
Surgical Research F.L. Raffucci Forum Abstracts of the 29th Memorial Lecture and Surgical Research Forum



1 **The Medical Liability Environment in San Juan: Results of the 2008 Survey.** Norma I. Cruz MD; District of San Juan, Puerto Rico College of Physicians and Surgeons

Introduction: Puerto Rico has a rate of 5.6 malpractice award payments per 100,000 people, while the average across the United States is 2.4 per 100,000*. A survey was performed to evaluate the effect that this high rate of malpractice claims has had in our community. The survey was sponsored by the District of San Juan of the Puerto Rico College of Physicians and Surgeons. Method: In August 2008 a questionnaire consisting of 15 items which evaluated medical liability was mailed to all physicians in the San Juan District. The questionnaire requested information on basic demographics, medical specialty, insurance company used, annual premium paid, umbrella coverage, changes made in medical practices to decrease medical liability risk, malpractice claims received during the last ten years, and whether awards exceeding insurance coverage were paid. Physicians were requested to return the completed questionnaires by FAX or mail to the main office of the Puerto Rico College of Physicians and Surgeons. All information received was analyzed using the computerized statistical program SPSS (Statistical Package for the Social Sciences). Results: There were 951 completed questionnaires returned. Since we successfully mailed the questionnaire to 3,148 physicians, we estimated that 30% of the group participated in the survey. The mean age of the responders was 53±12 and 74% were males. The mean time in practice was 22 years and 87% were specialists. The main professional liability insurance carrier was SIMED (76%) followed by Triple S (13%). Umbrella coverage, in addition to basic liability insurance, was carried by only 8% of the responders. Changes in their medical practices to decrease medical liability risk had been made by 70% of the physicians. Currently, 48% of physicians do not accept emergency cases and 50% do not accept high risk patients. If we add the responders that indicated they plan to “close their office”, “leave Puerto Rico”, or “retire”, it appears that Puerto Rico would lose 57% of its medical manpower. Malpractice claims were received at least once in the previous ten years by 40% of the physicians. If the high risk specialties were indepen-

dently analyzed, the survey found that 64% of surgeons, 63% of orthopedists and 57% of obstetric/gynecology specialists received malpractice claims during the study period. The awards requested by these claims exceeded the insurance coverage 75% of the time. After the final court decision was reached, 20% of the payments exceeded physicians’ insurance coverage. Conclusion: The adverse medical liability environment has affected the majority of physicians in San Juan, leading 70% of them to make changes in their practices to decrease the liability risk. As a result of these changes, the number of physicians willing to care for high risk and emergency patients has decreased significantly. The survey indicated that 40% of physicians received malpractice claims within the study period and the awards exceeded the physicians’ insurance coverage 20% of the time.

* The National Report Card on the State of Emergency Medicine 2009: Evaluating the Emergency Care Environment State by State. American College of Emergency Physicians. Available at: URL: <http://www.emreportcard.org>.

2 **Management of Full Thickness Electrical Scalp Burns Preserving Cranial Bone.** Norma I. Cruz MD, Manuel F. Saavedra MD; Division of Plastic Surgery and Neurosurgery Section, Department of Surgery, University of Puerto Rico, Medical Sciences Campus, San Juan, Puerto Rico.

Introduction: Electrical burns of the scalp, although uncommon, are currently observed more frequently. Since the value of copper has increased over 700% in recent years, copper theft from electrical wiring has become rampant throughout the United States and Puerto Rico. Usually the copper wire thief receives a severe electrical burn which enters the hand that holds the high tension wire and exits at the head when the person falls back, or at the feet if shoes are not insulated. Method: During the past five years the Plastic Surgery Service of the University Hospital has managed the treatment of 10 patients who received full thickness burns of the scalp. These injuries resulted not only in soft tissue loss, but also in full thickness non-viable cranial bone at the base of the defect. All patients were males whose age averaged 29 years. The patients were treated initially by debridement until the wound presented viable clean soft tissue mar-

