results

Overall, 729,921 patients incurred emergent hospitalization for trauma. across 970 hospitals. Of these, 35.9% (n=262,082) were hospitalized at HSHs (n=373; mean star-rating: 4.34 ± 0.47) whereas remainder 64.1% patients (64.1%) at LSHs (mean star-rating:2.16 ± 0.78). Compared to HSHs, LSHs had higher proportion of Medicaid patients (11.1% vs 7.7%; p<0.001) and uninsured (8.1% vs 6.2%; p<0.001), African-Americans (10.5% vs 6.9%; p<0.001) and Hispanics (3.9% vs 2.6%; p<0.001) and those at lowest income quartiles (25.5% vs 16.4%;p<0.001). On the contrary, patients at HSHs were largely whites (81.5% vs 72.8%;p<0.001) and privately insured (24.7% vs 20.8%; p<0.001). However, patients at HSHs were relatively older (65 vs 62) and had higher comorbidity. (modified Charlson Comorbidity score: 1.77 vs 1.74; p<0.001).

Regression models noted an association of HSHs with shorter hospital stay (-0.49 days; p<0.001), charges (-$5,779;p<0.001) and mortality (OR: 0.97;p=0.061). However, trauma patients admitted at HSHs were associated with higher risk of being discharged to rehabilitation (OR: 1.05; p<0.001), developing acute renal failure (OR:1.08;p<0.001), infections (OR: 1.06; p=0.01). No differences were observed in terms of CMS defined "never events" such as venous thromboembolic episodes

(OR:0.97; p=0.079), wound complications(OR: 0.99; p=0.641), adverse cardiac events (OR: 1.02; p=0.555), gastrointestinal(OR:1.02; p=0.606) or respiratory complications (OR:0.97; p=0.303).

Conclusion

This study demonstrates an association between high-star hospital rating and LOS and charges in general trauma patients. However, outcomes such as discharge disposition, mortality, and complications at LSHs are not inferior compared to HSHs. As CMS star-ratings are based upon generic overall hospital profiling and do not segregate individual specialties, patients and policy-makers should weigh upon such limitations prior to selecting trauma care and reimbursements, respectively.

POSTER #4C

DAMAGE CONTROL LAPAROTOMY IN PATIENTS OF ADVANCED AGE: HOW DO PATIENTS IN THEIR GOLDEN YEARS COMPARE IN THE GOLDEN HOURS OF TRAUMA?

Alison Smith, MD, PhD; Rebecca Schroll, MD; Patrick McGrew, MD; Chrissy Guidry, DO; Clifton McGinness, MD; Juan Duchesne, MD

Background

Damage Control Laparotomy (DCL) is an integral component in the immediate management of critically ill trauma patients to control hemorrhage and intra-abdominal contamination. Elderly patients have less physiologic reserve and an altered response to traumatic injuries when compared to younger patients. As the population in the United States continues to age, the number of DCLs in elderly patients is likely to rise. There is a paucity of literature on outcomes for older patients managed with DCL.

Objectives

The objective of this study was to provide evidence for outcomes in older population who received DCL for trauma.

Methods

A retrospective chart review of consecutive adult patients with DCL for abdominal trauma at a Level I trauma center was conducted from 2012-2017. The patients were stratified into two groups, advanced age (AA) for patients 40 years and older and younger age (YA) for patients less than 40 years of age.

Results

A total of 149 patients with DCLs were identified with an average age of 34.0 (range, 19-81 years). In regards to patient demographics, there was no difference in ISS ($p=0.16$), mechanism ($p=0.44$), and initial INR ($p=1.0$). The AA group did, however, have significantly lower ED SBP ($p=0.01$) and significantly higher initial fibrinogen ($p<0.0001$). When analyzing outcomes and interventions, AA patients received MTP more frequently ($p=0.03$). There was a trend toward increased mortality in the AA group (23% vs 11%) when compared to YA group, though this did not reach significance ($p=0.08$). Of significance, the AA group had an overall shorter time to mortality (4.5+0.4 vs 8.9+1.2 days, $p=0.02$).

Conclusion

With an aging population, it is likely that the number of DCLs in older patients will increase. AA patients managed with DCL had decreased initial ED SBP with more utilization of MTP resources and overall shorter time to mortality. Future research should emphasize strategies that will develop optimal management and resource utilization of older trauma patients.

POSTER #4D

IS THE "DEATH TRIAD" A CASUALTY OF MODERN DAMAGE CONTROL RESUSCITATION?

