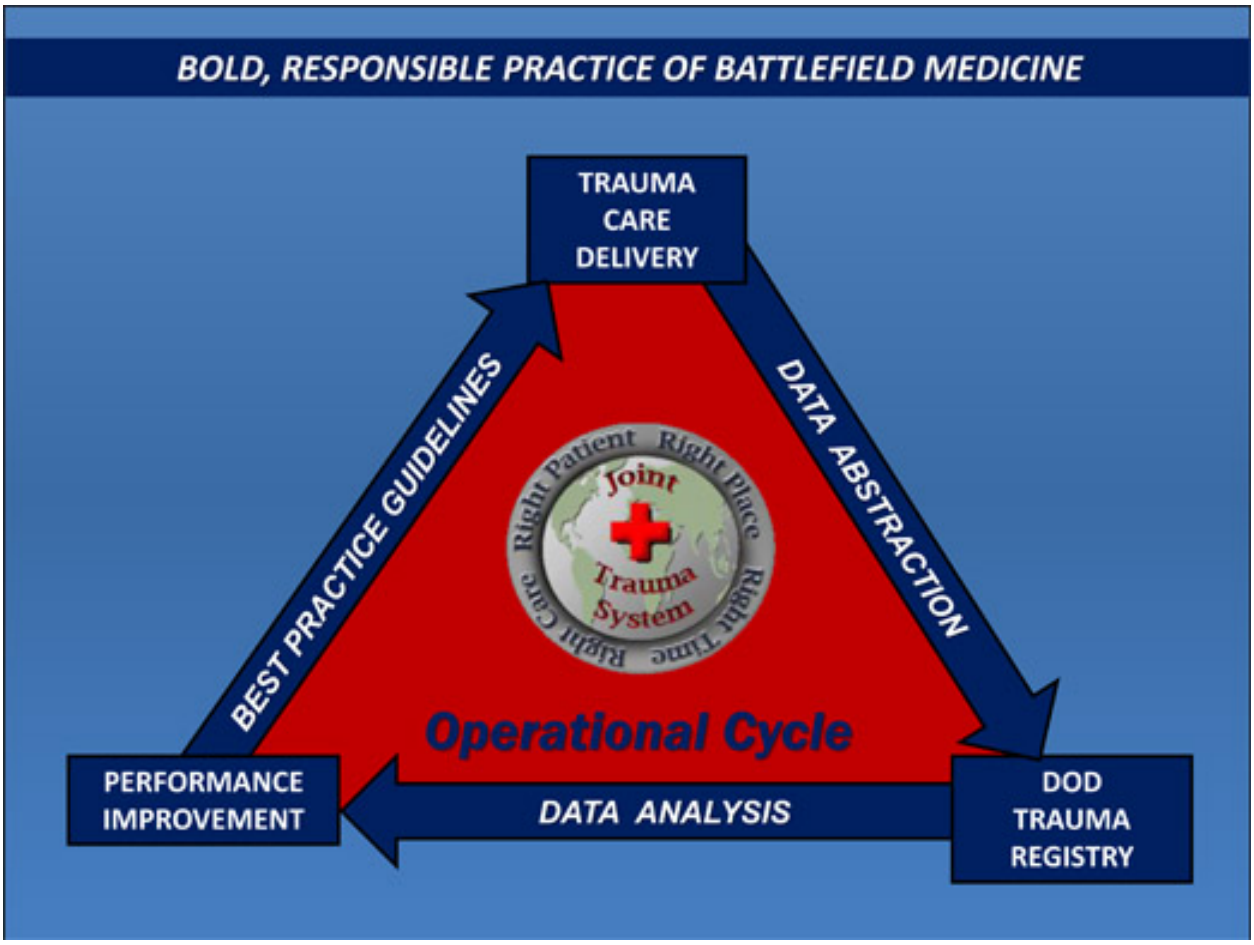
Committee on Surgical Combat Casualty Care (CoSCCC)



Journal Watch

1st Quarter

2019

Journal Watch Key Terminology Searched:

