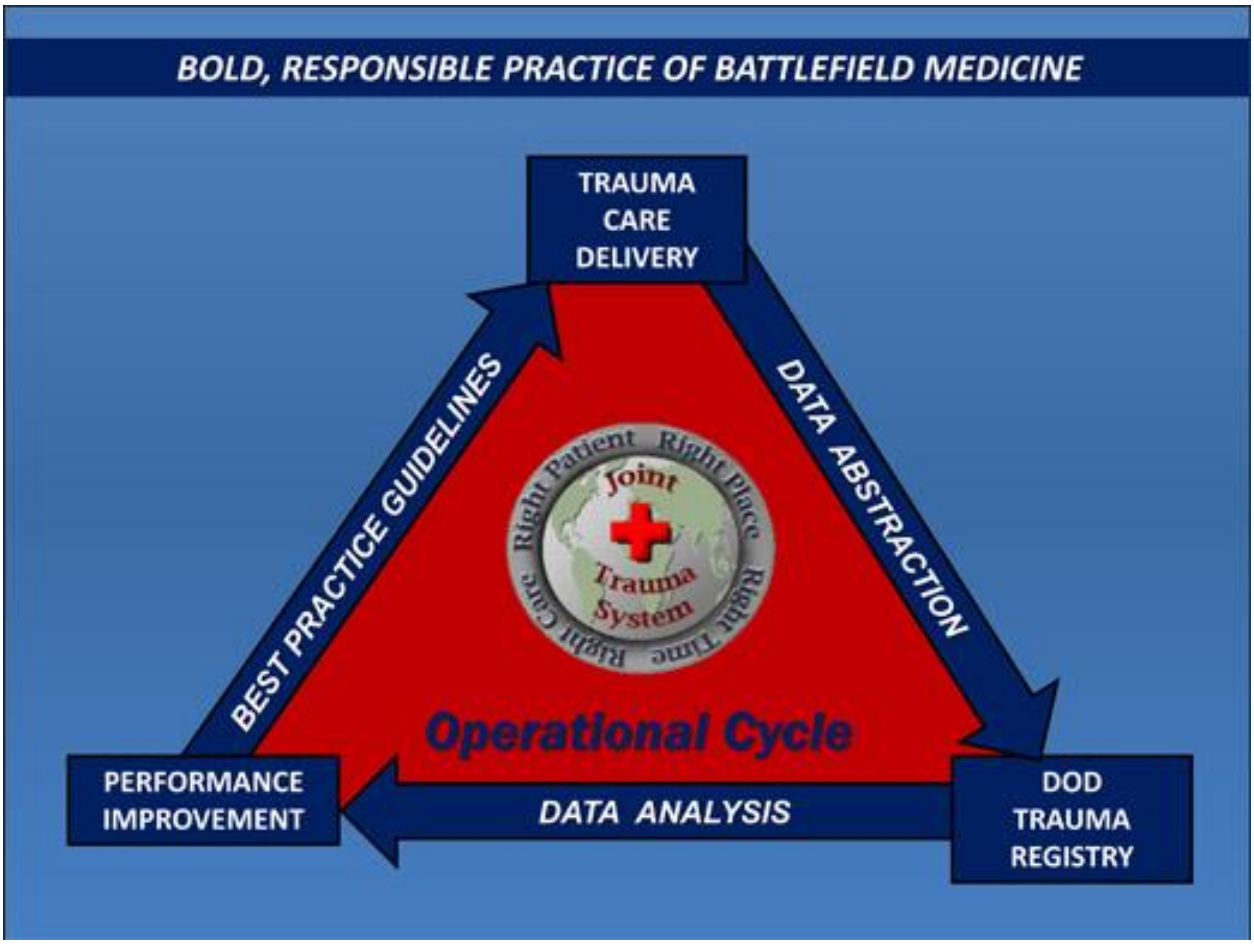
Committee on Surgical Combat Casualty Care

(CoSCCC)



Journal Watch

1st Quarter

2017

DECEMBER

Journal Watch Key Terminology Searched:

Microcirculation	Trauma Management	Haemorrhage
Shock	Sublingual	Ethics committees
Human subject research	IDF	Institutional review board
Haemorrhagic shock	Multiple trauma	Shock index
Traumatic brain injury	Coagulopathy	Diagnostic accuracy
Plasma	Pre-hospital	Thrombelastography (TEG)
Transfusion	Trauma	Imaging
RBCs	Resuscitation	Severe trauma
Stability	Ultrasound	

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Kawashima, H. (2016). Propensity-Matched Comparison of Percutaneous and Surgical Cut-Down Approaches in Transfemoral Transcatheter Aortic Valve Implantation using Balloon- Expandable Valve. *EuroIntervention journal*.

Naumann, D. (2016). Safety and feasibility of sublingual microcirculation assessment in the emergency department for civilian and military patients with traumatic haemorrhagic shock: a prospective cohort study. *BMJ Open*.

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Crit Care. 2016 Dec 15;20(1):400.

Resuscitative endovascular balloon occlusion of the aorta versus aortic cross clamping among patients with critical trauma: a nationwide cohort study in Japan.

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Abstract

BACKGROUND: Measures of aortic occlusion (AO) for resuscitation in patients with severe torso trauma remain controversial. Our aim was to characterize the current use of resuscitative endovascular balloon occlusion of the aorta (REBOA) and resuscitative open aortic cross-clamping (ACC), and to evaluate whether REBOA should be an alternative method to resuscitative open ACC.

METHODS: This study was a retrospective cohort study between 2004 and 2013 from a nationwide trauma registry in Japan. Participants were selected who underwent either REBOA or ACC. Their characteristics, interventions, and outcomes were analyzed to compare REBOA and ACC directly. The primary outcome was in-hospital mortality and the secondary outcome was mortality in the emergency department. Logistic regression analysis was performed to compare the outcomes between REBOA and ACC with adjustment for severity; 1:1 propensity score matching was also performed.

RESULTS: Of the 159,157 trauma patients, 903 were eligible based on the selection criteria. Overall, 405/607 patients (67%) who had REBOA died compared to 210/233 patients (90%) who had ACC. Patients with REBOA had higher revised trauma score (RTS) (mean ± SD, 5.2 ± 2.0 vs. 4.2 ± 2.2; $P < 0.001$) but higher Injury Severity Score (ISS) (median (interquartile); 34 (25) vs. 34 (20); $P < 0.001$), and higher probability of survival (0.43 ± 0.36 vs. 0.27 ± 0.30; $P < 0.001$) compared to those with ACC. REBOA had an odds ratio (OR) for in-hospital mortality of 0.309 (95% confidence interval (CI) = 0.190-0.502) adjusting for trauma and injury severity score using a logistic regression model (n = 903). Similar associations were observed adjusting for RTS (OR = 0.224; 95% CI = 0.129-0.700) or adjusting for ISS (OR, 0.188; 95% CI, 0.116 to 0.303). In the propensity score-matched cohort (n = 304), REBOA was associated with lower mortality compared to ACC (OR, 0.261; 95% CI, 0.130 to 0.523). Patients with REBOA had less severe chest complications than those with ACC (Abbreviated Injury Scale thorax, 3.8 ± 0.8 vs. 4.2 ± 0.8; $P < 0.001$), although physiological severity and backgrounds were similar in this population.

