Trauma in Afghanistan: Lessons Learned

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Learning Objectives

- Review of the pathophysiology involved in trauma
- Review current trends in trauma treatment and changes in massive transfusion practice
- Discuss the trauma nurse’s role in caring for injured patients, in both a combat and civilian environment
Faculty/Presenters/Authors/Content Reviewers/Planners disclose no conflict of interest relative to this educational activity.
To successfully complete this course, participants must attend the entire event and complete/submit the evaluation at the end of the session.

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Forward Surgical Team Video
What is an FST?

- **FST (Forward Surgical Team)**
  - Developed in the mid 1990’s

  - Mission is **damage control surgery and resuscitation**

  - Can be set up and ready to accept a patient within 90 minutes - “Light-weight, rapidly deployable, forward unit”

  - Consists of:
    - 3-bed ER/Trauma area
    - 2-bed OR
    - 3-bed ICU/PACU
What is an FST?

- **Command Staff**
  - Commander
  - Executive Officer
  - Detachment NCO

- **Physicians (Rotate every 90 days)**
  - 3 General Surgeons
  - 1 Ortho Surgeon

- **2 CRNA’s (Rotate every 90 days)**

- **ER/Trauma**
  - 1 ER/Trauma RN
  - 3 Combat Medics

- **OR**
  - 1 OR RN
  - 3 OR Techs

- **ICU**
  - 1 ICU RN
  - 3 LPN’s
Significant clinical experience in dealing with blast and explosive injuries

U.S. Military medical personnel have been quick to seek and adopt new strategies in treating hemorrhage, the leading cause of preventable death

Mortality rates are dramatically lower for the current conflicts, and there are many survivors of massive multiple trauma
Death Rates After Wounding:

- Revolutionary War/Civil War: 42%
- World War II: 30%
- Korean War: 25%
- Vietnam War: 25%
- Persian Gulf War: 25%
- Iraq/Afghanistan: <3%
Principles of Damage Control Surgery and Resuscitation

- Quickly stop the bleeding/Begin Massive Transfusion Protocol
- Limit Crystalloid use
- OR (if necessary at the FST)
Principles of Damage Control Surgery and Resuscitation

- Return to Operating Room in 12 to 18 hours for definitive surgery
  - In the FST setting, this will be performed at the next higher echelon of care
  - Ideally transferred out ASAP after patient is stabilized
Central Tenet: avoid “Lethal Trauma Triad”:

- **Acidosis** – results from blood loss and inadequate tissue perfusion
- **Hypothermia** – results from exsanguination and loss of intrinsic thermoregulation
- **Coagulopathy** – results from hypothermia, acidosis, platelet and clotting factor consumption, blood loss, and tissue injury (Multiple step process towards DIC/TIC)
Fibrinolytic Pathway

Coagulation Cascade
- Prothrombin
  - APC
  - Thrombin
  - PC
  - Thrombin Thrombomodulin

Fibrinolytic Cascade
- Plasminogen
  - TAFIa
  - Plasmin
  - TAFI
  - Fibrinogen
  - Fibrin
  - FDP’s
The 3 D’s of Coagulopathies in Trauma

- **Depletion** – Uncontrolled hemorrhage
- **Dysfunction** – Acidosis and hypothermia
- **Dilution** – Aggressive crystalloid infusion, large amounts of Packed Red Blood Cells (PRBC)
Lessons Learned: Intravenous Fluid Aspects for Hemostasis

- Massive Transfusion (MT): Defined as the use of 10 or more units of PRBC’s in a 24-hour time period.
The major principle in damage control resuscitation is to prevent coagulopathy due to dilution of factors needed to provide hemostasis.

In order to support this, we must provide components at an appropriate ratio throughout the resuscitation.

The goal in transfusion of the patient with need for massive transfusion deliver a ratio of 1:1:1 of PRBC’s, FFP, and platelets.
Limit crystalloid use: Can have inflammatory, acidotic, coagulopathy effects

“Avoid fluids that do not clot or carry oxygen!!”

....EMCRIT Webcast
Lessons Learned: Intravenous Fluid Aspects for Hemostasis

- Risk factors for MT in critically injured patients
  - SBP < 110
  - HR > 105
  - HCT < 32
  - pH < 7.25
  - INR > 1.4

- These are based on current Afghanistan CPG’s

- Guidelines only, decision to begin MT is based on the clinical judgment of the physician
Cryoprecipitate: may be added to component therapy to enhance replacement of fibrinogen, and other clotting factors.

