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Traumatic vascular injuries: who are repairing them and what are the outcomes?



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Abstract

BACKGROUND: Traumatic vascular injuries are infrequent but can be devastating. This study characterized their incidence and the need for vascular surgeons in their repair. Outcomes for patients repaired by vascular and trauma surgeons were compared.

METHODS: Patients age ≥ 14 , needing operations for acute traumatic vascular injuries from January 1, 2008 to December 31, 2013 were included.

RESULTS: Of the 27,224 adult trauma patients, 1.4% had vascular injuries needing operations. Trauma surgeons treated 40% of them. The need for repair by vascular surgeons varied based on mechanism, transfer status, injury location, time of injury, trauma staff practice, and experience ($P < .05$). Patients repaired by vascular surgeons had more transfusions, longer arrival-to-operation time, surgery duration, hospital stay but lower mortality ($P < .05$). This mortality difference dissipated after excluding early deaths.

CONCLUSIONS: Approximately 3% of trauma patients had vascular injuries. Trauma surgeons treated a significant portion of them; using less resources and achieving similar outcomes in select patients when compared with vascular surgeons.

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Traumatic vascular injuries are overall relatively infrequent, but can cause significant morbidity and mortality.^{1,2} After diagnosis, prompt surgical management is the mainstay of treatment for patients with vascular injuries.³ The treating surgeon needs to be skilled in both critical decision making and vascular surgical technique. Surgeons caring for patients with traumatic vascular injuries come from a

multitude of subspecialties including vascular, cardiothoracic, trauma, orthopedic, and plastic.

This study investigated the incidence of traumatic vascular injuries at a level I regional trauma center. It also characterized the factors associated with the need for vascular surgeons to repair these injuries. Currently, there is limited evidence available comparing outcomes of patients with vascular injuries treated by different surgical subspecialists. In this study, we specifically compared surgical outcomes of patients repaired by vascular surgeons with those repaired by trauma surgeons. Based on a prior study that only evaluated lower-extremity vascular injuries,⁴ we hypothesized that patients treated by trauma surgeons and those treated by vascular surgeons would have similar surgical outcomes.

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The authors declare no conflicts of interest.

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Methods

Adult trauma patients with age ≥ 14 , who needed operative repair of acute traumatic vascular injuries from January 1, 2008 to December 31, 2013 were included in this retrospective study. Data were obtained from medical records and the trauma registry at MetroHealth Medical Center, a level I regional trauma center. Patients were identified using International Classification of Diseases (ICD 9) codes 900 to 904 to capture vascular injuries located in head neck, thorax, abdomen pelvis (A/P), and upper and/or lower extremity (UE/LE).

Demographic variables collected include: age, gender, race, body region injured, trauma mechanism, nature of vascular injury, time of injury, Mangled Extremity Severity Score (MESS), and injury severity score (ISS). Treatment variables collected include: arrival-to-operation time, surgery duration, transfer status, perioperative transfusions, receiving trauma staff, trauma staff experience, trauma, critical care fellowship (TCCF) training status, and surgical subspecialty performing vascular repair. Arrival-to-operation time was calculated as time between hospital arrival and surgery start time. Perioperative transfusions were defined as transfusion of blood products that occurred intraoperatively, and within 24 hours before or after the operation. Attending experience was calculated as years after graduating from residency or fellowship to the year of injury. Surgical subspecialty performing repair was determined by the surgeon dictated in the associated operative report. All vascular repairs that had both vascular and trauma surgeons present in this study were categorized as repairs performed by vascular surgeons. Outcome variables collected include: intensive care unit length of stay (ICU LOS), hospital LOS, unplanned reoperation related to vascular injury, vascular graft patency, amputation related to vascular repair, and in-hospital mortality. There were 10 trauma and 3 vascular surgeons that performed operative repairs during the duration of this study. Seven trauma surgeons completed a TCCF. All vascular surgeons completed a vascular surgery fellowship.