CONCLUSIONS: Patients who underwent AO had a high mortality. REBOA might be a favorable alternative method to resuscitative ACC for severe torso trauma although some indication bias could still remain. Further studies are needed to elucidate optimal indications.

PMID:27978846 PMCID:PMC5159991 DOI:10.1186/s13054-016-1577-x

Scand J Trauma Resusc Emerg Med. 2016 Dec 12;24(1):148.

Is the shock index based classification of hypovolemic shock applicable in multiple injured patients with severe traumatic brain injury?-an analysis of the TraumaRegister DGU®.

Fröhlich M[1,2,3], Driessen A[4,5], Böhmer A[6,5], Nienaber U[7,5], Igressa A[8,5], Probst C[4,5], Bouillon B[4,5], Maegele M[4,5], Mutschler M[4,5]; and the TraumaRegister DGU.

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Abstract

BACKGROUND: A new classification of hypovolemic shock based on the shock index (SI) was proposed in 2013. This classification contains four classes of shock and shows good correlation with acidosis, blood product need and mortality. Since their applicability was questioned, the aim of this study was to verify the validity of the new classification in multiple injured patients with traumatic brain injury.

METHODS: Between 2002 and 2013, data from 40 888 patients from the TraumaRegister DGU® were analysed. Patients were classified according to their initial SI at hospital admission (Class I: SI < 0.6, class II: SI ≥0.6 to <1.0, class III SI ≥1.0 to <1.4, class IV: SI ≥1.4). Patients with an additional severe TBI (AIS ≥ 3) were compared to patients without severe TBI.

RESULTS: 16,760 multiple injured patients with TBI (AIS_{head} ≥3) were compared to 24,128 patients without severe TBI. With worsening of SI class, mortality rate increased from 20 to 53% in TBI patients. Worsening SI classes were associated with decreased haemoglobin, platelet counts and Quick's values. The number of blood units transfused correlated with worsening of SI. Massive transfusion rates increased from 3% in class I to 46% in class IV. The accuracy for predicting transfusion requirements did not differ between TBI and Non TBI patients.

DISCUSSION: The use of the SI based classification enables a quick assessment of patients in hypovolemic shock based on universally available parameters. Although the pathophysiology in TBI and

Non TBI patients and early treatment methods such as the use of vasopressors differ, both groups showed an identical probability of receiving blood products within the respective SI class.

CONCLUSION: Regardless of the presence of TBI, the classification of hypovolemic shock based on the SI enables a fast and reliable assessment of hypovolemic shock in the emergency department. Therefore, the presented study supports the SI as a feasible tool to assess patients at risk for blood product transfusions, even in the presence of severe TBI.

PMID:27955692 PMCID:PMC5153863 DOI:10.1186/s13049-016-0340-2

Ann Intensive Care. 2016 Dec;6(1):62. doi: 10.1186/s13613-016-0166-0. Epub 2016 Jul 11.

Integrating eFAST in the initial management of stable trauma patients: the end of plain film radiography.

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Abstract

BACKGROUND: The initial management of a trauma patient is a critical and demanding period. The use of extended focused assessment sonography for trauma (eFAST) has become more prevalent in trauma rooms, raising questions about the real "added value" of chest X-rays (CXRs) and pelvic X-rays (PXR), particularly in haemodynamically stable trauma patients. The aim of this study was to evaluate the effectiveness of a management protocol integrating eFAST and excluding X-rays in stable trauma patients.

METHODS: This was a prospective, interventional, single-centre study including all primary blunt trauma patients admitted to the trauma bay with a suspicion of severe trauma. All patients underwent physical examination and eFAST (assessing abdomen, pelvis, pericardium and pleura) before a whole-body CT scan (WBCT). Patients fulfilling all stability criteria at any time in transit from the scene of the accident to the hospital were managed in the trauma bay without chest and PXR.

RESULTS: Amongst 430 patients, 148 fulfilled the stability criteria (stability criteria group) of which 122 (82 %) had no X-rays in the trauma bay. No diagnostic failure with an immediate clinical impact was identified in the stability criteria group (SC group). All cases of pneumothorax requiring chest drainage were identified by eFAST associated with a clinical examination before the WBCT scan in the SC group. The time spent in the trauma bay was significantly shorter for the SC group without X-rays compared to those who received any X-ray (25 [20; 35] vs. 38 [30; 60] min, respectively; $p < 0.0001$). An analysis of the cost and radiation exposure showed savings of 7000 € and 100 mSv, respectively.

CONCLUSIONS: No unrecognized diagnostic with a clinical impact due to the lack of CXR and PXR during the initial management of stable trauma patients was observed. The eFAST associated with physical examination provided the information necessary to safely complete the WBCT scan. It allowed a sensible cost and radiation saving.

PMID:27401440 PMCID:PMC4940356 DOI:10.1186/s13613-016-0166-0

Isr J Health Policy Res. 2016 Dec 1;5:53. eCollection 2016.

Ethical standards for medical research in the Israeli military - review of the changes in the last decade.

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Abstract

BACKGROUND: The Israel Defense Forces Medical Corps (IDF MC) institutional review board (IRB) is one of approximately 50 IRBs active in Israel. In addition to routine IRB considerations it must also address in its deliberations specific safeguards in place in the IDF to protect research volunteers in the military environment. In this report, we present the characteristics of the IDF IRB, including the unique circumstances that led to a 2008 change in the pre-IRB advisory and preparatory process (APP). We also present quantitative data on the IRB's throughput and outcomes, in order to provide a benchmark for other IRBs.

METHODS: We reviewed all relevant IDF regulations, both historical and current, pertaining to the structure, activity and oversight of the IRB and of medical research conducted in the IDF. Additionally, we analyzed the ethical review process for all research proposals submitted to the IDF APP between January 1, 2013 and December 31, 2015.

RESULTS: In 2008 the IDF implemented several major changes which have had a substantial impact on the ethical regulation of military medical research. The period following these changes has seen a rise in the number of research proposals submitted to the IDF IRB annually. During the years 2013-2015, 377 research proposals entered the APP, of which 329 were deemed appropriate for IRB deliberation. Eight study protocols were granted waivers, 19 were rejected, and the remaining 302 were authorized. Overall, 345 of the 377 research proposals submitted (92 %) were ultimately cleared for execution; 310 of 329 proposals (94 %) deliberated by the IRB were authorized. The IRB required protocol revisions for 47 % of the research proposals, one-third of which were revisions directly associated with military-specific ethical precautions.

CONCLUSIONS: Guided by the principles of protecting personal autonomy in the complex military setting, the IDF has implemented several unique measures aimed at maintaining the highest ethical standards in medical research. By sharing research approval process data similar to those presented here, medical institutions can help build and support a peer-based benchmarking process through which individual IRBs can appraise their own processes and approval rates.

PMID:27980720 PMCID:PMC5131518 DOI:10.1186/s13584-016-0113-4

Scand J Trauma Resusc Emerg Med. 2016 Dec 9;24(1):145.

Pre-hospital transfusion of plasma in hemorrhaging trauma patients independently improves hemostatic competence and acidosis.

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Abstract

BACKGROUND: The early use of blood products has been associated with improved patient outcomes following severe hemorrhage or traumatic injury. We aimed to investigate the influence of pre-hospital blood products (i.e. plasma and/or RBCs) on admission hemostatic properties and patient outcomes. We hypothesized that pre-hospital plasma would improve hemostatic function as evaluated by rapid thrombelastography (rTEG).