gins. Reconstructive surgery was performed at an average of 22 ± 6 days after the burn occurred. With the assistance of a neurosurgeon, multiple burr holes, following a grid pattern, were made in the non-viable cranial bone (Figure 1). This bone grid was immediately covered with a well-vascularized scalp flap. The patient's progress was documented during the hospital stay and long-term follow-up at the Plastic Surgery Clinic was provided for at least one year. Results: The multiple burr holes filled with well vascularized fibrous tissue and the contour of the skull was maintained in all 10 patients without the need of a secondary cranioplasty. No postoperative infection, osteomyelitis, or cranial bone sequestration occurred in this group of patients. Two minor wound separations due to tension at the suture line, which healed by secondary intention, were reported. The patients were satisfied with the cosmetic results and the only complaints received were associated with the lack of hair at the skin-grafted flap donor sites. Conclusion: In summary, debridement of non-viable cranial bone due to electrical burns of the scalp can be limited to multiple burr holes in a grid pattern and does not necessarily require removal of the entire section of bone. As reported by others, if the underlying bone is not infected, it can be left in situ and covered with well vascularized tissue. Even with moderately delayed management of contaminated electrical burns, partial excision of the necrotic bone with burr holes appears to be sufficient. Leaving the skull grid in situ serves as a scaffold for "creeping substitution" bone regeneration. The conservative cranial bone debridement allows the patient to maintain a normal cranial contour without the need for a secondary cranioplasty.

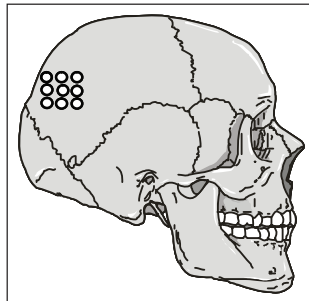


Figure 1. Burr hole grid

3 Incidence of Adrenal Insufficiency in Trauma Patients. Ricardo Guerrero MD, Suhein Galloza MD, Pablo Rodríguez MD, Gloria Rodríguez-Vega MD; Department of Surgery, Puerto Rico Trauma Center, University of Puerto Rico, Medical Sciences Campus.

Introduction: Acute adrenal insufficiency (AI) is a condition frequently observed in critically ill trauma patients. This is a major health concern, resulting in severe morbidity and mortality if not diagnosed on time. The reported incidence of AI varies widely (0-77%) depending on the population of patients studied and the diagnostic

criteria. Our study evaluated the incidence of acute AI in trauma patients and the clinical predictions of AI. Methods: Sixty-two adult patients admitted to our trauma center were followed with cortisol levels for 6 consecutive days. The incidence of biochemical and clinical AI was evaluated. Biochemical AI was defined as a random plasma cortisol level $< 25\text{mcg/dl}$ plus a cosyntropin test with a cortisol rise of less than 9mcg/dl . Clinical AI was defined as hemodynamic instability despite adequate administration of intravenous fluids. Blood samples were obtained at arrival and every 24hrs subsequently for 6 days. Exclusion criteria for this study were: previous use of corticosteroids or treatment with corticosteroids upon arrival. The Institutional Review Board of the University of Puerto Rico approved this study. Results: In this study 57(92%) of 62 patients had biochemical AI; one patient had clinical AI (1.6%) and 6.4% did not have biochemical or clinical AI. Thirty-nine patients with biochemical AI were 18 to 25 years old. Most patients had a positive ACTH test done 30 and 60 minutes after cosyntropin administration due to plasma cortisol less than 25mcg/dl (27% & 17%, respectively). At arrival, 38% of the patients had normal cortisol levels between 25-35 mcg/dl; at 24 hrs 37% of the patients had cortisol levels between 5-15mcg/dl. In this study 41% of patients had non-severe trauma index severity score (TISS); 26% had severe TISS; and 33% had very severe TISS. All patients with TISS had positive biochemical AI, but only one patient with very severe TISS showed clinical AI. Upon arrival, 69% had normal cortisol levels independent of the TISS. Sixty-three (63%) of the patients had undergone some surgical procedure; 68% of the patients operated upon at arrival had normal cortisol. All patients (100%) operated developed biochemical AI at some time during hospitalization; 83% of patients without surgery developed biochemical AI. Concerning expected blood loss (EBL), we observed low plasma cortisol levels in 40% of the patients with less than 500ml EBL; in 28% of patients with 500-750ml EBL, and in 28% patients with 750-1500ml EBL. Twenty-nine percent of the patients received less than 2 packed red blood cell (PRBC) transfusions; 50% received more than 2 PRBC transfusions; and 21% had none. Approximately 35% of patients with < 2 PRBC transfusions and 37% with > 2 PRBC had low cortisol levels, and 33% of patients with no transfusions also had decreased cortisol levels. From 86% of patients with biochemical AI, 63% stayed at the hospital less than 1 week; 13% left the hospital after 2-3 weeks; and 25% had a length-of-stay of 3-4 weeks. Conclusions: The incidence of biochemical and clinical AI was 92% and 1.6%, respectively. The age group with the highest inci-