Microcirculation
Shock
Human subject research
Haemorrhagic shock
Traumatic brain injury
Plasma
Transfusion
RBCs
Stability
Blast
Amputation
Traumatic Clinical outcomes
Injury
Coagulopathy
Fibrinogen concentrate
Viscoelastic haemostatic assays
Guidelines
fractures
REBOA
Orthopaedic trauma
Wound ballistics
Cause of injury
Trauma management
Battlefield Trauma
Trauma Management
Sublingual
IDF
Multiple trauma
Coagulopathy
Pre-hospital
Trauma
Resuscitation
Ultrasound
Facial trauma
Multiple
Clinical parameters
Pelvic fracture
Cryoprecipitate
Massive transfusion
Angiography
Internal fixation
X-ray
Antibiotic prophylaxis
Perioperative antibiotics
Faecal diversion
Head injuries
Austere
Haemorrhage
Ethics committees
Institutional review board
Shock index
Diagnostic accuracy
Thrombelastography (TEG)
Imaging
Severe trauma
Afghanistan
War
Transfusion
Damage control
Trauma
Fibrinogen
ABO
External fixation
Pelvic ring
Pre-peritoneal pelvic packing
Long bone fractures
Surgical site infection
Primary repair
Pain management
Austere Surgery

Transfusion. 2018 Dec 11. doi: 10.1111/trf.15086. [Epub ahead of print]

The use of whole blood in US military operations in Iraq, Syria, and Afghanistan since the introduction of low-titer Type O whole blood: feasibility, acceptability, challenges.

Vanderspurt CK[1], Spinella PC[2], Cap AP[3], Hill R[4], Matthews SA[5], Corley JB[6], Gurney JM[6,7].
Author information

Abstract

BACKGROUND: Hemorrhage is the leading cause of preventable death in military and civilian traumatic injury. Blood product resuscitation improves survival. Low-titer Type O Whole Blood (LTOWB) was recently re-introduced to the combat theater as a universal resuscitation product for hemorrhagic shock. This study assessed the utilization patterns of LTOWB compared to warm fresh whole blood (WFWB) and blood component therapy (CT) in US Military Operations in Iraq/Syria and Afghanistan known as Operation Inherent Resolve (OIR) and Operation Freedom's Sentinel (OFS) respectively. We hypothesized LTOWB utilization would increase over time given its advantages.

STUDY DESIGN AND METHODS: Using the Theater Medical Data Store, patients receiving blood products between January 2016 and December 2017 were identified. Product utilization ratios (PUR) for LTOWB, WFWB, and CT were compared across Area of Operations (AORs), medical treatment facilities (Role 2 vs. Role 3), and time. PUR was defined as number of blood products transfused/(number of blood products transfused + number of blood products wasted).

RESULTS: The overall PUR for all blood products was 17.4%; the LTOWB PUR was 14.3%. Over the study period, the total number of blood products transfused increased 133%. Although the total whole blood (WB) increased from 2.1% to 6.6% of all products transfused, WFWB use remained at 2% while LTOWB transfusions increased from 0.5% to 4%. Transfusion of LTOWB occurred more in austere Role 2 facilities compared to Role 3 hospitals.

CONCLUSIONS:

LTOWB transfusion is feasible in austere, far-forward environments. Further investigation is needed regarding the safety, clinical outcomes, and drivers of LTOWB transfusions.

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Neurosurg Focus. 2018 Dec 1;45(6):E2. doi: 10.3171/2018.9.FOCUS18404.

Association of time to craniectomy with survival in patients with severe combat-related brain injury.

Shackelford SA[1], Del Junco DJ[1,2], Reade MC[3], Bell R[4], Becker T[5], Gurney J[1], McCafferty R[6], Marion DW[7].

Abstract

OBJECTIVE: In combat and austere environments, evacuation to a location with neurosurgery capability is challenging. A planning target in terms of time to neurosurgery is paramount to inform prepositioning of neurosurgical and transport resources to support a population at risk. This study sought to examine the association of wait time to craniectomy with mortality in patients with severe combat-related brain injury who received decompressive craniectomy.

METHODS: Patients with combat-related brain injury sustained between 2005 and 2015 who underwent craniectomy at deployed surgical facilities were identified from the Department of Defense Trauma Registry and Joint Trauma System Role 2 Registry. Eligible patients survived transport to a hospital capable of diagnosing the need for craniectomy and performing surgery. Statistical analyses included unadjusted comparisons of postoperative mortality by elapsed time from injury to start of craniectomy, and Cox proportional hazards modeling adjusting for potential confounders. Time from injury to craniectomy was divided into quintiles, and explored in Cox models as a binary variable comparing early versus delayed craniectomy with cutoffs determined by the maximum value of each quintile (quintile 1 vs 2-5, quintiles 1-2 vs 3-5, etc.). Covariates included location of the facility at which the craniectomy was performed (limited-resource role 2 facility vs neurosurgically capable role 3 facility), use of head CT scan, US military status, age, head Abbreviated Injury Scale score, Injury Severity Score, and injury year. To reduce immortal time bias, time from injury to hospital arrival was included as a covariate, entry into the survival analysis cohort was defined as hospital arrival time, and early versus delayed craniectomy was modeled as a time-dependent covariate. Follow-up for survival ended at death, hospital discharge, or hospital day 16, whichever occurred first.