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Background

Classic trauma surgery principles focus on the "death triad" of hypothermia, acidosis, and coagulopathy as a significant cause of trauma-related mortality. However, the validity of the death triad has been questioned in the modern era of Damage Control Laparotomy (DCL) in combination with Damage Control Resuscition (DCR).

Objectives

The aim of this study was to evaluate if the death triad carries the same prognosis with the advent of current resuscitative trauma practices.

Methods

A five-year retrospective chart review of all consecutive adult trauma patients presenting to a level I trauma center who underwent DCL was conducted. Parameters associated with the death triad were evaluated (temperature, lactic acidosis (LA), pH, base deficit (BD), INR, and fibrinogen levels) on admission, at 24 hours, and at 48 hours after presentation. Kaplan Meier survival plots were made for the individual components of the death triad. Univariate analysis was performed using a Student's t-test. A multivariate linear regression was performed to assess factors independently associated with death.

Results

of the death triad in the first 48 hours had a mortality of 9.3% (4/43), 25.8% mortality (8/31) if two components were present, and 36.7% (11/30) if all three components were present. Cox proportional hazard model showed no increased risk of death when all three components of the death triad were present (HR 0.29, 95% CI 0.12-0.74, p=0.009). Lactic acid was the only variable found in multivariate analysis to be significantly associated with mortality (OR 1.3, 95% CI 1.1-1.4, p=0.002).

Conclusion

This study demonstrated that mortality of trauma patients increases with additional components of the death triad. However, even a complete death triad was only able to predict death 36.7% of the time in patients treated with DCL and DCR, which is lower than expected and previously cited in the trauma literature. Results suggest that the death triad might not be as applicable in the modern era of DCL, DCR, and MTP.

POSTER #5A

MEDIAL STUDENTS AS "STOP THE BLEED" INSTRUCTORS

T Zeoli, A Smith, M Martin, S Baker, P Greiffenstein, M Moore, P McGrew, J Duchesne, J Avegno, R Schroll

Background

Stop the Bleed (STB) program trains lay rescuers to identify and control of life-threatening bleeding. Recently, medical students were allowed to become instructors.

Objectives

The aim of this study was to assess the efficacy of medical student course participation as both learners and instructors.

Methods

Students from two US medical schools were enrolled in the course. Participants anonymously self-reported pre- and post-course confidence in 6 major skill areas using a Likert scale. At the end of the course, students' ability to perform STB skills were assessed using an internally validated 15 point objective assessment tool. A pilot group of medical students volunteered to be instructors and their ability to effectively teach the course was objectively assessed.

Results

A total of 329 medical students were evaluated. Pre-course confidence was highest in holding pressure on a wound (2.9+0.1) and lowest in identification of severe active bleeding (1.8+0.1). Post-course participant confidence increased significantly in all 5 areas as shown in Table 1., including confidence to teach skills to others. Objective assessment of medical students by STB instructors found greater than 95% skill proficiency. An assessment of 20 medical student instructors found that all students were able to proficiently serve as instructors with 80% receiving perfect scores on their teaching evaluations.

Conclusion

This study demonstrates that medical students can effectively master STB skills and can also serve as competent course instructors. Future program development should focus on continued training of medical students and their involvement as instructors to help increase the availability of STB courses.

POSTER #5B

TEG IN TRAUMA PATIENTS: EVERY MINUTE COUNTS

M Marturano, A Smith, L Hakki, C Guidry, P McGrew, C McGinness, R Schroll, J Duchesne

Background

Thromboelastography (TEG) has become an integral part of the management of trauma patients. However, optimal protocols to incorporate TEG into routine trauma protocols have not been determined. We hypothesize a correlation between early TEG use and survival in patients with severe hemorrhage.

Objectives

To identify a correlation between early TEG use and survival in patients with severe hemorrhage.

Methods

A retrospective review of consecutive adult patients who received massive transfusion protocol (MTP) at a Level I Trauma Center was performed from 4/2017-2/2018. Patient demographics, Injury Severity Score (ISS), blood product usage, and mortality were recorded. Patients were stratified into 2 groups based on length of time before TEG was ordered (TEG-L, >120 min and TEG-S

Results

A total of 91 patients were identified and 56.0% of these patients had TEG level measured. Average time for trauma surgeons to order TEG was 381.4 min with a range of 22-7226 min. There was no difference in baseline patient demographics between TEG-L and TEG-S patients. The TEG-S group had decreased ICU LOS (8.6+1.8 vs. 22.6+3.8, p=0.0031) and decreased deaths (14.2% vs 47.8%, p=0.0135).