dence of biochemical AI was 18-25 years old (40%). The more sensitive parameter for a positive ACTH test was plasma cortisol of less than 25mcg/ml after cosyntropin administration. A large number of patients had a normal cortisol level upon arrival, but we observed a tendency to a progressive daily decrease throughout the hospital stay. This trend may be due to adrenal exhaustion. Patients with very severe TISS show lower cortisol levels. We observed a positive correlation between surgery and development of biochemical AI, but the incidence of biochemical or clinical AI is not related to the necessity of surgery. We did not observe any correlation between the amount of EBL and plasma cortisol levels or the incidence of biochemical AI, but blood loss is directly related to the incidence of biochemical AI. We did not observe an absolute correlation between PRBC transfusions and plasma cortisol. We concluded that development of biochemical AI was a factor independent of PRBC transfusions ($p < 0.02$). The length of stay at this trauma facility was not related to the incidence of biochemical AI.

4 Pediatric Tracheotomy: Changing Trends in Puerto Rico. Melissa Ortiz MD, Yadiel Alameda MD, Javier González MS, Carlos González-Aquino MD, FACS; Division of Otolaryngology-Head and Neck Surgery, University of Puerto Rico, Medical Sciences Campus, San Juan, Puerto Rico.

Introduction: A study was done to understand changing trends in the indications and decannulation rates for pediatric tracheotomy and to propose recommendations for the coordinated care of children with tracheotomy. **Methods:** A retrospective chart review of 189 patients undergoing tracheotomy, between 1991 and 2007, was done at San Jorge Children's Hospital, San Juan, Puerto Rico. There were 189 patients under 17 years of age who underwent tracheotomy. Sufficient data was available on 171 children. The data was tabulated for age, diagnosis, complications, and outcome. Patients were divided in groups based on the indication for tracheotomy. **Results:** A total of 189 tracheotomies were performed between 1991 and 2007. Sufficient data was available on 171 patients. The average age at the time of tracheotomy was 40 months, with a range of 2 days – 296 months and mean time of follow-up was 33 months. Unfortunately, 49 patients were lost to follow-up. Five groups were identified based on the primary indication for tracheotomy and decannulation rates were calculated for each: true vocal cord paralysis in 10 patients (6%) with 30% decannulation rate, airway obstruction in 29 patients (17%) with 90% decannulation rates, craniofacial malformation in 17 patients (10%) with a 23% decannula-

tion rate, neurological impairment in 85 patients (50%) with a 1% decannulation rate, and prolonged mechanical ventilation in 30 patients (18%) with a 10% decannulation rate. We report no intraoperative complications, a 19% overall complication rate, and a 9% mortality not directly related to the tracheotomy procedure. The majority of patients lost to follow-up were in the prolonged mechanical ventilation, and neurological impairment groups. **Conclusions:** Over the last decades the indications for tracheotomy have shifted toward children with underlying neurological impairment and need for prolonged mechanical ventilation. Decannulation rates for these children are significantly lower (approximately 1 and 10%, respectively) than for children with obstructive airway pathology (90%). The neurological impairment and prolonged mechanical ventilation groups also had more loss to follow-up (29 and 50% respectively) than the obstructive airway pathology group (7%). Therefore, the care of these children and their tracheotomies will require long-term coordinated multidisciplinary settings. We present recommendations to achieve this goal.

5 Surgeon Performed Ultrasound is a Useful Localization Test for Recurrent Medullary Thyroid Carcinoma. Rivera M, Abdul-Hadi A, Estronza S, Méndez W; Department of Surgery, University of Puerto Rico, Medical Sciences Campus, San Juan, Puerto Rico.