RESULTS: Of 486 patients identified as having undergone craniectomy, 213 (44%) had complete date/time values. Unadjusted postoperative mortality was 23% for quintile 1 (n = 43, time from injury to start of craniectomy 30-152 minutes); 7% for quintile 2 (n = 42, 154-210 minutes); 7% for quintile 3 (n = 43, 212-320 minutes); 19% for quintile 4 (n = 42, 325-639 minutes); and 14% for quintile 5 (n = 43, 665-3885 minutes). In Cox models adjusted for potential confounders and immortal time bias, postoperative mortality was significantly lower when time to craniectomy was within 5.33 hours of injury (quintiles 1-3) relative to longer delays (quintiles 4-5), with an adjusted hazard ratio of 0.28, 95% CI 0.10-0.76 (p = 0.012).

CONCLUSIONS: Postoperative mortality was significantly lower when craniectomy was initiated within 5.33 hours of injury. Further research to optimize craniectomy timing and mitigate delays is needed. Functional outcomes should also be evaluated.

KEYWORDS: AIS = Abbreviated Injury Scale; DECRA = Decompressive Craniectomy trial; ED = Emergency Department; GCS = Glasgow Coma Scale; ICP = intracranial pressure; IQR = interquartile range; ISS = Injury Severity Score; RESCUE-ASDH = Randomized Evaluation of Surgery with Craniectomy for patients Undergoing Evacuation of Acute Subdural Hematoma; RESCUEicp = Randomized Evaluation of Surgery with Craniectomy for Uncontrollable Elevation of intracranial pressure; TBI = traumatic brain injury; craniectomy; military trauma system; severe traumatic brain injury; timing of craniectomy

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Combat vascular injury: Influence of mechanism of injury on outcome.

Sharrock AE[1], Remick KN[2], Midwinter MJ[3], Rickard RF[4].

Abstract

BACKGROUND: Haemorrhage is the leading cause of death on the battlefield. Seventy percent of injuries are due to explosive mechanisms. Anecdotally, these patients have had poorer outcomes when compared to those with penetrating mechanisms of injury (MOI). We wished to test the hypothesis that outcomes following vascular reconstruction were worse in blast-injured than non blast-injured patients.

METHODS: Retrospective cohort study. British and American combat casualties with arterial injuries sustained in Iraq or Afghanistan (2003-2014) were identified from the UK Joint Theatre Trauma Registry (JTTR). Eligibility included explosive or penetrating MOI, with follow-up to UK hospital discharge, or death. Outcomes were mortality, amputation, graft thrombosis, haemorrhage, and infection. Statistical analysis was performed using Pearson Chi-Square test, t-tests, ANOVA or non-parametric equivalent, and survival analyses.

RESULTS: One hundred and fifteen patients were included, 80 injured by explosive and 35 by penetrating mechanisms. Evacuation time, ISS, number of arterial injuries, age and gender were comparable between groups. Seventy percent of arterial injuries resulted from an explosive MOI. The explosive injuries group received more blood products ($p = 0.008$) and suffered more regions injured ($p < 0.0001$). Early surgical interventions in both were ligation (n = 36, 31%), vein graft (n = 33, 29%) and shunting (n = 9, 8%). Mortality (n = 12, 10%) was similar between groups. Differences in limb salvage rates following explosive (n = 17, 53%) vs penetrating (n = 13, 76.47%) mechanisms approached statistical significance ($p = 0.056$). Nine (28%) vein grafted patients developed complications. No evidence of a difference in the incidence of vein graft thrombosis was found when comparing explosive with non-explosive cohorts ($p = 0.154$).

CONCLUSIONS: The recorded numbers of vein grafts following combat arterial trauma in are small in the JTTR. No statistically-significant differences in complications, including vein graft thrombosis, were found between cohorts injured by explosive and non-explosive mechanisms.

KEYWORDS: Combat; Explosive; Thrombosis; Vascular outcomes; Vascular trauma

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A contemporary, 7-year analysis of vascular injury from the war in Afghanistan.

