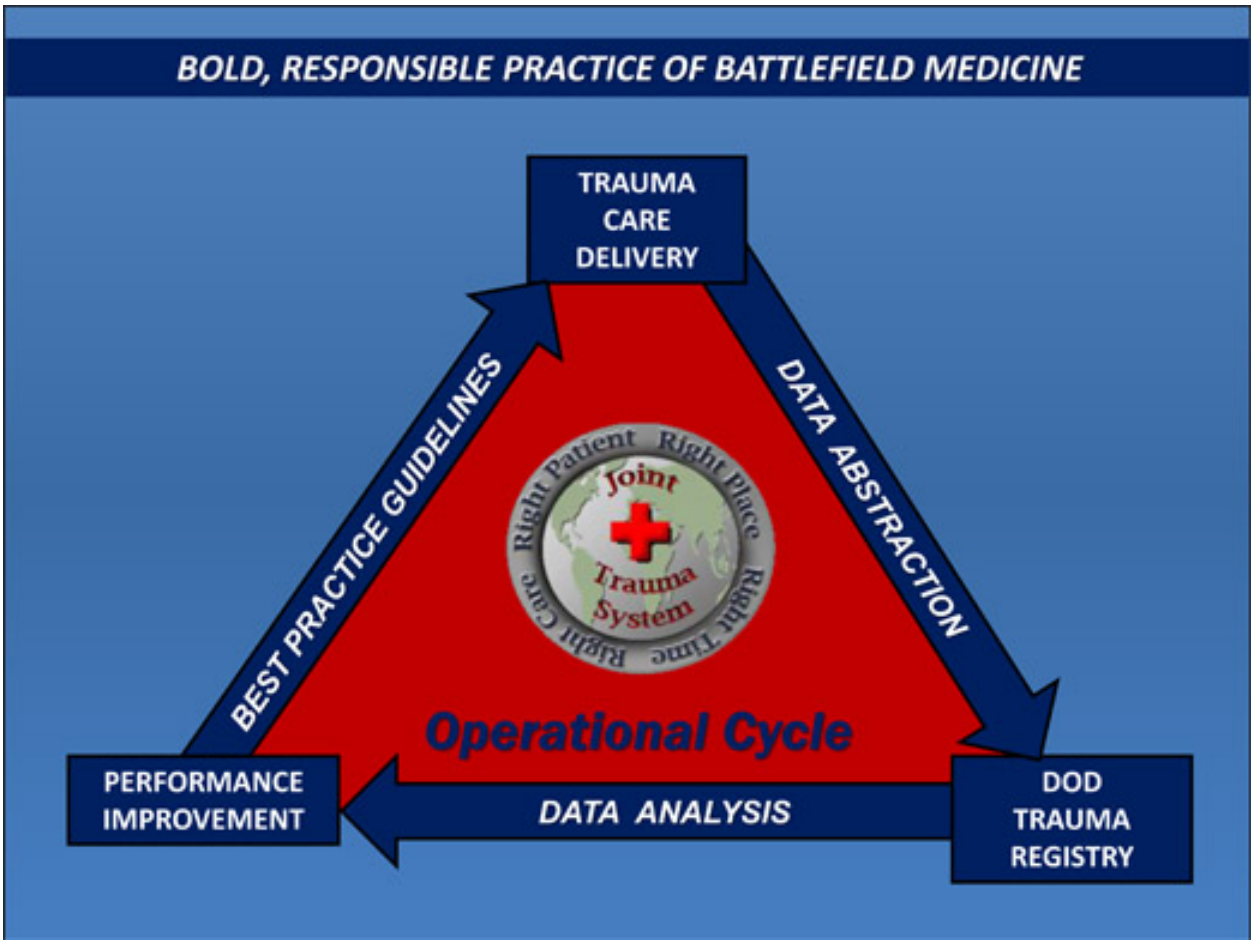
Committee on Surgical Combat Casualty Care (CoSCCC)



Journal Watch

2nd Quarter

2018

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
Sublingual
IDF
Multiple trauma
Coagulopathy
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Trauma
Resuscitation
Ultrasound
Facial trauma
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Pelvic fracture
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Massive transfusion
Angiography
Internal fixation
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Shock index
Diagnostic accuracy
Thrombelastography (TEG)
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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

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The effect of fibrinogen concentrate and fresh frozen plasma on the outcome of patients with acute traumatic coagulopathy: A quasi-experimental study.

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Abstract

INTRODUCTION: The debate on replacing coagulation factors and its effect on the final outcome of the patients with acute traumatic coagulopathy (ATC) in need of transfusion is still ongoing. Therefore, the present study is designed with the aim of comparing the outcome of patients with acute traumatic coagulopathies receiving fibrinogen and fresh frozen plasma (FFP).