Conclusion

This analysis demonstrated a survival benefit in severe hemorrhage patients with early use of TEG. Institutions should adopt quality measures to review proper early use of TEG in patients with severe hemorrhage. Prospective validation is needed in order to better understand this TEG time-survival correlation.

POSTER #5C

EVALUATING LITERACY OF VASCULAR TERMINOLOGY IN THE U.S. VETERAN POPULATION

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Background
Essentially no evidence is available regarding the public's knowledge of vascular disease and its treatments. Improved health literacy has been associated with increased screening, adherence with physician recommendations, compliance with medication regimens, and an improvement in overall health outcomes.

Objectives
This study aims to assess the level of vascular literacy among U.S. veterans and their significant others.

Methods
"A random cohort of veterans and their significant others were surveyed during attendance at national veteran's conferences in New Orleans, Louisiana between July and August of 2017. Significant others were only surveyed if they were meaningfully involved in the veteran's care. Volunteers were asked to complete a background demographic form and a 24 question survey with multiple-choice answers concerning their knowledge of common vascular related terminology. The terminology tested were extracted from our ten most commonly used vascular surgery consent forms. Participants were encouraged to select the answer choice "I do not know

Results
A random cohort of veterans and their significant others were surveyed during attendance at national veteran's conferences in New Orleans, Louisiana between July and August of 2017. Significant others were only surveyed if they were meaningfully involved in the veteran's care. Volunteers were asked to complete a background demographic form and a 24 question survey with multiple-choice answers concerning their knowledge of common vascular related terminology. The terminology tested were extracted from our ten most commonly used vascular surgery consent forms. Participants were encouraged to select the answer choice "I do not know," when unfamiliar with the term.

Conclusion
This study provides a reliable method for evaluating literacy of vascular terminology, as well as a future platform for improving physician-patient communication and vascular surgery outcomes in the veteran population. We found the majority of those surveyed have insufficient knowledge of vascular terms which could leave them at a higher risk of poor vascular surgery related outcomes.

POSTER #5D

THE FUNDAMENTALS OF VASCULAR SURGERY: A 6-YEAR REVIEW OF THE FIRST U. S. DEDICATED VASCULAR SIMULATION COURSE

J Kim, A Lalani, C Sheahan, T Palit, B Torrance, M Unruh, R Batson, M Sheahan,

Background
Duty hour restrictions, changing training paradigms, and diminishing open surgical case volumes have caused dramatic shifts in vascular trainees' experience over the past decade. While simulation training has been advocated as an augment to resident training, the benefits of short three to four day courses are largely unknown.

Objectives
The goal of this study was to perform a six year review of the first simulation course established for vascular trainees in the United States.

Methods
A three day vascular simulation course was conducted at a dedicated learning center each year from 2012 to 2017. Attendees rated their confidence pre and post course on a 6-point Likert scale ranging from 1 "none" to 6 "expert" across 8 different technical and cognitive categories. Participants were also asked to rate the value of each activity using a similar scale. Assessments of each trainee were completed by the course director and sent to their program director (PD). After six months, PDs and participants were surveyed on the lasting usefulness of the course.

Results
There were 153 attendees, after excluding medical students and general surgery residents, full data were available for 98 vascular trainees. Residents were categorized as Junior (PGY1-2, n=59) or Senior (PGY ≥3, n=39). Participants rated all teaching activities as useful (4) or better, with anatomic exposures (5. 8) and one-on-one suturing (5. 5) rated most valuable. Both groups showed significant improvement in confidence in all measures following the course (Table 1) with Juniors improving significantly more than Seniors in anastomoses, AAA measurements, and tibial exposures (Table 2). Six month follow-up with PDs found that 100% (41/41) reported at least one noticeable lasting skill improvement and 85% (35/41) stating they modified their trainees curriculum based on the course assessment. Attendee survey response found that 100% (63/63) would recommend the course as a valuable activity and the majority reported incorporating at least one (97%, 61/63) or multiple skills (90%, 57/63) learned at the course into their daily activities.

Conclusion
This study demonstrates that brief, intensive simulation courses can have a valuable and lasting impact on vascular resident education. Modifying learning activities by trainee level and focusing on high yield activities such as cadaver exposures and one on one instruction can add further benefit. Providing outside assessments of trainee competence may be especially useful in individualizing resident curricula.