Patel JA[1], White JM[2], White PW[2], Rich NM[2], Rasmussen TE[2].

Abstract

OBJECTIVE: Vascular injury is a leading cause of death and disability in military and civilian trauma. Although a previous interim study defined the distribution of vascular injury during the wars in Iraq and Afghanistan, a contemporary epidemiologic assessment has not been performed. The objective of this study was to provide a current analysis of vascular injury during the final 7 years of the war in Afghanistan, including characterization of anatomic injury patterns, mechanisms of injury, and methods of acute management.

METHODS: The Department of Defense Trauma Registry was analyzed to identify U.S. military service members who sustained a battle-related vascular injury and survived to be treated at a surgical facility in Afghanistan between January 1, 2009, and December 31, 2015. All battle-related injuries (nonreturn to duty) were used as a denominator to establish the injury rate. Mechanism and anatomic distribution of injury as well as the acute management strategies of revascularization, ligation, and use of endovascular techniques were defined.

RESULTS: Of 3900 service members who sustained a battle-related injury, 685 patients (17.6%) had 1105 vascular injuries (1.6 vascular injuries per patient). Extremity trauma accounted for 72% (n = 796) of vascular injuries, followed by the torso (17%; n = 188) and cervical (11%; n = 118) regions. Lower extremity vascular injury was the most prevalent anatomic location (45%; 501/1105). Explosion with fragment penetration accounted for 70% (477/685) of injuries, whereas gunshot wounds accounted for 30% (205/685). Open repair was performed in 559 cases (57%; 554/981), whereas ligation was the initial management strategy in 40% (395/981) of cases. In addition, 374 diagnostic endovascular procedures were completed, 27 therapeutic endovascular interventions to include stent placement and angioplasty were performed and 55 inferior vena cava filters were placed. Mortality of the vascular injury cohort was 5%.

CONCLUSIONS: The rate of vascular injury in modern combat is higher than that reported in previous wars. Open reconstruction is performed in half of cases, although ligation is an important damage control option, especially for minor or distal vessel injuries. Angiographic techniques are increasingly being used and documented within wartime registries more than ever. Proficiency with open and endovascular methods of vascular injury management remains a critical need for the U.S. military and will require partnership with civilian institutions to attain and maintain.

KEYWORDS: Vascular trauma; War injury

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Predictors and Timing of Amputations in Military Lower Extremity Trauma With Arterial Injury.

Thomas SB[1], Schechtman DW[1], Walters TJ[2], Kauvar DS[3,4].

Abstract

INTRODUCTION: Military lower extremity arterial injuries present threats to life and limb. These injuries are common and limb salvage is a trauma system priority. Understanding the timing and predictors of amputation through the phases of casualty evacuation can help inform future limb salvage efforts. This study characterizes limbs undergoing amputation at different operationally relevant time points.

METHODS: A retrospective cohort study of casualties with lower extremity arterial injuries undergoing initial vascular limb salvage in Iraq and Afghanistan was undertaken. Amputations were grouped as having been performed early (in theater at Role 2 or 3) or late (after evacuation to Role 4 or 5). Further distinction was made between late and delayed (after discharge from initial hospitalization) amputations.

RESULTS: 455 casualties met inclusion criteria with 103 (23%) amputations. 21 (20%) were performed in theater and 82 (80%) were performed following overseas evacuation. 21 (26% of late amputations) were delayed, a median of 359 days from injury (IQR 176-582). Most amputations were performed in the first 4 days following injury. Amputation incidence was highest in popliteal injuries (28%). Overall amputation was predicted by higher incidence of blast mechanism and fracture and greater limb and casualty injury severity. Early amputations had higher limb injury severity than late amputations. Delayed amputations had greater incidence of motor and sensory loss and contracture than early amputations.

CONCLUSION: Casualty and limb injury severity predict predictors and timing of amputation in military lower extremity arterial injury. Amputation following overseas evacuation was more common than in-theater amputation and functional loss is associated with delayed amputation. Future limb salvage efforts should focus on post-evacuation and rehabilitative care.

EVIDENCE LEVEL: Level III, epidemiologic.

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The "top 10" Research and Development Priorities for Battlefield Surgical Care: Results From the Committee on Surgical Combat Casualty Care Research gap Analysis.

Martin MJ[1], Holcomb J, Polk T, Hannon M, Eastridge B, Malik SZ, Blackman V, Galante JM, Grabo D, Schreiber M, Gurney J, Butler FK, Shackelford S.