METHODS: We conducted a prospective observational study recruiting 257 trauma patients admitted to a Level I trauma center having received either blood products pre-hospital or in-hospital within 6 hours of admission. Clinical data on patient demographics, blood biochemistry, injury severity score and mortality were collected. Admission rTEG was conducted to characterize the coagulation profile and hemostatic function.

RESULTS: 75 patients received pre-hospital plasma and/or RBCs (PH group; nearly half received both RBCs and plasma) whereas 182 patients only received in-hospital blood products (RBCs, Plasma and Platelets) within 6 hours of admission (IH group). PH patients had lower Glasgow coma scale (GCS) scores, more penetrating injuries, lower systolic blood pressures, lower hemoglobin levels, lower platelet counts and greater acidosis upon ED admission than the IH group (all $p < 0.05$). Despite differences in type of injury and admission vitals indicating that the PH group had more signs of bleeding than the IH group, there were no significant differences in in-hospital mortality (PH 26.7% vs. IH 20.9% $p = 0.31$). When comparing rTEG variables between PH patients transfused with 0, 1 or 2 units of plasma, more pre-hospital plasma transfusion was tendency towards improved rTEG variables. When adjusting for pre-hospital RBC, pre-hospital plasma was associated with significantly higher rTEG MA ($p = 0.012$) at hospital admission.

DISCUSSION: After adjusting for pre-hospital RBCs, pre-hospital plasma transfusion was independently associated with increased rTEG MA, as well as arrival indices of shock and hemodynamic instability. Besides more severe injury and worse clinical presentation, the group that received pre-hospital transfusion had early and late mortality similar to patients not transfused pre-hospital.

CONCLUSIONS: These data suggest that early administration of plasma can provide significant hemostatic and potential survival benefit to severely hemorrhaging trauma patients.

PMID:27938373 PMCID:PMC5148857 DOI:10.1186/s13049-016-0327-z

HPB (Oxford). 2016 Dec;18(12):991-999. doi: 10.1016/j.hpb.2016.09.005. Epub 2016 Oct 18.

Major liver resection, systemic fibrinolytic activity, and the impact of tranexamic acid.

Karanicolas PJ[1], Lin Y[2], Tarshis J[3], Law CH[4], Coburn NG[4], Hallet J[4], Nascimento B[4], Pawliszyn J[5], McCluskey SA[6].

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Abstract

BACKGROUND: Hyperfibrinolysis may occur due to systemic inflammation or hepatic injury that occurs during liver resection. Tranexamic acid (TXA) is an anti-fibrinolytic agent that decreases bleeding in various settings, but has not been well studied in patients undergoing liver resection.

METHODS: In this prospective, phase II trial, 18 patients undergoing major liver resection were sequentially assigned to one of three cohorts: (i) Control (no TXA); (ii) TXA Dose I - 1 g bolus followed by 1 g infusion over 8 h; (iii) TXA Dose II - 1 g bolus followed by 10 mg/kg/hr until the end of surgery. Serial blood samples were collected for thromboelastography (TEG), coagulation components and TXA concentration.

RESULTS: No abnormalities in hemostatic function were identified on TEG. PAP complex levels increased to peak at 1106 μg/L (normal 0-512 μg/L) following parenchymal transection, then decreased to baseline by the morning following surgery. TXA reached stable, therapeutic concentrations early in both dosing regimens. There were no differences between patients based on TXA.

CONCLUSIONS: There is no thromboelastographic evidence of hyperfibrinolysis in patients undergoing major liver resection. TXA does not influence the change in systemic fibrinolysis; it may reduce bleeding through a different mechanism of action. Registered with ClinicalTrials.gov: NCT01651182.

PMID:27765582 PMCID:PMC5144548 DOI:10.1016/j.hpb.2016.09.005

EuroIntervention. 2016 Dec 20. pii: EIJ-D-16-00408. doi: 10.4244/EIJ-D-16-00408. [Epub ahead of print]

Propensity-Matched Comparison of Percutaneous and Surgical Cut-Down Approaches in Transfemoral Transcatheter Aortic Valve Implantation using Balloon- Expandable Valve.

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Abstract

AIMS: This study compared the clinical outcomes of patients undergoing transfemoral-transcatheter aortic valve implantation (TAVI) via a percutaneous or surgical cut-down approach.

METHODS AND RESULTS: Between October 2013 and July 2015, 586 patients underwent transfemoral TAVI according to the Optimized CathEter vAlvular iNtervention (OCEAN)-TAVI registry (percutaneous approach, n = 305; surgical cut-down approach, n = 281). After propensity matching, 166 patients underwent transfemoral TAVI via each approach. Major vascular complications, as defined per the Valve Academic Research Consortium-2 criteria, were found less frequently in patients who underwent a percutaneous approach (15.1% vs. 27.1%, p < 0.01), and femoral artery injuries needing surgical repair were mostly the result of a closure device failure (seven cases, 4.2%). In these patients, major bleeding was less (7.2% vs. 16.9%, p = 0.01) and blood transfusion less frequent (21.1% vs. 38.0%, p < 0.01); therefore, the cases of acute kidney injuries (AKI) were rare (6.0% vs. 15.1%, p < 0.01).

CONCLUSIONS: Transfemoral TAVI using the percutaneous approach proved safe and feasible and resulted in fewer events of major vascular complications, bleeding, and AKI compared to the surgical cut-down approach.

PMID:27746402 DOI:10.4244/EIJ-D-16-00408

BMJ Open. 2016 Dec 21;6(12):e014162. doi: 10.1136/bmjopen-2016-014162.

Safety and feasibility of sublingual microcirculation assessment in the emergency department for civilian and military patients with traumatic haemorrhagic shock: a prospective cohort study.

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Abstract

OBJECTIVES: Sublingual microcirculatory monitoring for traumatic haemorrhagic shock (THS) may predict clinical outcomes better than traditional blood pressure and cardiac output, but is not usually performed until the patient reaches the intensive care unit (ICU), missing earlier data of potential importance. This pilot study assessed for the first time the feasibility and safety of sublingual video-microscopy for THS in the emergency department (ED), and whether it yields useable data for analysis.

SETTING: A safety and feasibility assessment was undertaken as part of the prospective observational MICROSHOCK study; sublingual video-microscopy was performed at the UK-led Role 3 medical facility at Camp Bastion, Afghanistan, and in the ED in 3 UK Major Trauma Centres.

PARTICIPANTS: There were 15 casualties (2 military, 13 civilian) who presented with traumatic haemorrhagic shock with a median injury severity score of 26. The median age was 41; the majority (n=12) were male. The most common injury mechanism was road traffic accident.

PRIMARY AND SECONDARY OUTCOME MEASURES: Safety and feasibility were the primary outcomes, as measured by lack of adverse events or clinical interruptions, and successful acquisition and storage of data. The secondary outcome was the quality of acquired video clips according to validated criteria, in order to determine whether useful data could be obtained in this emergency context.

RESULTS: Video-microscopy was successfully performed and stored for analysis for all patients, yielding 161 video clips. There were no adverse events or episodes where clinical management was affected or interrupted. There were 104 (64.6%) video clips from 14 patients of sufficient quality for analysis.