POSTER #6A

TRENDS AND OUTCOMES OF BLUNT AND PENETRATING TRAUMA IN MASS CASUALTY INCIDENTS: A NATIONAL ANALYSIS

R Santiago, A Smith, K Ibraheem, J Friedman, M Hoof, R Schroll, C Guidry, J Duchesne, P McGrew

Background

A mass casualty incident (MCI) is defined by the National Incident Management System (NIMS) as an incident in which the number of patients requiring pre-hospital emergency services overwhelms the local resources. MCIs related to active shooter incidents in the United States have been reported with increasing frequency, which has prompted a call for major changes to how EMS and hospital systems manage MCIs. Most studies of MCIs analyze large-scale events, such as earthquakes, plane crashes, or mass shootings. However, no study has provided an analysis of the characteristics of all national MCIs.

Objectives

The aim of this study was to provide a national descriptive analysis of MCIs over a six-year range in order to better prepare our pre-hospital systems for these events, and to improve triage and on-scene mortality rates.

Methods

A retrospective review of the prospectively maintained National EMS Information System (NEMSIS) database was performed. All MCIs from Jan 1, 2010 through Dec 31, 2015 were identified and data was stratified by injury mechanism and separated into blunt and penetrating trauma subgroups. Demographic information and on scene mortality was obtained. Results were analyzed for statistical significance.

Results

A total of 61,789 patients were identified. 60,294 of MCIs were blunt trauma from motor vehicle collisions (97.6%). Although only 2.4% of MCIs were due to penetrating mechanism; the incidence of compressible injuries: extremity (36.1% vs. 30.2%, $p=0.0001$) and non-compressible injuries: abdominal (10.7% vs. 5.8%, $p<0.001$) and chest (16.2% vs 12.4%, $p=0.03$) were higher when compared to blunt trauma MCIs. Penetrating MCIs had higher mortality rate as well, with most of them occurring in the pre-hospital arena (12.9% vs. 2.0%, $p<0.001$) when compared to blunt MCIs.

Conclusion

Blunt trauma continues to be the most common mechanism in MCIs, though penetrating trauma results in a six-fold higher rate of pre-hospital mortality. Given an increasing surge in MCIs related to penetrating trauma, results from this study raises the awareness for improvement in pre-hospital interventions that could potentially improve on scene mortality.

POSTER #6B

NOT ALL ABDOMENS ARE THE SAME

A Flaris, A Smith, M Marturano, R Fabian, B Domangue, C Guidry, R Schroll, C McGinness, J Duchesne, P McGrew

Background

Damage Control Surgery (DCS) with Temporary Abdominal Closure (TAC) for Emergency General Surgery (EGS) and Trauma Surgery (TS), are now commonly practiced by trauma and elective surgeons. Difference in demographics and surgical indications could influence survival following DCS between EGS vs. TS.

Objectives

To determine if there was a difference in survival between these two groups.

Methods

All consecutive adult EGS and TS patients from 2012-2018, at two large tertiary care hospitals were studied retrospectively by chart review. Demographics, comorbidities, admission physiological data, outcomes, and mortality/discharge status information was collected. Mortality between the two groups was analyzed using Fisher's exact test. A binary logistic regression analysis was performed to determine the relationship of patient risk factors on in-hospital mortality. A p value of <0.05 was considered to be statistically significant.

Results

A total of 47 EGS patients with a mean age of 58 +/- 15 years and a total of 79 TS patients with a mean age of 33 +/- 11 years underwent DCS and managed with TAC. The incidence of in-hospital mortality was 32% for EGS patients vs. 13% for TS patients ($p < 0.02$). TS patients received significantly more packed red blood cells during their entire hospital stay (18 units vs. 4 units, $p < 0.01$). On multivariate analysis, having EGS and fewer units of packed red blood cells were predictive of mortality.

Conclusion

In our cohort, the type of surgery (EGS vs. TS), as well as units of blood administered had a significant impact on mortality. Future studies are needed to determine which further characteristics of the two populations and management strategies lead to this large difference in mortality.

POSTER #6C

THE USE OF A PORTABLE ULTRASOUND TABLET IN AUTOLOGOUS BREAST RECONSTRUCTION: A PROMISING ADJUNCT.

Christopher Homsy, Allen Chen, Michelle McCarthy, Ravi Tandon,

Background

Autologous breast reconstruction is at the center of reconstructive strategies after mastectomy for breast cancer. Although technical skills and training have improved significantly since the procedure was first described, there is still a tremendous amount of pre-operative planning and post-operative flap monitoring involved in this patient population. Ultrasonography (US) has recently become an essential part of many medical and surgical specialties training requirements. In plastic surgery, however, its role is still limited and the indications of its use unclear. The implementation of US by the plastic surgery community at large, especially within microsurgical breast reconstruction is limited and warrants further investigation. The advent of a tablet-based US offers high-definition visualization, a compact size, and a user-friendly device that can be use by residents.