Statistical analysis were performed using IBM SPSS[®] version 22 (IBM, Armonk, NY, USA). Continuous variables were compared using Student's *t*-test or Mann-Whitney *U* test. Categorical data were analyzed using either chi-square test or Fisher's exact test. A *P* value $\leq .05$ was deemed statistically significant. Means in this study are reported as mean \pm standard deviation, and medians are reported as median, 25th to 75th percentile. This study was approved by the MetroHealth Medical Center Institution Review Board.

Results

A total of 27,224 adult trauma patients were admitted from 2008 to 2013. There were 778 patients with acute traumatic vascular injuries (2.9%), and 382 (1.4%) of them underwent operative repair for their vascular injuries (Fig. 1). The mean age for the 382 patients was 34 ± 15 ; 84% were male. Mean ISS was 14 ± 12 , and mean

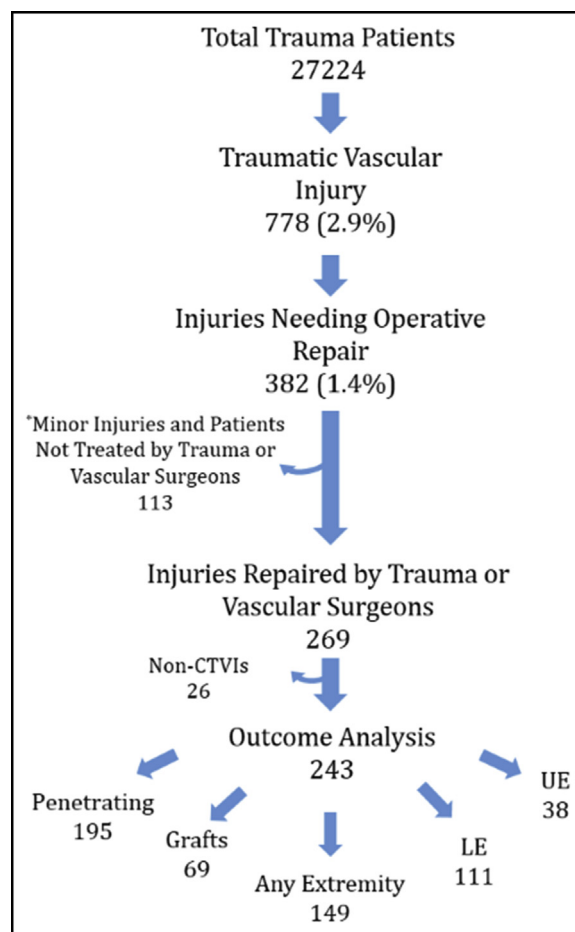


Figure 1 Study sample.

*42 patients had minor injuries (ie, external and anterior jugular veins, superficial extremity veins, epigastric vessels, and other unnamed vessels). Eighty-five patients were repaired by other subspecialty surgeons besides vascular and trauma. Fourteen patients had minor injuries and were also repaired by other subspecialty surgeons besides vascular and trauma. Core traumatic vascular injuries (CTVIs) included penetrating head neck injuries, thoracic injuries excluding blunt aortic injuries, abdominal pelvic injuries, and extremity injuries proximal to elbow and ankle. Subgroup analysis included patients with penetrating injuries, injuries needing grafts, injury to UE or LE, and injury to any extremity.

MESS was 4 ± 2 . A total of 71% of them suffered penetrating trauma. The most commonly injured body regions were LE, UE, and A/P (30%, 29%, and 20%, respectively). Three percent of patients had vascular injuries in multiple body regions. Trauma surgeons operated on 40% of the patients alone. Vascular surgeons operated on 23% alone, and 14% were operated on by a team of trauma and vascular surgeons. The rest of the patients with vascular injuries were treated by other subspecialty surgeons.

Factors associated with the need for vascular surgeons

To evaluate the factors associated with the need for repair by vascular surgeons, patients with minor vascular injuries

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