CONCLUSIONS: Early sublingual microcirculatory monitoring in the ED for patients with THS is safe and feasible, even in a deployed military setting, and yields videos of satisfactory quality in a high proportion of cases. Further investigations of early microcirculatory behaviour in this context are warranted.

TRIAL REGISTRATION NUMBER: NCT02111109.

PMID:28003301 PMCID:PMC5223697 DOI:10.1136/bmjopen-2016-014162

PLoS One. 2016 Dec 13;11(12):e0168401. doi: 10.1371/journal.pone.0168401. eCollection 2016.

Transfusion: -80°C Frozen Blood Products Are Safe and Effective in Military Casualty Care.

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Abstract

INTRODUCTION: The Netherlands Armed Forces use -80°C frozen red blood cells (RBCs), plasma and platelets combined with regular liquid stored RBCs, for the treatment of (military) casualties in Medical Treatment Facilities abroad. Our objective was to assess and compare the use of -80°C frozen blood products in combination with the different transfusion protocols and their effect on the outcome of trauma casualties.

MATERIALS AND METHODS: Hemovigilance and combat casualties data from Afghanistan 2006-2010 for 272 (military) trauma casualties with or without massive transfusions (MT: ≥6 RBC/24hr, N = 82 and non-MT: 1-5 RBC/24hr, N = 190) were analyzed retrospectively. In November 2007, a massive transfusion protocol (MTP; 4:3:1 RBC:Plasma:Platelets) for ATLS® class III/IV hemorrhage was introduced in military theatre. Blood product use, injury severity and mortality were assessed pre- and post-introduction of the MTP. Data were compared to civilian and military trauma studies to assess effectiveness of the frozen blood products and MTP.

RESULTS: No ABO incompatible blood products were transfused and only 1 mild transfusion reaction was observed with 3,060 transfused products. In hospital mortality decreased post-MTP for MT patients from 44% to 14% (P = 0.005) and for non-MT patients from 12.7% to 5.9% (P = 0.139). Average 24-hour RBC, plasma and platelet ratios were comparable and accompanying 24-hour mortality rates were low compared to studies that used similar numbers of liquid stored (and on site donated) blood products.

CONCLUSION: This report describes for the first time that the combination of -80°C frozen platelets, plasma and red cells is safe and at least as effective as standard blood products in the treatment of (military) trauma casualties. Frozen blood can save the lives of casualties of armed conflict without the need for in-theatre blood collection. These results may also contribute to solutions for logistic problems in civilian blood supply in remote areas.

PMID:27959967 PMCID:PMC5154589 DOI:10.1371/journal.pone.0168401

JANUARY

Journal Watch Key Terminology Searched:

Afghanistan	Blast	Facial trauma	War
Amputation	Multiple	Transfusion	Traumatic Clinical outcomes
Clinical parameters	Damage control	Injury	Pelvic fracture
Trauma	Coagulopathy	Cryoprecipitate	Fibrinogen
Fibrinogen concentrate	Massive transfusion	Trauma	ABO
Viscoelastic haemostatic assays		Angiography	External fixation
Guidelines	Injury	Internal fixation	Management
Mechanic	Pelvic	Pelvic ring fractures	X-ray
Pre-peritoneal pelvic packing	REBOA	Trauma	Antibiotic prophylaxis
Long bone fractures	Orthopaedic trauma	Perioperative antibiotics	
Surgical site infection			

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Eur J Trauma Emerg Surg. 2017 Jan 13. doi: 10.1007/s00068-016-0754-6. [Epub ahead of print]

Impact of pelvic fractures on the early clinical outcomes of severely injured trauma patients.

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Abstract

BACKGROUND: Pelvic fractures contribute to morbidity and mortality following injury. We sought to study the impact of pelvic fractures on the clinical course and outcomes of trauma patients with a pelvic fracture in comparison to patients with similar injury severity without pelvic fracture to identify potential parameters to track patients' clinical course post-injury.

METHODS: A cohort of 206 consecutive blunt trauma survivors, studied over a 5-year period in a level I trauma center of which 75 patients (36.4%) had a pelvic fracture, was included in the study. To perform a retrospective cohort study with matched controls, 60 patients of the pelvic fracture group [(PF), 41 males and 19 females; age: 40 ± 17; injury severity score (ISS): 26.6 ± 9.3] were compared to 60 patients without pelvic fracture (non-PF) trauma as controls (41 males and 19 females; age: 40 ± 13; ISS: 26.9 ± 7.7), both with matching age (±5 years), sex, and ISS (±5 points).

RESULTS: Statistically significant differences were observed in Intensive Care Unit (ICU) length of stay (LOS), total LOS, and Marshall MOD score between PF and non-PF groups, respectively. Acid-base markers such as pH, lactate, LDH, and base deficit were all significantly altered in PF compared to non-PF cohort upon admission. Moreover, our analysis showed significant differences in inflammatory biomarkers (Prolactin, CRP, and IL-6), and clinical parameters (CPK, Hgb, Platelets count, and WBC) over the 7-day clinical course in patients with PF when compared to non-PF cohort.

CONCLUSION: In this matched cohort, patients with pelvic fractures exhibited biochemical and physiological alterations upon admission. Furthermore, our results suggest that pelvic fracture affects the clinical outcomes in severely injured patients, independently of injury severity, mechanism of injury, age or gender.

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Pelvic trauma: WSES classification and guidelines.

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Abstract

Complex pelvic injuries are among the most dangerous and deadly trauma related lesions. Different classification systems exist, some are based on the mechanism of injury, some on anatomic patterns and some are focusing on the resulting instability requiring operative fixation. The optimal treatment strategy, however, should keep into consideration the hemodynamic status, the anatomic impairment of pelvic ring function and the associated injuries. The management of pelvic trauma patients aims definitively to restore the homeostasis and the normal physiopathology associated to the mechanical stability of the pelvic ring. Thus the management of pelvic trauma must be multidisciplinary and should be ultimately based on the physiology of the patient and the anatomy of the injury. This paper presents the World Society of Emergency Surgery (WSES) classification of pelvic trauma and the management Guidelines.

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Postdischarge Cause-of-Death Analysis of Combat-Related Burn Patients.

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Abstract

Combat operations in Iraq and Afghanistan have resulted in up to 8.8% of combat-related casualties suffering burns. From World War I through Desert Storm, burns have been associated with approximately 4% of the combat-related deaths. Experiencing a blast injury and exposure to killing and death while deployed has been shown to increase suicide risk. Although several studies of military populations have investigated risk factors for death among burn patients during the acute phase, no studies have reported mortality rates, cause-of-death, or the prevalence of suicide after hospital discharge. This study examined the case fatality rate, causes of death, and the prevalence of suicide among 830 combat burn patients discharged from the sole burn center in the U.S. Department of Defense, between March 7, 2003 and March 6, 2013. Cause-of-death was determined through the Armed Forces Medical Examiner's Office and the Office of the Secretary of Defense's National Death Index. A total of 11 deaths occurred among the 830 burn survivors, for an overall case fatality rate of 1.3%. Of the 11 who died, five deaths were related to accidental poisoning by exposure to drugs; three were related to operations of war (two after returning to the war zone), and the remaining three died from other accidental causes (one explosion and two vehicle crashes). There was no indication of suicide or suspicion of suicide as a cause-of-death for the former patients included in this study, suggesting that combat burn injury did not appear to increase the risk of death by suicide in our study population. Further research is needed to understand the factors that contribute to the apparent resilience of combat burn survivors.