Objectives

In this paper, we share the preliminary plastic surgery resident experience in the use of a portable US tablet ("LUMIFY") as an adjunct in the care of patients undergoing DIEP flap breast reconstruction. We also present indications for the use of a portable US in autologous breast reconstruction.

Methods

This is a series of 11 consecutive patients who underwent a unilateral or bilateral autologous breast reconstruction. All patients were evaluated with the LUMIFY, either pre- and/or postoperatively by a single plastic surgery resident between February and September 2018. Both still images and video recordings were collected in all patients.

Results

A total of 11 patients were included in this series. Ten patients underwent deep inferior epigastric perforator (DIEP) flaps reconstruction, and one patient underwent a unilateral reconstruction with pedicle thoracodorsal artery perforator flap (TDAP). LUMIFY was used preoperatively in 3 patients for perforator mapping: two of these patients had renal failure and could not undergo a computed tomographic angiography (CTA), and in one patient, the US was used to identify the TDAP perforator vessel location and design the skin paddle accordingly. For the remaining 8 patients, the use of LUMIFY was performed post-operatively: 3 patients had a loss of Doppler signal from the flap, however the use of LUMIFY confirmed patency of the anastomoses and flap perfusion, avoiding therefore an unnecessary re-exploration. Two patients underwent successful US-guided seroma drainage. Two patients developed breast swelling, which was diagnosed with the LUMIFY as lateral breast hematomas. Finally, one patient developed a clinically significant ecchymosis of the DIEP skin paddle. The use of the LUMIFY confirmed adequate flap perfusion and patency of both arterial and venous systems within the flap. There were no flap losses or error in diagnosis.

Conclusion

The use of portable US in plastic surgery is a valuable resource for plastic surgery residents taking care of patients with autologous breast reconstruction. It provides reliable preoperative perforator mapping, and is an excellent bedside modality to assess postoperative flap perfusion when the usual methods fail.

POSTER #6D

UNDERSTANDING THE RELATIONSHIP BETWEEN PULMONARY CONTUSION AND RIB FRACTURE SEVERITY

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Blunt trauma has been found to be the cause of over 90% of chest wall injuries. Along with rib fractures, blunt trauma patients may develop pleural effusion, pneumothorax, and more commonly, pulmonary contusion (PC). Patients who experience PC are at a higher risk of developing Acute Respiratory Distress Syndrome (ARDS) and have an increased mortality rate of 10% to 25%. Studies have also shown that mortality rates and complications increase in an almost linear fashion with the increase in the number of rib fractures. The assumption is that PC incidence and severity increases as the number of rib fractures increases, however this has not been examined directly. We hypothesize that increased PC scores will be associated with increased number of rib fractures. We performed a six year (2012-2018) retrospective chart review of trauma patients admitted to University Medical Center in New Orleans with a radiological diagnosis of PC based on CT imaging of the chest taken upon arrival. One hundred twenty three patients were identified in this timeframe as having PC. Forty-three patients were excluded as having penetrating trauma and 11 were excluded because they were younger than 18 (n=69 patients). The CT scans of these patients were scored using the Chest Trauma Scoring System for age, severity and location of pulmonary contusions, number of rib fractures, and bilaterality of rib fractures. Clinical and demographic data was also collected from the electronic medical record. Both univariate and multivariate analyses were performed using SAS.

Demographic and clinical data show that the patients in our cohort were predominantly male (75.4%), young (mean age 38.2 ± 7.8, range 19-73,) and had an average PC score of (2.1 ± 1.2). It further shows that patients who presented with a more severe PC score (3 or 4), tended to have more rib fractures than patients with PC scores of 1 or 2 ($p=0.0008$). When adjusted for sex, age, and BMI these trends were confirmed ($p=0.0005$). We also found that overall, more women presented with severe bilateral PCs (PC score=4) than men ($p=0.0106$). There was no correlation between age, BMI, or trauma fatality with PC score ($p>0.05$).

These results show that there is a significant correlation between mild pulmonary contusion and low number of rib fractures, and a significant correlation between severe pulmonary contusion and high number of rib fractures. Interestingly, the correlation between pulmonary contusion and rib fractures in the moderate ranges (RS 2-3 vs. PC 2-3) becomes less obvious, thus the correlative increase is not perfectly linear. Understanding how other factors influence both the severity of PC and rib fractures may help us understand how best to care for these patients and anticipate pitfalls during their recovery.