Committee on Surgical Combat Casualty Care (CoSCCC)

Journal Watch

4th Quarter

FY 2021

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
Damage Control Resuscitation
Tension pneumothorax
Blast Injury
Combat casualty care
Surgical skills
Novel Coronavirus
Predictions
Limb Salvage
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
Battlefield injury
Thoracotomy
Died of Wounds
Medical treatment facility
Emergency surgery
COVID-19
Vital Signs
Temporary Shunts
Haemorrhage
Ethics committees
Institutional review board
Shock index
Diagnostic accuracy
Thrombelastography (TEG)
Imaging
Severe trauma
Afghanistan
War
Transfusion
Damage control Surgery
Battlefield Trauma
Fibrinogen
ABO
External fixation
Pelvic ring
Pre-peritoneal pelvic packing
Long bone fractures
Surgical site infection
Primary repair
Poly-trauma
Prolonged field care
Military Medicine
Killed in Action
Mortality
Infection prevention
Hypocalcemia
Global Surgery

Crit Care
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The impact of prehospital tranexamic acid on mortality and transfusion requirements: match-pair analysis from the nationwide German TraumaRegister DGU®

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Abstract

Background: Outcome data about the use of tranexamic acid (TXA) in civilian patients in mature trauma systems are scarce. The aim of this study was to determine how severely injured patients are affected by the widespread prehospital use of TXA in Germany.

Methods: The international TraumaRegister DGU® was retrospectively analyzed for severely injured patients with risk of bleeding (2015 until 2019) treated with at least one dose of TXA in the prehospital phase (TXA group). These were matched with patients who had not received prehospital TXA (control group), applying propensity score-based matching. Adult patients (≥ 16) admitted to a trauma center in Germany with an Injury Severity Score (ISS) ≥ 9 points were included.

Results: The matching yielded two comparable cohorts (n = 2275 in each group), and the mean ISS was 32.4 ± 14.7 in TXA group vs. 32.0 ± 14.5 in control group (p = 0.378). Around a third in both groups received one dose of TXA after hospital admission. TXA patients were significantly more transfused (p = 0.022), but needed significantly less packed red blood cells (p ≤ 0.001) and fresh frozen plasma (p = 0.023), when transfused. Massive transfusion rate was significantly lower in the TXA group (5.5% versus 7.2%, p = 0.015). Mortality was similar except for early mortality after 6 h (p = 0.004) and 12 h (p = 0.045). Among non-survivors hemorrhage as leading cause of death was less in the TXA group (3.0% vs. 4.3%, p = 0.021). Thromboembolic events were not significantly different between both groups (TXA 6.1%, control 4.9%, p = 0.080).

Conclusion: This is the largest civilian study in which the effect of prehospital TXA use in a mature trauma system has been examined. TXA use in severely injured patients was associated with a significantly lower risk of massive transfusion and lower mortality in the early in-hospital treatment period. Due to repetitive administration, a dose-dependent effect of TXA must be discussed.

Keywords: Bleeding; Coagulopathy; Hemostatic disorders; Mass transfusion; TXA; Tranexamic acid; Trauma; Trauma care.

Crit Care Explor
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Use of Thromboelastography in the Evaluation and Management of Patients With Traumatic Brain Injury: A Systematic Review and Meta-Analysis

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Abstract

Traumatic brain injury is associated with coagulopathy that increases mortality risk. Viscoelastic hemostatic assays such as thromboelastography (Haemonetics SA, Signy, Switzerland) provide rapid coagulopathy assessment and may be particularly useful for goal-directed treatment of traumatic brain injury patients. We conducted a systematic review to assess thromboelastography in the evaluation and management of coagulopathy in traumatic brain injury patients.

Data sources: MEDLINE, PubMed Central, Embase, and CENTRAL.

Study selection: Clinical studies of adult patients with traumatic brain injury (isolated or polytrauma) who were assessed by either standard thromboelastography or thromboelastography with platelet mapping plus either conventional coagulation assays or platelet function assays from January 1999 to June 2021.

Data extraction: Demographics, injury mechanism and severity, diagnostic, laboratory data, therapies, and outcome data were extracted for analysis and comparison.

Data synthesis: Database search revealed 1,169 sources; eight additional articles were identified by the authors. After review, 31 publications were used for qualitative analysis, and of these, 16 were used for quantitative analysis. Qualitative and quantitative analysis found unique patterns of thromboelastography and thromboelastography with platelet mapping parameters in traumatic brain injury patients. Patterns were distinct compared with healthy controls, nontraumatic brain injury trauma patients, and traumatic brain injury subpopulations including those with severe traumatic brain injury or penetrating traumatic brain injury. Abnormal thromboelastography K-time and adenosine diphosphate % inhibition on thromboelastography with platelet mapping are associated with decreased survival after traumatic brain injury. Subgroup meta-analysis of severe traumatic brain injury patients from two randomized controlled trials demonstrated improved survival when using a viscoelastic hemostatic assay-guided resuscitation strategy (odds ratio, 0.39; 95% CI, 0.17-0.91; p = 0.030).