Introduction: Localization of recurrent medullary thyroid carcinoma (MTC) in patients presenting with elevated calcitonin after initial surgery sometimes involve multiple tests. Surgeon performed ultrasound (SUS) is a simple, rapid test that may accurately localize recurrent disease. **Method:** Five patients with history of surgery for (MTC) and elevated calcitonin were evaluated between July, 2007 and August, 2008. Previous surgeries included Total Thyroidectomy (TT) (n=2), TT with central neck dissection (CND) (n=2) and TT with CND and ipsilateral jugular lymph node sampling (n=1). No other neck surgeries have been performed since the initial procedure. History, physical examination and SUS were performed during initial evaluation. SUS evaluated the central and lateral neck compartments. Enlarged, rounded lymph nodes with loss of central streak were considered positive (P-USLN). Neck and chest CT Scan and Fluorodeoxyglucose-Positron emission tomography (FDG-PET) were done in all patients. All patients with localized disease in neck underwent modified neck dissection according to anatomical location. Jugular chain was defined as Groups II-V. Ipsilateral (IJC) or contralateral jugular chain (CJC) were identified according to

initial tumor location in thyroid. Calcitonin levels were measured after surgery. Results: PE revealed palpable lesions in two (2/5) patients. SUS revealed P-USLN in the IJC in five patients (5/5), one patient also presented P-USLN in the CJC (1/5). Neck CT Scan showed enlarged IJC LN in three patients (3/5). No patients showed enlarged LN in the CJC (0/5). None of the patients (0/5) had suspicious lesions in chest CT Scan. Three patients (3/5) presented ipsilateral cervical metastatic foci on FDG-PET. Four patients (4/5) underwent ipsilateral modified neck dissection and one patient underwent bilateral MND. Permanent pathology reported all (5/5) IJC with positive LN (3-9 positive LN) and in the only (1/1) CJC (2 positive LN). Calcitonin levels normalized in two (2/5) patients and decreased (31%-50% decrease) in three (3/5) patients. Conclusion: SUS is a useful test to localize recurrent MTC in patients with hypercalcitonemia.

6 Non-Operative Management of Pneumobilia following Blunt Abdominal Trauma: A Case Report and Review of the Literature. Jorge J. Zequeira MD, Pablo Rodríguez-Ortiz MD, FACS, FCCM, FACP; Division of Trauma, Department of Surgery, University of Puerto Rico, Medical Sciences Campus, San Juan, Puerto Rico

Introduction: Pneumobilia is an uncommon finding in imaging studies that denotes the presence of air in the biliary tree. It has a myriad of clinical connotations depending on the setting in which it is found. Taking into consideration that only five cases of pneumobilia following blunt abdominal trauma have been reported, we will add an additional case which was managed non-operatively. Method: A literature review was performed using MEDLINE and keywords related to pneumobilia in a trauma setting. The references included in each of the search articles were also reviewed. We will report the case of a seventy-one year old male patient who sustained a motor vehicle accident as a restrained driver. The patient complained of severe pain in his left thigh and mild abdominal discomfort. On physical exam he was hemodynamically stable, had an obvious deformity in his left thigh, associated upper abdominal tenderness without peritoneal signs, and a decreased Glasgow Coma Scale of 14/15. All lab values were within normal limits with the exception of a mild anemia of Hgb 11.3. Imaging studies demonstrated evidence of a cephalohematoma, pneumobilia, duodenal contusions, minimal free fluid on Morrison's pouch, and a left femoral shaft fracture. The patient was admitted, placed on bowel rest, nasogastric suction, and followed with serial physical exams. An abdominal CT scan with intravenous and oral contrast was

repeated one day later revealing no new findings. The closed femur fracture was repaired four days after the injury and the nasogastric tube was removed when it drained less than 100ml/24hr. The patient was started on oral feedings and progressed as tolerated. Once he tolerated a regular enteral nutrition, the patient was discharged home and followed at clinics one month later. During ambulatory follow-up, he denied any abdominal pain and stated that he was tolerating the diet and evacuating properly. Results: Pneumobilia has been historically associated to diseases that mandate a surgical intervention. Five cases of pneumobilia after a blunt traumatic injury have been reported in the literature. Two of these patients were managed operatively while the other three were managed expectantly. None of the patients who were explored had findings suggestive of a surgically correctable cause of pneumobilia. Those who were managed expectantly were discharged home without abdominal complications. The proposed mechanism for this event to occur is retrograde flow of air from the duodenum into the biliary system as a consequence of sudden application of extrinsic pressure to the abdomen. Conclusion: Taking into consideration the lack of surgical findings in those patients whose abdomen has been explored we preliminarily propose that patients with radiographic evidence of pneumobilia and no other clinical or radiographic indications for laparotomy should be managed expectantly with bowel rest, nasogastric suction, and serial physical examinations. However, we still believe that pneumobilia is a rare finding after blunt abdominal trauma and more evidence is needed in order to generalize a management strategy for these patients.