METHODS: In this quasi-experimental randomized controlled study, patients with severe blunt trauma (ISS>16) and in need of packed cells transfusion were divided into 3 groups of receiving fibrinogen, receiving FFP, and control, and their final outcome was compared.

RESULTS: 90 patients with the mean age of 33.16±16.32years were randomly allocated to one of the 3 study groups (82.2% male). The 3 groups were similar regarding baseline characteristics. Patients receiving fibrinogen needed significantly less packed cells (p=0.044) and intravenous fluid in the initial 24h of hospitalization (p=0.022). In addition, mortality rate (p=0.029), need for admission to intensive care unit (p=0.020) and duration of hospitalization (p=0.045) were also lower in the group receiving fibrinogen. The number of sepsis cases in patients receiving fibrinogen and control group was lower than those who received FFP (p=0.001). The number of multiple organ failure cases in patients receiving fibrinogen was about one fourth of the other 2 groups (p=0.106), and a fewer number of them needed mechanical ventilation (p=0.191). No case of venous thrombosis was detected in any of the 3 groups.

CONCLUSION: Multiple trauma patients in need of transfusion who received fibrinogen along with packed cells had significantly better outcomes regarding mortality, sepsis, need for admission to the intensive care unit, need for receiving packed cells, need for receiving intravenous fluids in the initial 24h, and duration of hospitalization.

KEYWORDS: Blood coagulation disorders; Blood component transfusion; Fibrinogen; Multiple trauma; Plasma

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Concomitant external and internal hemorrhage: Challenges to managing patients with open pelvic fracture.

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Abstract

INTRODUCTION: Managing patients with open pelvic fractures continues to be challenging and requires a multidisciplinary approach. In this study, we examined the characteristics of patients with open pelvic fractures and strategies for managing such patients.

MATERIALS AND METHODS: The records of patients with open pelvic fractures from January 2010 to August 2016 were retrospectively reviewed. Emergency surgery was performed to control hemorrhaging in patients with an active external hemorrhage. Transcatheter arterial embolization (TAE) was used for definitive hemostasis. The relation between cause of death and timing of death was examined. We also compared the characteristics of surviving and non-surviving patients. Furthermore, patients who received both surgery and post-operative TAE were analyzed in detail.

RESULTS: In total, 42 patients with open pelvic fractures were enrolled in the study. The overall mortality rate among patients with open pelvic fractures was 26.2%. Patients whose deaths were related to hemorrhaging and associated injuries died significantly earlier than patients whose deaths were related to sepsis and multiple organ failure (1.3days vs. 12.3days, $p<0.001$). Sixteen patients (38.1%) received TAE for hemostasis, and their systolic blood pressure (SBP) improved significantly following TAE (from 88.4mmHg to 111.6mmHg, $p<0.05$). In the patients who received both surgery and post-operative TAE (n=8), the SBP increased significantly after surgery (from 58.8mmHg to 81.1mmHg, $p<0.05$). Similarly, the patients' SBP after TAE was significantly higher than their post-operative SBP (110.5mmHg vs. 81.1mmHg, $p<0.05$).

CONCLUSION: Active external hemorrhaging was initially controlled when managing patients with open pelvic fractures; however, most patients also required TAE for definitive hemorrhage control. Early TAE should be considered due to the high probability of concomitant internal and external hemorrhage. Close observation and further infection control are important following the hemostatic procedure.

KEYWORDS: External hemorrhage; Internal hemorrhage; Open pelvic fracture

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Evaluation of Experience with Lower Extremity Arterial Injuries at an Urban Trauma Center.

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Abstract

Lower extremity arterial injuries (LEAIs) can be complicated injuries resulting in limb loss and death. Patients with LEAI often have multiple injuries increasing the risk for morbidity and mortality. We sought to evaluate the incidence and management of LEAI and to define associations between injuries and outcomes. We performed a retrospective review of LEAI at an urban level-1 trauma center from April 2005 to April 2015. Chi-square tests were used to compare independent groups with respect to mortality and amputation. Means were compared between independent groups using two-sample *t* -tests. From April 2005 to April 2015, 208 arterial injuries occurred in 163 patients. The majority (80.4%) suffered concomitant lower extremity injuries with 35.6% suffering systemic injuries. Surgical intervention was required for 72.1% of injuries. Amputation rate was 14.7%. Mortality rate was 8.0%. Data from 2010 to 2015 were more specifically analyzed. Injury severity score (ISS) was higher with fatalities (37 ± 13.16 vs. 11.8 ± 8.51, $p < 0.0001$) and in patients requiring an amputation (25.4 ± 15.32 compared with 11.6 ± 9.05, $p = 0.0015$). Popliteal artery injury was most likely to require an amputation (odds ratio [OR] = 2.9, $p = 0.04$). Mortality was more likely when systemic injuries were present (OR = 18.1, $p = 0.0005$). The majority of patients with arterial injuries require surgical management, most often with open surgical techniques. Arterial injuries associated with systemic injuries, blunt injury mechanisms, and higher ISS are at a significantly increased risk of mortality.