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Patient Saf Surg. 2017 Jan 16;11:2. doi: 10.1186/s13037-016-0118-5. eCollection 2017.

Current practice of antibiotic prophylaxis for surgical fixation of closed long bone fractures: a survey of 297 members of the Orthopaedic Trauma Association.

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Abstract

BACKGROUND: The risk of postoperative surgical site infection after long bone fracture fixation can be decreased with appropriate antibiotic use. However, there is no agreement on the superiority of a single- or multiple-dose perioperative regimen of antibiotic prophylaxis. The purpose of this study is to determine the following: 1) What are the current practice patterns of orthopaedic trauma surgeons in using perioperative antibiotics for closed long bone fractures? 2) What is the current knowledge of published antibiotic prophylaxis guidelines among orthopaedic trauma surgeons? 3) Are orthopaedic surgeons willing to change their current practices?

METHODS: A questionnaire was distributed via email between September and December 2015 to 955 Orthopaedic Trauma Association members, of whom 297 (31%) responded.

RESULTS: Most surgeons (96%) use cefazolin as first-line infection prophylaxis. Fifty-nine percent used a multiple-dose antibiotic regimen, 39% used a single-dose regimen, and 2% varied this decision according to patient factors. Thirty-six percent said they were unfamiliar with Centers for Disease Control and Prevention (CDC) antibiotic prophylaxis guidelines; only 30% were able to select the correct CDC recommendation from a multiple-choice list. However, 44% of surgeons said they followed CDC recommendations. Fifty-six percent answered that a single-dose antibiotic prophylaxis regimen was not inferior to a multiple-dose regimen. If a level-I study comparing a single preoperative dose versus multiple perioperative antibiotic dosing regimen for treatment of closed long bone fractures were published, most respondents (64%) said they would fully follow these guidelines, and 22% said they would partially change their practice to follow these guidelines.

CONCLUSION: There is heterogeneity in the use of single- versus multiple-dose antibiotic prophylaxis for surgical repair of closed long bone fractures. Many surgeons were unsure of current evidence-based recommendations regarding perioperative antibiotic use. Most respondents indicated they would be receptive to high-level evidence regarding the single- versus multiple-dose perioperative prophylactic antibiotics for the treatment of closed long bone fractures.

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Patients with multiple traumatic amputations: An analysis of operation enduring freedom joint theatre trauma registry data.

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Abstract

INTRODUCTION: Improvised Explosive Devices (IED) are the primary wounding mechanism for casualties in Operation Enduring Freedom. Patients can sustain devastating traumatic amputations, which are unlike injuries seen in the civilian trauma sector. This is a database analysis of the largest patient registry of multiple traumatic amputations.

METHODS: The Joint Theater Trauma Registry was queried for patients with a traumatic amputation from 2009 to 2012. Data obtained included the Injury Severity Score (ISS), Glasgow Coma Score (GCS), blood products, transfer from theatre, and complications including DVT, PE, infection (Acinetobacter and fungal), acute renal failure, and rhabdomyolysis. Comparisons were made between number of major amputations (1-4) and specific outcomes using χ^2 and Pearson's rank test, and multivariable logistic regression was performed for 30-day survival. Significance was considered with $p<0.05$.

RESULTS: We identified 720 military personnel with at least one traumatic amputation: 494 single, 191 double, 32 triple, and 3 quad amputees. Average age was 24.3 years (18-46), median ISS 24 (9-66), and GCS 15 (3-15). Tranexamic acid (TXA) was administered in 164 patients (23%) and tourniquets were used in 575 (80%). Both TXA and tourniquet use increased with increasing number of amputations ($p<0.001$). Average transfusion requirements (in units) were packed red blood cells (PRBC) 18.6 (0-142), fresh frozen plasma (FFP) 17.3 (0-128), platelets 3.6 (0-26), and cryoprecipitate 5.6 (0-130). Transfusion of all blood products increased with the number of amputations ($p<0.001$). All complications tested increased with the number of amputations except Acinetobacter infection, coagulopathy, and compartment syndrome. Transfer to higher acuity facilities was achieved in 676 patients (94%).

CONCLUSION: Traumatic amputations from blast injuries require significant blood product transfusion, which increases with the number of amputations. Most complications also increase with the number of amputations. Despite high injury severity, 94% of traumatic amputation patients who are alive upon admission to a role II/III facility will survive to transfer to facilities with higher acuity care.

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The Surgical Outcome of Traumatic Extraaxial Hematomas Causing Brain Herniation.

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Abstract

AIM: The aim of this study was to assess the surgical outcome and the prognostic importance of clinical and radiological data of patients operated emergently for an extraaxial hematoma causing brain herniation.

MATERIAL AND METHODS: This retrospective study comprised 108 adult patients who were operated due to herniated traumatic extraaxial hematomas from January 2000 to January 2013.

RESULTS: Of 108 patients, 63 patients (58.3%) were diagnosed as subdural hematoma (SDH), and 45 patients (41.7%) as epidural hematoma (EDH). An unfavorable outcome was significantly increased for patients who were diagnosed as SDH (90.4%) compared with EDH patients (33.3%). Mortality rate for herniated SDH patients was 65.1%, and 26.6% for herniated EDH patients. High mortality and unfavorable outcome ratios were associated with Glasgow Coma Scale scores at admission, mean postoperative intracranial pressure (ICP) values, type of the brain herniation, interval from the time of trauma to the time of hematoma decompression, the duration of the brain herniation, intraoperative acute brain swelling, hematoma volume and thickness, degree of the midline shift and the obliteration of the basal cisterns.

CONCLUSION: Our data showed that, postoperative ICP values were one most important predictor of the mortality. We recommended postoperative ICP monitoring for all patients presenting with the brain herniation due to traumatic extraaxial hematoma.

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There's an app for that: A handheld smartphone-based infrared imaging device to assess adequacy and level of aortic occlusion during REBOA.

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Abstract

BACKGROUND: Advances in thermal imaging devices have made them an appealing noninvasive point-of-care imaging adjunct in the trauma setting. We sought to assess whether a smartphone-based infrared imaging device (SBIR) could determine presence and location of aortic occlusion in a swine model. We hypothesized that various levels of aortic occlusion would transmit significantly different heat signatures at various anatomical points.

METHODS: Six swine (35-50 kg) underwent sequential zone 1 (Z1) aortic cross clamping as well as zone 3 (Z3) aortic balloon occlusion (resuscitative endovascular balloon occlusion of the aorta [REBOA]). SBIR images and readings (FLIR One) were taken at five anatomic points (axilla [A], subcostal [S], umbilical [U], inguinal [I], medial malleolar [M]) and were used to determine significant thermal trends 5 minutes to 10 minutes after Z1 and Z3 occlusion. Significant ($p \leq 0.05$) thermal ratio patterns were identified and compared among groups, and images were reviewed for obvious qualitative differences at the various levels of occlusion.