7 Hand Assisted Laparoscopic Splenectomy (HALS) in Children - Our Initial Experience with the Gelpert. Jocel Pagán MS-IV*, Carmen Ramos MD, FACS, FAAP†; *School of Medicine, Universidad Central del Caribe and Division of Pediatric Surgery, †San Jorge Children's Hospital, San Juan, Puerto Rico

Introduction: Since 2002, hand assisted laparoscopic splenectomy (HALS) has been advocated as the preferred approach for splenectomy in adults with splenomegaly in the setting of benign and malignant hematological disease. Not only it maintains the advantages of a purely laparoscopic approach but it allows the surgeon to remove the organ intact, especially when the diagnosis of malignancy is equivocal. In children, although it seems feasible and safe, not much has been reported in the surgical literature. We present our experience of operative and post operative results of HALS performed

for hematological disease which was equivocal for malignancy in three pediatric patients. Method: In the year 2008, three female patients, ages 10 -15 yrs, referred by the Hematology Oncology service, underwent HALS. The procedures were performed using an anterior approach through a semilateral position. In two patients, the Gelport device was used through a Pfannestiel incision for final retrieval of the organ. One patient had an extension of one of the trocar incisions to retrieve the organ. Results: Maximum diameter of the spleens was 16 cm. All spleens were removed intact. Pathological analysis demonstrated one spleen to be a lymphangioma/hemangioma, one was an involuted hematoma with fibrosis and the other a congenital splenic cyst. Operative time ranged from 150 -180 minutes. Mean blood loss was 60 cc. There were no complications and the patients were discharged home on postoperative day #3 tolerating a regular diet and oral medications for pain control. Conclusion: Hand assisted laparoscopic splenectomy is a safe and feasible minimally invasive procedure in children with hematological disorders when neoplasm cannot be readily ruled out. Second generation devices such as the Gelport provide an exceptional approach while maintaining the pneumoperitoneum, facilitating the exposure and providing a great cosmetic result.

8 Endoscopic Third Ventriculostomy: A Surgeon's Experience. Emil A Pastrana MD, Lincoln M Jiménez MD, Ivan J Sosa MD; Neurosurgery Section, Department of Surgery, University of Puerto Rico, Medical Sciences Campus, San Juan, Puerto Rico.

Introduction: Endoscopic third ventriculostomy (ETV) is considered an alternative treatment for certain types of hydrocephalus. Depending on patient's age and etiology of hydrocephalus, it can carry a success rate as high as 90 %. However, as in any surgical procedure inherent risks are present and a risk-benefit analysis must be taken prior to selecting patients for this intervention. Our objective was to evaluate retrospectively the experience of ETV at the University of Puerto Rico by examining the etiological factors, demographic data and symptoms among the Puerto Rican population. This study represents the data of one neurosurgeon and is the first account of Endoscopic third ventriculostomy as a mode of treatment in the Caribbean area. Method: A retrospective analysis of 29 patients treated in the University Pediatric Hospital (UPH) and University District Hospital (UDH) in San Juan was undertaken. Different etiologies of hydrocephalus were identified and managed. Results: The most common indication for ETV was aqueductal stenosis (59%) with male gender predominance (55%). Also the most

common population treated were adults (72%) and the most common symptoms of presentation were headache (52%) and gait disturbances (43%). Conclusion: Endoscopic third ventriculostomy is a safe and effective way to treat hydrocephalus and should be considered a first choice of treatment for certain patients with hydrocephalus unless otherwise contraindicated.

Table 1.

| Characteristics | |
|-------------------------------|------------|
| Sex | |
| Male | 55 % |
| Female | 45 % |
| Age | |
| Mean | 36 yrs |
| Range | 0 – 81 yrs |
| Mean Age - Males | 36 yrs |
| Mean Age – Females | 54 yrs |
| Pediatric (0-18 yrs) – Male | 28 % |
| Pediatric (0-18 yrs) – Female | 0 % |
| Adult (18 – 85 yrs) – Male | 72 % |
| Adult (18 – 85 yrs) – Female | 100 % |
| Signs and Symptoms | |
| Adults | |
| Headaches | 52 % |
| Gait disturbances | 43 % |
| Altered mental status | 29 % |
| Pediatrics | |
| Increased head circumference | 38 % |
| Etiology | |
| Aqueductal stenosis | 59 % |
| Normal pressure hydrocephalus | 17 % |
| Tumors | 10 % |
| Others | 14 % |