KEYWORDS: amputation; arterial injury; fasciotomy; injury severity score; lower extremity; mortality; trauma

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Over Resuscitation With Plasma is Associated With Sustained Fibrinolysis Shutdown and Death in Pediatric Traumatic Brain Injury.

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Abstract

BACKGROUND: Elevated INR is a marker of poor outcome but not necessarily bleeding or clinical coagulopathy in injured children. Conversely, children with traumatic brain injury (TBI) tend to be hypercoagulable based on rapid thromboelastography (rTEG) parameters. Many clinicians continue to utilize INR as a treatment target.

METHODS: Prospective observational study of severely-injured children age<18 with rTEG on arrival and daily thereafter for up to 7 days. Standard rTEG definitions of hyperfibrinolysis (HF; LY30≥3), fibrinolysis shutdown (SD; LY30≤0.8), and normal (LY30=0.9-2.9) were applied. The first 24-hours blood product transfusion volumes were documented. AIS score≥3 defined severe traumatic brain injury. Sustained shutdown was defined as two consecutive rTEG with SD and no subsequent normalization. Primary outcomes were death and functional disability, based on functional independence measure score assessed at discharge.

RESULTS: 101 patients were included: median(IQR) age=8(4-12), injury severity score=25(16-30), 72% blunt mechanism, 47% severe TBI, 16% mortality, 45% discharge disability. Neither total volume nor any single product volume transfused (mL/kg; all p>0.1) differed between TBI and non-TBI groups. On univariate analysis, transfusion of PRBC (p=0.016), plasma (p<0.001) and platelets (p=0.006) were associated with sustained shutdown; however, in a regression model that included all products (cc/kg) and controlled for severe TBI (Head AIS ≥ 3), admission INR, polytrauma, and clinical bleeding, only plasma remained an independent predictor of sustained SD (OR=1.17, p=0.031). Patients with both severe TBI and plasma transfusion had 100% sustained SD, 75% mortality, and 100% disability in survivors. Admission INR was elevated in TBI patients, but did not correlate with rTEG-ACT(p=NS) and was associated with sustained SD (p=0.006).

CONCLUSIONS: Plasma transfusion is independently associated with sustained fibrinolysis SD. Severe TBI is also associated with sustained shutdown; the combined effect of plasma transfusion and severe TBI is associated with extremely poor prognosis. Plasma transfusion should not be targeted to INR thresholds but rather to rTEG-ACT and clinical bleeding.

LEVEL OF EVIDENCE: level II, prognostic and epidemiological. PMID: 29443859
DOI:10.1097/TA.0000000000001836

Mil Med. 2018 Jan 1;183(1-2):e45-e50. doi: 10.1093/milmed/usx057.

Fibrinogen Concentrate in the Special Operations Forces Environment.

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Abstract

Introduction: Hemorrhage is the most common cause of death among Special Operations Force (SOF) soldiers. Bringing remote damage control resuscitation into the far-forward combat environment is logistically challenging, as it requires blood products that generally require a robust cold chain. Alternatively, lyophilized products such as fibrinogen concentrate, which does not require thawing or blood group compatibility testing before use, might be advantageous in damage control resuscitation in the battlefield. In this report, we review the evidence for the use of fibrinogen concentrate in the Canadian SOF environment.

Materials and Methods: The literature on the use of fibrinogen concentrate in the trauma setting was reviewed by Canadian Forces Services Working Group, in three separate meetings. Multiple stakeholders were consulted to obtain authoritative perspectives from subject matter experts on the use of fibrinogen concentrate in the Canadian SOF environment. We also conducted a comparison review of fibrinogen content, pathogen risk, shelf life, and methods required for use for fresh frozen plasma, cryoprecipitate, and fibrinogen concentrate relevant to their application in the far-forward combat environment.

Results: Indications and a protocol for the use of fibrinogen as an adjunct to fresh whole blood were formulated based on a literature review and clinical expert opinion. Alternative strategies and other lyophilized blood products were considered before selecting fibrinogen concentrate as the lyophilized blood product of choice. Fibrinogen concentrate is an ABO-universal blood product with an excellent safety profile. Training was conducted by subject matter experts within civilian trauma centers and at military training facilities. The clinical efficacy and safety were confirmed by monitoring the use of fibrinogen concentrate in deployed combat settings.