- FFP and platelets do not have adequate amount of fibrinogen
  - 1 unit of platelets contains 80mg of fibrinogen
  - 1 unit of FFP contains 400mg of fibrinogen
  - 10 unit pack of cryoprecipitate contains 2500mg of fibrinogen
  - Not needed in FWWB as 1 unit contains 1000mg
Lessons Learned: Intravenous Fluid Aspects for Hemostasis

- FWWB (Fresh Warm Whole Blood): used based on discretion of the physician or when one of the blood components is not available
  - Offers an appropriate ratio of components, excellent platelet activity, and field availability
  - Treatment option currently not FDA-approved due to slight risk of transmission infection

- Retrospective data shows potential survival benefit when FWWB is used during resuscitation in severely injured combat patients
Lessons Learned: Intravenous Fluid Aspects for Hemostasis

- TXA (Tranexamic Acid)
  - Anti-fibrinolytic that blocks the action of plasminogen, an enzyme that dissolves blood clots
  
  - Been used in surgical procedures since approved in 1986, but recently used in trauma patients
  
  - Administer as soon as possible after injury, but ideally no later than 3 hours post-injury
  
  - 1g loading dose currently being given at POI (Point of Injury) by Combat Medics
Hemostasis: Permissive Hypotension

- Patients in hemorrhagic shock should be fluid resuscitated to a minimal acceptable BP

- Helps keep traumatically severed blood vessels in a low flow, low pressure state until surgical control of bleeding is performed

- Helps prevent “popping” the clot
  - Occurs when elevating the BP in previously injured vessels, that spontaneously clotted in a low flow state, dislodges the clot and begin bleeding again
Tourniquets:

- Fell out of favor in the later part of the 20th century
- Use liberally for any significant extremity hemorrhage
- No adverse events seen
- Use early: “first resort not last resort”
- Every soldier carries at least one at all times
Tourniquets

CAT TOURNIQUET

SOF TOURNIQUET
Hemostatic Dressings

- Causes rapid localized coagulation and formation of a stable clot
- Does not absorb into the body and safe to leave in place until further care is available
- Does not produce heat
What do we mean when the term IED is used?

- Improvised Explosive Device

- It’s a generalized term used to describe any explosive device
  - Roadside bomb (Placed in trash, animal carcasses, etc.)
  - Landmine
  - Suicide Bomber
  - Vehicle bomb
Injuries from Explosive Munitions and IED’s

- High percentage of current injuries
- Often severe, multisystem
- Multiple limb amputations
- Secondary injury from being thrown
- Eardrum rupture common
- Occult injuries may be present: “blast lung,” bowel rupture, closed head injury
Blast Injury Mechanisms

- The closer the victim is to the explosion, the greater increase in severity of injuries.
- Victim does not have to be close to the blast for injuries to occur.
- Pay close attention to non-apparent injuries.
What importance comes from studying IED blast injuries?
Joint Theater Trauma Registry (JTTR)

- Largest trauma database in the world
- Used to research, evaluate, and improve current treatments, procedures, and Clinical Practice guidelines in Operation Enduring Freedom
- Each U.S. medical unit in Afghanistan is responsible for entering data on all patients
- Quality improvement on all levels of care
Other Trends in Trauma..

- Closer attention to mild traumatic brain injuries (mTBI)
- Increased use of hypertonic saline in regards to head injuries
- Decreasing NSAID use in combat troops
- Post Traumatic Stress Disorder (PTSD)
Afghanistan
ER/Trauma
ER/Trauma
OR
Radiology in the FST
Flight Line
Incoming Flight
Incoming Flight
IED Injuries: Lower Ext’s
IED Injuries: Lower Ext’s

VASCULAR SHUNTING
IED Injuries: Lower Ext’s
Exploratory Laparotomy
High Caliber GSW Rt Femur
High Caliber GSW Rt Femur
Traumatic Amputations: Feet
Traumatic Amputations
Traumatic Amputations
Traumatic Amputations
Shrapnel Injuries
Fasciotomy
Shrapnel Injuries
Shrapnel Injuries
Shrapnel Injuries
Shrapnel Injuries
Penetrating Chest Wound: Hemothorax
Surgical Amputations
Athos
Athos
Athos
Fallen Heroes
Caring for Trauma Patients
Caring for Trauma Patients
Caring for Trauma Patients
Rocket/Mortar Attacks
Rocket/Mortar Attacks
Base Attack with a Truck Bomb
Base Attack with a Truck Bomb
The 624th FST
The End


Resources

- Current Operation Enduring Freedom Clinical Practice Guidelines