9 Outcomes of Upper and Lower Extremity Arterial Trauma: Review of over 8,000 Patients from the National Trauma Data Bank. Fernando L Joglar*, Palma Shaw*, Robert Eberhardt*, Denis Rybin†, Gheorghe Doros†, Alik Farber*; *Boston University Medical Center, Boston, MA, †Biostatistics Department, Boston University, Boston, MA

Introduction: The purpose of this study was to examine the outcome of acute arterial traumatic injuries in upper extremities (UE) compared to lower extremities (LE) and blunt compared to penetrating trauma. Method: A retrospective review of prospectively collected data from the 2008 version of the National Trauma Data Bank was performed. Using the International Classification of Diseases, Ninth Revision (ICD-9) codes, cases with a diagnosis of arterial vascular injury were identified and procedures were classified according to ICD-9 Clinical Modification codes for vascular therapy. Patients 18 years and older with traumatic blunt or penetrating arterial injury to the extremities were included in the

analysis, divided into upper extremity (UE) and lower extremity (LE) injury groups and then by mechanism of injury, blunt or penetrating. A comparison of demographic information, outcomes, and major amputation rates between groups was performed using Chi-Square, T and Wilcoxon tests. Results: From 2002-2006, we identified 8,311 extremity arterial injuries among the 1,309,311 patients in the dataset. The patients were 82.7 % male, mean age of 36.2 years, mean Glasgow Coma Scale (GCS) 13.9 ± 3.2 (14.2 ± 2.8 in UE vs. 13.5 ± 3.7 in LE, $p < 0.0001$); 13.7 ± 3.4 in blunt vs. 14 ± 3 in penetrating, $p < 0.0001$) and mean Injury Severity Score (ISS) 10.7 ± 9.8 (8.6 ± 8.3 in UE vs. 14.3 ± 11.1 in LE, $p < 0.0001$;

13.0 ± 11.2 in blunt vs. 9 ± 8 in penetrating, $p < 0.0001$). There were significantly more African Americans in LE group ($p < 0.0001$) (Table 2). Conclusion: In the LE group there were significantly more complications, greater mean overall hospital and ICU length of stay and higher mortality. Lower extremities required more intensive intervention compared to upper extremities: there were more fasciotomies, complex soft tissue repairs and major amputations performed. Those patients with blunt mechanism of injury, regardless of the extremity, also had higher rates of these procedures as well as significantly higher complication and mortality rates compared to those with penetrating injury.

Table 2.

| Variable | Overall (n=8311) | Upper extremity (n=5260) | Lower extremity (n=3051) | Test p-value | Blunt injury (n=3681) | Penetrating injury (n=4630) | Test p-value |
|--|---------------------|-----------------------------|-----------------------------|-----------------|-----------------------------|-----------------------------------|-----------------|
| Blunt injury (%) | 3681 (44.29) | 1967 (37.4) | 1714 (56.18) | | | | |
| Penetrating injury (%) | 4630 (55.71) | 3293 (62.6) | 1337 (43.82) | <0.0001 | | | |
| Complications (%) | 844 (10.16) | 270 (5.13) | 574 (18.81) | <0.0001 | 505 (13.72) | 339 (7.32) | <0.0001 |
| Mean Length of Stay (range) | 8.06 (0-158) | 5.22 (0-158) | 12.97 (0-153) | <0.0001 | 10.93 (0-134) | 5.75 (0-158) | <0.0001 |
| Mean Intensive Care Unit LOS (range) | 2.6 (0-99) | 1.61 (0-99) | 4.1 (0-99) | <0.0001 | 3.6 (0-90) | 1.74 (0-99) | <0.0001 |
| Mortality (%) | 350 (4.21) | 115 (2.19) | 235 (7.7) | <0.0001 | 175 (4.75) | 175 (3.78) | 0.03 |
| Fasciotomies (%) | 1071 (12.89) | 351 (6.67) | 720 (23.6) | <0.0001 | 520 (14.13) | 551 (11.9) | 0.003 |
| Complex soft tissue repairs (%) | 1035 (12.45) | 541 (10.29) | 494 (16.19) | <0.0001 | 647 (17.58) | 388 (8.38) | <0.0001 |
| Major amputations (%) | 306 (3.68) | 68 (1.29) | 238 (7.8) | <0.0001 | 248 (6.74) | 58 (1.25) | <0.0001 |