Conclusion: Fibrinogen concentrate is a useful adjunct to remote damage control resuscitation in the SOF environment. Fibrinogen concentrate was found to be robust for transport into the SOF environment and is widely accepted among SOF operators and medics.

KEYWORDS: Damage control resuscitation; Fibrinogen concentrate; Massive transfusion; Special Operations Forces; Trauma

PMID:29401352 DOI: 10.1093/milmed/usx057

J Spec Oper Med. Winter 2017;17(4):52-55.

The SOF Truths for Army Special Operations Forces Surgical Teams.

Baker JB, Modlin RE, Ong RC, Remick KN.

Abstract

The US Army Special Operations Command and Army Medical Command are at a critical junction in Army medical training. Army Special Operations Forces (ARSOF) will receive Forward Resuscitative Surgical Teams (FRSTs) in the near future and must establish a training model to enable successful support for ARSOF operations. The military has been directed by Congress through the 2017 National Defense Authorization Act to embed trauma combat casualty care teams in civilian trauma centers. ARSOF FRSTs should be embedded in the nation's leading civilian trauma centers to build and sustain true expertise in delivering trauma care on the battlefield. The SOF Truths provide valuable insights into the required conditions for success of this new training paradigm.

PMID: 29256195

J Orthop Trauma. 2018 Mar;32 Suppl 1:S37-S42. doi: 10.1097/BOT.0000000000001121.

Management of Mangled Extremities and Orthopaedic War Injuries.

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Abstract

In 16 years of conflict, primarily in Iraq and Afghanistan, wounded warriors have primarily been subjected to blast type of injuries. Evacuation strategies have led to unprecedented survival rates in blast-injured soldiers, resulting in large numbers of wounded warriors with complex limb trauma. Bone and soft tissue defects have resulted in increased use of complex reconstructive algorithms to restore limbs and function. In addition, in failed salvage attempts, advances in amputation options are being developed. In this review, we summarize state-of-the-art limb-salvage methods for both soft tissue and bone. In addition, we discuss advances in diagnostic methods with development of personalized clinical decision support tools designed to optimize outcomes after severe blast injuries. Finally, we present new advances in osteointegrated prostheses for above-knee amputations.

PMID: 29461402 DOI: 10.1097/BOT.0000000000001121

J Trauma Acute Care Surg. 2018 Feb 17. doi: 10.1097/TA.0000000000001850. [Epub ahead of print]

Emergency sternal intraosseous access for warm fresh whole blood transfusion in Damage Control Resuscitation: 'Sternal intraosseous access in DCR'.

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Abstract

BACKGROUND: Intraosseous (IO) vascular access is increasingly used as an emergency tool for achieving access to the systemic circulation in critically ill patients. The role of IO transfusion of blood in Damage Control Resuscitation is however questionable due to possible inadequate flow rate and hemolysis. Some experts claim that IO transfusion is contraindicated. In this study we have challenged this statement by looking at flow rates of autologous fresh whole blood reinfusion and hemolysis using two of the commonly used FDA-approved and CE-marked sternal needles. Additionally, the success rate of sternal access between the two devices is evaluated.

METHODS: Volunteer professional military personnel, were enrolled prospectively in an non-randomized observational study design. We collected 450 ml of autologous whole blood from each participant. Participants were divided into the following three groups of 10: T.A.L.O.N. IO, FAST1 IO, and intravenous (IV) group. The reinfusion was done by gravity only. Blood sampling was performed before blood collection, and 30 minutes after reinfusion. Investigation of hemolysis was performed by measurements of haptoglobin and lactate dehydrogenase (LD). Success rate was evaluated by correct aspiration of bone marrow.

RESULTS: Median reinfusion time was 46.2 ml/min in the FAST1 group, 32.4 ml/min in the T.A.L.O.N. group and 74.1 ml/min in the IV group. Blood samples from all participants were within normal ranges. There was no statistically significant difference in haptoglobin and lactate dehydrogenase between the groups. In the Fast 1 group 1/11 (9%) procedures failed. In the T.A.L.O.N group 4/14 (29%) procedures failed.

CONCLUSION: Although preferable, achieving peripheral venous access in the bleeding patient is a major problem. Our findings suggest that fresh whole blood transfusion through the IO route is safe, reliable and provide sufficient flow for resuscitation.

LEVEL OF EVIDENCE: Level III Therapeutic/Care management. PMID:29462086
DOI:10.1097/TA.0000000000001850