RESULTS: Body temperatures were similar during control (CON), Z1 occlusion, and Z3 occlusion, ranging from 94.0 °F to 100.9 °F ($p = 0.126$). No significant temperature differences were found among A, S, U, I, M points prior to and after aortic occlusions. Among the anatomical 2-point ratios evaluated, A/M and S/M ratios were the best predictors of aortic occlusion, whether at Z1 (8.2 °F, $p < 0.01$; 10.9 °F, $p < 0.01$) or Z3 (7.3 °F, $p < 0.01$; 8.4 °F, $p < 0.01$), respectively. The best predictor of Z1 versus Z3 level of occlusion was the S/I ratio (5.2 °F, $p < 0.05$ vs. 3.4 °F, $p = 0.27$). SBIR generated qualitatively different thermal signatures among groups.

CONCLUSION: SBIR was capable of detecting thermal trends during Z1 and Z3 aortic occlusion by using an anatomical 2-point thermal ratio. There were also easily recognized qualitative differences between control and occlusion images that would allow immediate determination of adequate occlusion of the aorta. SBIR represents a potential inexpensive and accurate tool for assessing perfusion, adequate REBOA placement, and even the aortic level of occlusion.

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Mil Med. 2017 Jan;182(1):e1614-e1618. doi: 10.7205/MILMED-D-15-00590.

Single Neurosurgeon Operative Experience at Craig Joint Theater Hospital During the Afghanistan Surge (November 2010 to April 2011), Part II: Humanitarian Cases.

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Abstract

BACKGROUND: The Afghanistan Surge saw NATO troops working with their Afghan partners to remove Taliban governance and replace it with a more democratic model. As part of this endeavor, medical support for both trauma and humanitarian cases was needed.

OBJECTIVE: Identify and discuss disease trends to better prepare for future combat medical treatments.

METHODS: Retrospective review of operative experience from a neurosurgeon from November 2010 to April 2011.

RESULTS: 63 cases were performed on 20 NATO and 43 Afghan patients. Combat-related neurotrauma represented 73% (46/63) of cases and humanitarian cases represented the remainder. The most common diseases among humanitarian cases were benign tumors (29%, 5/17), cranioplasty (23%, 4/17), obstructive hydrocephalus (11%, 2/17), nonobstructive hydrocephalus (11%, 2/17), hemifacial spasm (11%, 2/17), and cerebral angiography (11%, 2/17). There was 1 death from ventriculitis for a complication rate of 6%.

CONCLUSION: In select well-nourished, patients with minimal risk of needing tracheostomy, humanitarian neurosurgery can be safely performed in theater with a complication rate (6%) no worse than patients operated on in the United States.

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Injury. 2016 Dec 26. pii: S0020-1383(16)30818-X. doi: 10.1016/j.injury.2016.12.012. [Epub ahead of print]

Fibrinogen in traumatic haemorrhage: A narrative review.

Winearls J[1], Campbell D[2], Hurn C[3], Furyk J[4], Ryan G[5], Trout M[6], Walsham J[7], Holley A[8], Shuttleworth M[9], Dyer W[10], Keijzers G[11], Presneill J[12], Fraser JF[13], Wullschleger M[14].

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AbstractHaemorrhage in the setting of severe trauma is associated with significant morbidity and mortality. There is increasing awareness of the important role fibrinogen plays in traumatic haemorrhage. Fibrinogen levels fall precipitously in severe trauma and the resultant hypofibrinogenaemia is associated with poor outcomes. Hence, it has been postulated that early fibrinogen replacement in severe traumatic haemorrhage may improve outcomes, although, to date there is a paucity of high quality evidence to support this hypothesis. In addition there is controversy regarding the optimal method for fibrinogen supplementation. We review the current evidence regarding the role of fibrinogen in trauma, the rationale behind fibrinogen supplementation and discuss current research.

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The surgical management of facial trauma in British soldiers during combat operations in Afghanistan.

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Abstract

INTRODUCTION: The recent Afghanistan conflict caused a higher proportion of casualties with facial injuries due to both the increasing effectiveness of combat body armour and the insurgent use of the improvised explosive device (IED). The aim of this study was to describe all injuries to the face sustained by UK service personnel from blast or gunshot wounds during the highest intensity period of combat operations in Afghanistan.

METHODS: Hospital records and Joint Theatre Trauma Registry data were collected for all UK service personnel killed or wounded by blast and gunshot wounds in Afghanistan between 01 April 2006 and 01 March 2013.

RESULTS: 566 casualties were identified, 504 from blast and 52 from gunshot injuries. 75% of blast injury casualties survived and the IED was the most common mechanism of injury with the mid-face the most commonly affected facial region. In blast injuries a facial fracture was a significant marker for increased total injury severity score. A facial gunshot wound was fatal in 53% of cases. The majority of survivors required a single surgical procedure for the facial injury but further reconstruction was required in 156 of the 375 of survivors aero medically evacuated to the UK.

CONCLUSIONS: The presence and pattern of facial fractures was significantly different in survivors and fatalities, which may reflect the power of the blast that these cohorts were exposed to. The Anatomical Injury Scoring of the Injury Severity Scale was inadequate for determining the extent of soft tissue facial injuries and did not predict morbidity of the injury.

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FEBRUARY

Journal Watch Key Terminology Searched:

Afghanistan	Blast	Facial trauma	War
Amputation	Multiple	Transfusion	Traumatic Clinical outcomes
Clinical parameters	Damage control	Injury	Pelvic fracture
Trauma	Coagulopathy	Cryoprecipitate	Fibrinogen
Fibrinogen concentrate	Massive transfusion	Trauma	ABO
Viscoelastic haemostatic assays		Angiography	External fixation
Guidelines	Injury	Internal fixation	Management
Mechanic	Pelvic	Pelvic ring fractures	X-ray
Pre-peritoneal pelvic packing	REBOA	Trauma	Antibiotic prophylaxis
Long bone fractures	Orthopaedic trauma	Perioperative antibiotics	
Surgical site infection	Cause of injury	Head injuries	Wound ballistics

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A systematic review of military head injuries.

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Abstract

INTRODUCTION: This commissioned review discusses military head injuries caused by non-ballistic impacts, penetrating fragments and bullets (including parts of bullets) and behind helmet blunt trauma (BHBT).

METHOD: A systematic review of the literature was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses method. The openly accessible literature was reviewed to investigate military head injuries and their severity.

RESULTS: Fifty-four sources were identified that included pertinent openly accessible information relevant to this topic. Limited injury data exist for non-ballistic head injuries for UK forces, although some international data exist for parachutists. The majority of fatal head injuries are due to projectiles penetrating through the face rather than through the area of the head covered by the helmet. Penetrating head injuries are primarily caused by fragments, but helmets are more commonly perforated by high-energy rifle bullets than by fragments. No reports of a BHBT injury have been located in the literature.

CONCLUSIONS: The description of body segment varies among articles and this makes comparisons among datasets difficult. There is a lack of detail regarding the precise position and severity of injuries, and long-term outcome for casualties. It is demonstrated that wearing military helmets reduces fatalities on and off the battlefield. The risk of BHBT injuries is widely referred to, but evidence of their occurrence is not provided by the authors that describe the risk of BHBT occurring. Further research into the causes and severity of head injuries would be useful for designers of military helmets and other associated personal protective equipment, particularly as advances in materials technology means lighter, thinner and more protective helmets are achievable.

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Resuscitation with Lyophilized Plasma is Safe and Improves Neurologic Recovery in a Long-Term Survival Model of Swine Subjected to Traumatic Brain Injury, Hemorrhagic Shock, and Polytrauma.