Abstract

BACKGROUND: The US Military has achieved the highest casualty survival rates in its history. However, there remain multiple areas in combat trauma that present challenges to the delivery of high quality and effective trauma care. Previous work has identified research priorities for pre-hospital care, but there has been no similar analysis for forward surgical care.

METHODS: A list of critical "focus areas" was developed by the Committee on Surgical Combat Casualty Care (CoSCCC). Individual topics were solicited and mapped to appropriate focus areas by group consensus and review of EAST and JTS guidelines. A web-based survey was distributed to the CoSCCC and the military committees of EAST and AAST. Topics were rated on a Likert scale from 1 (low) to 10 (high priority). Descriptives, univariate statistics, and inter-rater correlation analysis was performed.

RESULTS: 13 research focus areas were identified (8 clinical and 5 adjunctive categories). Ninety individual topics were solicited. The survey received 64 responses. The majority of respondents were military (90%) versus civilians (10%). There was moderate to high agreement (inter-rater correlation coefficient=0.93, $p<0.01$) for 10 focus areas. The top 5 focus areas were Personnel/Staffing (mean=8.03), Resuscitation & Hemorrhage Management (7.49), Pain/Sedation/Anxiety Management (6.96), Operative Interventions (6.9), and Initial Evaluation (6.9). The "Top 10" research priorities included 4 in Personnel/Staffing, 4 in Resuscitation/Hemorrhage Management, and 3 in Operative Interventions. A complete list of the topics/scores will be presented.

CONCLUSIONS: This is the first objective ranking of research priorities for combat trauma care. The "Top 10" priorities were all from 3 focus areas, supporting prioritization of personnel/staffing of austere teams, resuscitation/hemorrhage control, and damage control interventions. This data will help guide DOD research programs and new areas for prioritized funding of both military and civilian researchers.

LEVEL OF EVIDENCE: IV STUDY DESIGN: Original article.

PMID: 30633096 DOI: 10.1097/TA.0000000000002200

J Vasc Surg. 2018 Nov 26. pii: S0741-5214(18)32221-3. doi: 10.1016/j.jvs.2018.07.075. [Epub ahead of print]

Impact of time to repair on outcomes in patients with lower extremity arterial injuries.

Alarhayem AQ[1], Cohn SM[2], Cantu-Nunez O[3], Eastridge BJ[4], Rasmussen TE[5].

Abstract

BACKGROUND: Six hours has long been considered the threshold of ischemia after peripheral artery injury. However, there is a paucity of evidence regarding the impact of operative delays on morbidity and mortality in patients with lower extremity arterial injuries.

METHODS: We analyzed the records of 3,441,259 injured patients entered into the National Trauma Data Bank Research Dataset from 2012 to 2015. Patients (≥16 years) with lower extremity arterial injuries were identified by International Classification of Diseases, Ninth Revision injury and procedure codes. Patients with crush injuries, patients with prehospital or emergency department cardiac arrest, those not transferred directly from point of injury, and patients in whom a nonoperative management strategy was attempted were excluded from analysis.

RESULTS: We examined the data from 4406 patients with lower extremity arterial injuries; 85% of the patients were male, with a mean age of 35 years. The overall mortality in this cohort was 3.2% (143/4406); the amputation rate was 11.3% (499/4406). Using a multivariate logistic regression model, blunt mechanisms of injury, increased time from injury to operating room arrival, nerve injury, associated lower extremity fractures, increased age, and Injury Severity Score were associated with increased amputation risk. The amputation rate in those undergoing repair within 60 minutes was 6% compared with 11.7% and 13.4% in those undergoing repair after 1 to 3 hours and 3 to 6 hours, respectively.

CONCLUSIONS: Optimal limb salvage is achieved when revascularization of lower extremity arterial injury occurs within 1 hour of injury. To improve survival and recovery after extremity arterial injury, efforts should be focused on strategies to expedite reperfusion of the injured limb.

KEYWORDS: Arterial trauma; Fasciotomy; Ischemic reperfusion injury; Ischemic threshold; Vascular injury

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J Trauma Acute Care Surg. 2018 Dec;85(6):1123-1126. doi: 10.1097/TA.0000000000002055.

Heeding the call: Military-civilian partnerships as a foundation for enhanced mass casualty care in the United States.

Martin MJ[1], Rasmussen TE, Margaret Knudson M, Elster E.

No abstract available for this Article.

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