Conclusions: Thromboelastography and thromboelastography with platelet mapping characterize coagulopathy patterns in traumatic brain injury patients. Abnormal thromboelastography profiles are associated with poor outcomes. Conversely, treatment protocols designed to normalize abnormal parameters may be associated with improved traumatic brain injury patient outcomes. Current quality of evidence in this population is low; so future efforts should evaluate viscoelastic hemostatic assay-guided hemostatic resuscitation in larger numbers of traumatic brain injury patients with specific focus on those with traumatic brain injury-associated coagulopathy.

Keywords: blood coagulation tests; hemostasis; mortality; platelet function; thromboelastography; traumatic brain injury.

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Resuscitative endovascular balloon occlusion of the aorta (REBOA) in patients with major trauma and uncontrolled haemorrhagic shock: a systematic review with meta-analysis

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Abstract

Background: Multiple studies regarding the use of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) in patients with non-compressible torso injuries and uncontrolled haemorrhagic shock were recently published. To date, the clinical evidence of the efficacy of REBOA is still debated. We aimed to conduct a systematic review assessing the clinical efficacy and safety of REBOA in patients with major trauma and uncontrolled haemorrhagic shock.

Methods: We systematically searched MEDLINE (PubMed), EMBASE and CENTRAL up to June 2020. All randomized controlled trials and observational studies that investigated the use of REBOA compared to resuscitative thoracotomy (RT) with/without REBOA or no-REBOA were eligible. We followed the PRISMA and MOOSE guidelines. Two authors independently extracted data and appraised the risk of bias of included studies. Effect sizes were pooled in a meta-analysis using random-effects models. The quality of evidence was assessed using the Grading of Recommendations Assessment, Development and Evaluation methodology. Primary outcomes were mortality, volume of infused blood components, health-related quality of life, time to haemorrhage control and any adverse effects. Secondary outcomes were improvement in haemodynamic status and failure/success of REBOA technique.

Results: We included 11 studies (5866 participants) ranging from fair to good quality. REBOA was associated with lower mortality when compared to RT (aOR 0.38; 95% CI 0.20-0.74), whereas no difference was observed when REBOA was compared to no-REBOA (aOR 1.40; 95% CI 0.79-2.46). No significant difference in health-related quality of life between REBOA and RT (p = 0.766). The most commonly reported complications were amputation, haematoma and pseudoaneurysm. Sparse data and heterogeneity of reporting for all other outcomes prevented any estimate.

Conclusions: Our findings on overall mortality suggest a positive effect of REBOA among non-compressible torso injuries when compared to RT but no differences compared to no-REBOA. Variability in indications and patient characteristics prevents any conclusion deserving further investigation. REBOA should be promoted in specific training programs in an experimental setting in order to test its effectiveness and a randomized trial should be planned.

Keywords: Systematic review, Resuscitative Endovascular Balloon Occlusion of the Aorta, Major trauma haemorrhage, Resuscitative thoracotomy.

Surgery
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Whole blood at the tip of the spear: A retrospective cohort analysis of warm fresh whole blood resuscitation versus component therapy in severely injured combat casualties

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Abstract

Background: Death from uncontrolled hemorrhage occurs rapidly, particularly among combat casualties. The US military has used warm fresh whole blood during combat operations owing to clinical and operational exigencies, but published outcomes data are limited. We compared early mortality between casualties who received warm fresh whole blood versus no warm fresh whole blood.

Methods: Casualties injured in Afghanistan from 2008 to 2014 who received ≥2 red blood cell containing units were reviewed using records from the Joint Trauma System Role 2 Database. The primary outcome was 6-hour mortality. Patients who received red blood cells solely from component therapy were categorized as the non-warm fresh whole blood group. Non- warm fresh whole blood patients were frequency-matched to warm fresh whole blood patients on identical strata by injury type, patient affiliation, tourniquet use, prehospital transfusion, and average hourly unit red blood cell transfusion rates, creating clinically unique strata. Multilevel mixed effects logistic regression adjusted for the matching, immortal time bias, and other covariates.

Results: The 1,105 study patients (221 warm fresh whole blood, 884 non-warm fresh whole blood) were classified into 29 unique clinical strata. The adjusted odds ratio of 6-hour mortality was 0.27 (95% confidence interval 0.13-0.58) for the warm fresh whole blood versus non-warm fresh whole blood group. The reduction in mortality increased in magnitude (odds ratio = 0.15, P = .024) among the subgroup of 422 patients with complete data allowing adjustment for seven additional covariates. There was a dose-dependent effect of warm fresh whole blood, with patients receiving higher warm fresh whole blood dose (>33% of red blood cell-containing units) having significantly lower mortality versus the non-warm fresh whole blood group.

Conclusion: Warm fresh whole blood resuscitation was associated with a significant reduction in 6-hour mortality versus non-warm fresh whole blood in combat casualties, with a dose-dependent effect. These findings support warm fresh whole blood use for hemorrhage control as well as expanded study in military and civilian trauma settings.