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Abstract

We have previously shown that fresh frozen plasma (FFP) and lyophilized plasma decrease brain lesion size and improve neurologic recovery in a swine model of traumatic brain injury (TBI) and hemorrhagic shock (HS). In this study, we examine whether these findings can be validated in a clinically relevant model of severe TBI, HS, and polytrauma. Female Yorkshire swine were subjected to TBI (controlled cortical impact), hemorrhage (40% volume), grade III liver and splenic injuries, rib fracture, and rectus abdominis crush. The animals were maintained in a state of shock (mean arterial pressure 30-35 mm Hg) for two hours, and then randomized to resuscitation with normal saline (NS), FFP, or LP (n=5 swine/group). Animals were recovered and monitored for 30 days, during which time neurologic recovery was assessed. Brain lesion sizes were measured via magnetic resonance imaging (MRI) on post-injury days (PID) 3 and 10. Animals were euthanized on PID30. The severity of shock and response to resuscitation was similar in all groups. When compared to NS-treated animals, plasma-treated animals (FFP and LP) had significantly lower neurologic severity scores (PID 1-7) and a faster return to baseline neurologic function. There was no significant difference in brain lesion sizes between groups. LP treatment was well tolerated and similar to FFP. In this clinically relevant large animal model of severe TBI, HS, and polytrauma, we have shown that plasma based resuscitation strategies are safe and result in neurocognitive recovery that is faster than recovery following NS based resuscitation.

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Potential benefits of an integrated military/civilian trauma system: experiences from two major regional conflicts.

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Abstract

BACKGROUND: Although differences of opinion and controversies may arise, lessons learned from military conflicts often translate into improvements in triage, resuscitation strategies, and surgical technique. Our fully integrated national trauma system, providing care for both military and civilian casualties, necessitates close cooperation between all aspects of both sectors. We theorized that lessons learned from two regional conflicts over 8 years, with resultant improved triage, reduced hospital length of stay, and sustained low mortality would aid performance improvement and provide evidence of overall trauma system maturation.

METHODS: We performed an 8 year, retrospective analysis of the Israeli National Trauma Registry prospective data base for all casualties presenting to level 1 and 2 trauma centers nationwide during an earlier conflict (W1) (7/12/06-8/14/06) and sought to compare results to those of a more recent war(W2), (7/08/14-08/26/14), as well as to compare our results to non-war civilian morbidity and mortality during the same time frame. Of particular interest were: casualty distributions, injuries/ISS, patterns of evacuation/triage, hospital length of stay, and mortality.

RESULTS: Data on 919 war casualties was available for evaluation. Of 490 evacuated during W1, 341 (70%) were transferred to Level 1 centers, compared with 307 (72%) from the 429 casualties in W2. In W2, significantly more severe injuries (ISS ≥16) were evacuated directly to level 1 centers (42, 76% vs. 20, 43% respectively; $p = 0.0007$). W2 vs. W1 saw a significant increase in evacuations using helicopter (219,51% vs. 180,37%; $p < 0.0001$) and increase in ISS ≥16: (66; 15.5% vs. 55; 11%, $p = 0.057$). In W2 vs. W1, less late inter-hospital transfers occurred: (48, 11% vs. 149, 30%, $p < 0.0001$); and there was a reduction in admission ≥ 7 days (90,22%vs 154,32%, $p = 0.0009$). These results persisted in logistic regression analyses, when controlling for ISS..Mortality was not significantly changed either overall or for injures with ISS ≥ 16: (1.2%in W1 vs. 1.9% in W2, $p = 0.59$, 10.9% in W1 vs. 10.6% in W2, $p = 1.0$, respectively). When compared to civilian related, (non-war) mortality during the same 8 year time frame, overall mortality was unchanged (1.6% vs. 1.8%, $p = 0.38$), although there was a noteworthy significant decrease in mortality over time for ISS ≥ 16: 12.1 vs. 9.4 ($p = 0.012$), and a concomitant reduction in late inter-hospital transfers (9.8 vs. 7.5, $p < 0.0001$).

CONCLUSION: Despite more severe injuries in the most recent regional conflict, there was increased direct triage via helicopter to level 1 centers, reduced inter-hospital transfers, reduced hospital length of stay, and persistent low mortality. Although further assessment is required, these data suggest that via ongoing cooperation in a culture of improved preparedness, an integrated military/civilian national trauma network has also positively impacted civilian results via reduced mortality in ISS ≥ 16 and reduced late inter-hospital transfers. These findings support continued maturation of the system as a whole.

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Overseas organ donation during wartime operations: Benchmarking military performance against civilian practice.

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Abstract

BACKGROUND: Over the past 15 years of war, eligible U.S. military members donated organs overseas in Germany. Our hypothesis was that outcomes at a military treatment facility were comparable to a civilian cohort.

METHODS: Military donors were matched 1:3 with a donor cohort from the U.S. United Network for Organ Sharing. Data were compared using univariate and multivariate analysis. Significance set at $p < 0.05$.

RESULTS: Forty military organ donors were compared with 116 civilian matched donors. The military cohort conversion rate was 75.5% and recovered more organs per donor (4.6 vs. 4.0, $p = 0.02$) with more transplants (4.2 vs 3.5, $p = 0.01$). Multivariate analysis controlling for sex, age, and type of organ donation showed no difference in odds of total organs donated in the military versus civilian cohort (odds ratio 2.1, 95% CI 0.87-5.24, $p = 0.10$).

CONCLUSIONS: Organ donation at a military treatment facility overseas can be accomplished successfully.

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MARCH

Journal Watch Key Terminology Searched:

Afghanistan	Blast	Facial trauma	War
Amputation	Multiple	Transfusion	Traumatic Clinical outcomes
Clinical parameters	Damage control	Injury	Pelvic fracture
Trauma	Coagulopathy	Cryoprecipitate	Fibrinogen
Fibrinogen concentrate	Massive transfusion	Trauma	ABO
Viscoelastic haemostatic assays		Angiography	External fixation
Guidelines	Injury	Internal fixation	Management
Mechanic	Pelvic	Pelvic ring fractures	X-ray
Pre-peritoneal pelvic packing	REBOA	Trauma	Antibiotic prophylaxis
Long bone fractures	Orthopaedic trauma	Perioperative antibiotics	colorectal trauma
Faecal diversion	Primary repair	Surgical site infection	Cause of injury
Head injuries	Wound ballistics		

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Wilderness Environ Med. 2017 Mar 16. pii: S1080-6032(16)30287-3. doi: 10.1016/j.wem.2016.12.005. [Epub ahead of print]

Bleeding Control Using Hemostatic Dressings: Lessons Learned.

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Abstract

Based on lessons learned, many military battlefield trauma advances ultimately transition to enhance civilian trauma care. However, even with major strides to enhance battlefield hemorrhage control, it is unclear how effectively these techniques and products are being translated to civilian trauma. The purpose of this brief review is to present the evidence of current hemostatic product effectiveness, determine the evidence for transitioning of this technology to prehospital civilian application, and provide recommendations about potential use in the wilderness/austere setting. It is concluded that there is adequate evidence of hemorrhage control effectiveness in both military and civilian preclinical studies and clinical case series. The Committee on Tactical Combat Casualty Care recommends implementing approved hemostatic dressings as one part of a comprehensive hemorrhage control training and clinical management program. These recommendations for hemostatic dressings use by public safety and laypersons should be applied in acute transport urban settings or during prolonged care in austere environments.

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Management of colorectal trauma: a review.

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Abstract

Traumatic colorectal injuries are common during times of military conflict, and major improvements in their care have arisen in such periods. Since World War II, many classification systems for colorectal trauma have been proposed, including (i) Flint Grading System; (ii) Penetrating Abdominal Trauma Index; (iii) Colonic/Rectal Injury Scale; and (iv) destructive/non-destructive colonic injuries. The primary goal of these classifications was to aid surgical management and, more particularly, to determine whether a primary repair or faecal diversion should be performed. Primary repair is now the preferred surgical option. Patients who have been identified as having destructive injuries have been found to have higher anastomotic leak rates after a primary repair. Damage control principles need to be adhered to in surgical decision-making. In this review, we discuss the mechanisms of injury, classifications, clinical presentation and current recommendations for the management of colorectal trauma.

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Management of War-related Ballistic Craniocerebral Injuries in a French Role 3 Hospital During the Afghan Campaign.

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Abstract

INTRODUCTION: France deployed to Afghanistan from 2001 to 2014 within the International Security and Assistance Force. A French role 3 hospital was built in 2009 in the vicinity of Kabul International Airport (KaIA). The objectives of this study were to describe the epidemiology, management and outcome of war-related craniocerebral injuries during the Afghan campaign in a French role 3 hospital.

METHODS: From March 1, 2010 to September 30, 2012, we conducted a retrospective descriptive study in Kabul, Afghanistan. All patients presenting with a ballistic craniocerebral injury to the KaIA role 3 hospital were included.

RESULTS: We analyzed 48 records. Mean age was 21.9 years (1-46) with a 37/11 sex ratio and a majority of Afghans (n=41). Civilians represented 64.6% (n=31) of casualties. On the battlefield, mean GCS was 9.4 [3-15]. Upon arrival at the KaIA field hospital, 20 out of the 48 patients were hemodynamically unstable. All patients underwent a full-body computed tomography scan. The majority of our casualties had associated injuries. Neurosurgery was indicated for 42 (87.5%) patients. The surgery consisted of wound debridement plane by plane associated with decompressive craniectomy (N=11), debridement craniectomy (N=19), and craniotomy (N=12). 32.4% wounded died on the point of injury, 8.4% at the emergency department, and 16.9% after surgery.

CONCLUSION: War casualties with ballistic head injuries were predominantly multitraumatized patients with hemodynamic compromise requiring neurosurgical damage control management and multidisciplinary care. The neurosurgeon has thus an essential role to play.

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The Afghan Theater: A Review of Military Medical Doctrine From 2008 to 2014.

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Abstract

This article forms part of a series that will explore the effect that Role 2 (R2) medical treatment facilities (MTFs) had on casualty care during the military campaign in Afghanistan and how we should interpret this to inform the capabilities in, and training for future R2 MTFs. Key aspects of doctrine which influence the effectiveness of R2 MTFs include timelines to care, patient movement capabilities, and MTF capabilities. The focus of this analysis was to review allied doctrine from the United States, United Kingdom, and the North Atlantic Treaty Organization to identify similarities and differences regarding employment of R2 related medical assets in the Afghan Theater, specifically for trauma care. Several discrepancies in medical doctrine persist among allied forces. Timelines to definitive care vary among nations. Allied nations should have clear taxonomy that clearly defines MTF capabilities within the combat casualty care system. The R2 surgical capability discrepancy between United States and North Atlantic Treaty Organization doctrine should be reconciled. Medical evacuation capabilities on the battlefield would be improved with a taxonomy that reflected the level of capability. Such changes may improve interoperability in a dynamic military landscape.

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Blood Transfus. 2017 Mar;15(2):153-157. doi: 10.2450/2017.0310-16.

Modelling the effects of blood component storage lesions on the quality of haemostatic resuscitation in massive transfusion for trauma.

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Abstract

BACKGROUND: All blood components undergo loss of potency during storage. These loss-of-potency storage lesions are important in trauma resuscitation because they reduce the haemostatic capacity of mixtures of components that attempt to reconstitute whole blood. Even red cell storage-related loss of potency, which averages 17% with modern additive solutions, is important because 6 units of red cells must be given to achieve the effect of 5 fully potent units.

MATERIALS AND METHODS: Loss of potency of stored units of red blood cells, plasma, platelets, and cryoprecipitate were summed for dilutional, storage-related, pathogen reduction-related, and splenic sequestration-related causes and expressed as fractional plasma coagulation factor concentrations and platelet counts.

RESULTS: Production of reconstituted whole blood from 1:1:1 unit ratios of red cells:plasma:platelets is associated with a 38% loss of plasma coagulation factor concentration and 56% loss of platelets. Storage losses of 17% for red cells, 10% for coagulation factors, and 30% for platelets are additive to pathogen reduction-related losses of 18% for coagulation factors and 30% for platelets.

DISCUSSION: Component preparation and storage-related losses of potency for all blood components are serious problems for trauma resuscitation. Even red cell storage contributes to this problem and this can be made better in ways that can save many lives each year.

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Corneal and Corneoscleral Injury in Combat Ocular Trauma from Operations Iraqi Freedom and Enduring Freedom.

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Abstract

OBJECTIVES: To examine the incidence and the etiology of corneal and corneoscleral injuries in the setting of combat ocular trauma, and to determine what effect these injuries have on overall visual impairment from combat ocular trauma.

METHODS: Retrospective, noncomparative, interventional case series, analyzing U.S. service members who were evacuated to the former Walter Reed Army Medical Center (WRAMC). Primary outcome measures were types of corneal injuries, length of follow-up at WRAMC, globe survival, and anatomical causes of blindness. Secondary outcome measures included surgical procedures performed, use of eye protection, source of injury, and visual outcomes.

RESULTS: Between 2001 and 2011, there were 184 eyes of 134 patients with corneal or corneoscleral injuries. The average age was 26 years (range, 18-50); 99.3% were male, 31.9% had documented use of eye protection. The average follow-up was 428.2 days (3-2,421). There were 98 right-eye and 86 left-eye injuries. There were 169 open-globe and 15 closed-globe injuries with corneal lacerations occurring in 73 eyes with injuries to Zone I. Most injuries were attributable to an intraocular foreign body (IOFB; 48%), followed by penetrating (19.6%) and perforating (16.3%) injuries. The most common presenting visual acuity was hand motion/light perception (45.7%), yet, at the end of the study, visual acuity improved to 20/40 or better (40.8%). The majority of injuries in eyes with visual acuity worse than 20/200 involved the cornea and retina (58%). Injuries solely to the cornea accounted for only 19% of all injuries sustained.

CONCLUSIONS: Ocular injuries in military combat have led to significant damage to ocular structures with a wide range of visual outcomes. The authors describe corneal and corneoscleral injuries in combat ocular trauma by classifying injuries by the anatomical site involved and identifying the main source of decreased visual acuity. In combat ocular trauma, corneal or corneoscleral injuries are not the sole etiology for poor vision. A cohesive approach among multiple ophthalmic subspecialties is needed when treating combat ocular trauma.

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