TRAUMA 101: Everything you need to know

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TRAUMA 101.

Avoiding the critical triad of hypothermia, hypoxia and coagulopathy is essential for trauma patients.

The management of trauma is a clinical art.

In general, access in the distribution of the SVC is preferable. The preferred route of IO access is humeral.

The indications to intubate trauma patients are:
- airway protection
- administration of positive pressure ventilation
- management of gas exchange, particularly for the head injured patient.

The preferred drug for intubation of trauma patients is ketamine 1.5mg/kg.

For unstable trauma patients, or those who have arrested chest decompression should be considered mandatory. This will often require positive pressure ventilation. Needle decompression is less likely to be successful than finger thoracostomy.

Other sources of haemorrhage should be controlled for trauma patients.

The practice of “springing” the pelvis should be abandoned.

Best practice transfusion incorporates:
- the administration of warmed products
- use of 1:1:1 product ratios
- maintenance of normal serum Ca++
- a therapeutic aim of SBP 90mmhg
- the use of tranexamic acid in accordance with the CRASH-2 trial protocol

The primary objectives of a trauma team leader are:
- resuscitation of the trauma patient
- expedient transfer of the patient to definitive care, either with the retrieval services or to the operating theatre
Lessons learned the hard way....

Management of Blood Pressure
Haemorrhage control
Chest decompression
Coagulation management
Leadership/prioritization
Case Scenario

26yo male, high speed MVA

2hr entrapment

Multiple injuries: head, chest, pelvis, long bones

Critically injured:

HR 120  BP 85/60
RR 28  SaO₂ 89%
GCS 8(M5)  T 35.4°C
A typical day...

Ambulance: 1x 20g cannula
New interns
Registrar off sick
Wardsman can’t find chest drains
Blood bank = paperwork
XRAY broken
REMEMBER...

Trauma is a CLINICAL ART

METHODS are less important than RESULTS
Priorities

- Intubation
- Access...
- Volume resuscitation
- Haemorrhage control
- Transfer to definitive care
A Lethal Triad\textsuperscript{1-5}

- HYPOTHERMIA (1.2)
- COAGULOPATHY (5.38)
- ACIDOSIS (6.9)

Bleeding
Hypoxia

Diagram showing the interconnection of the lethal triad components.
ACCESS ESSENTIALS
Access Issues

SVC distribution
Most novel access is IVC
Aim for the humeral head
Size is less important than haemorrhage control
Intubation

Why?
- Protect
- PPV
- Gas Management
- Maintain BP

Manley et al 2003 Arch Surg:
- SBP < 90 = 2x mortality

Commit = Surgical airway
Ketamine

1970s\textsuperscript{8,9}

2 case series, 9 patients, 6 fall in CPP

Only in abnormal CSF pathways

2000s\textsuperscript{10,11}

2 RCTs, 60 patients, no change in CPP
HEMS Intubation Algorithm

1. Induction

- Cannot see cords
  - 30 Second drills
    - Retry
      - Fail
        - Failed Intubation Drill
          1. Insert Proseal LMA
          2. Surgical Cricothyroidotomy or
             Brevovalve mask to hospital
          3. Adjust patient position
        - Adjust position
          - Adjust patient position
          - Suction
            - Insert blade to maximum and slowly withdraw under vision
            - Backward upward rightward pressure
            - Release cricoids pressure
            - Long blade/McGoy blade

- Adjust your position
  - Adjust patient position
  - Suction
    - Insert blade to maximum and slowly withdraw under vision
    - Backward upward rightward pressure
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    - Long blade/McGoy blade
The Surgical Airway

Simple - scalpel/finger/bougie\textsuperscript{13,14}

Most likely to be successful\textsuperscript{15}

Needles do not work

If necessary divide longitudinally in midline
Cricothyrotomy Landmarks

- Cut Skin Here
- Thyroid Cartilage
- Circumthyroid Membrane
- Cricoid Cartilage
DO NOT STOP FOR BLEEDING.

SECURE THE AIRWAY.
CHEST
DECOMPRESSION
Post intubation...

"ETT successfully placed, IPPV begun...."

Rapidly falling BP

Cardiac arrest

The END?
Chest decompression

Lifesaving: “part of the resuscitation effort”
Emerg Med J 2009: 18/34 decompressed 4 ROSC
Needles DO NOT WORK
5cm: 18–33% pleural penetration
Finger Thoracostomy
Tubes = optional
Decompression = mandatory
HAEMORRHAGE CONTROL
Haemorrhage – Pelvis\textsuperscript{20}

“Preserve clot...punch anyone who tries to spring the pelvis” – Dr Timothy Coates
The Pelvis

pelvic # is an x-ray diagnosis

Binder

Works! 66% reduction in diastasis

Common mistake = too high

base of penis

1 - 2 cm above union of labia
Other Haemorrhage

- splint long bones (esp femur/tibia)
- donway, CT6, trauma slab, whatever
- limb tourniquet
- FAST SCAN

Specific NOT sensitive (99% vs 43%)\textsuperscript{26}
Haemorrhage

Warm everything

Avoid 0.9% NaCl

1:1:1 means 4u PRC to 4u FFP to 1 bag platelets.

Remember cryoprecipitate and calcium

Permissive hypotension?
# Lactate as an Endpoint

## Adjusted for HR, BP, GCS, ISS

<table>
<thead>
<tr>
<th>Lactate</th>
<th>OR death</th>
<th>6h Lactate clearance</th>
<th>OR Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2.5</td>
<td>1.0</td>
<td>&gt;60%</td>
<td>1.0</td>
</tr>
<tr>
<td>2.5 - 4.0</td>
<td>1.5</td>
<td>30 - 59%</td>
<td>3.5</td>
</tr>
<tr>
<td>&gt;4.0</td>
<td>3.8</td>
<td>&lt;30%</td>
<td>4.3</td>
</tr>
</tbody>
</table>
1g tranexamic acid stat^{25}  
PUSH  
1g infused over 8 hours  
Within 3 hours injury
DEFINITIVE CARE
Our patient’s progress

RSI successful
6U PRC, 4U FFP, 1 bag plt, 1g tranexamic acid
BP 79/40, HR 110
Chest decompressed
Our patient’s progress
Our patient’s progress

Surgical PHO wants a CT to “locate the bleeding”...

Anaesthetist wants an arterial line and NGT....

Orthopaedics wants a trauma slab for a colles fracture.....

Nurse asks 10 minutes for IDC......

Social worker wants to bring family in.........
Avoid the therapeutic vacuum: seek definitive care.
Remember

Lines above the diaphragm
Commit to the airway
Decompress the chest
Pay attention to haemodynamics
Control the lethal triad
REMEMBER...

Trauma is a CLINICAL ART

METHODS are less important than RESULTS
References


Hypothermia correlates with revised trauma score OR 1.68

Waibel BH. Hypothermia in trauma patients: predicting the big chill. Crit Care 2012 16:155

Primary hypothermia (injury mediated) and secondary hypothermia (exposure, fluid etc)


170 pt cohort of landmine victims. Use of prehospital warming decreased hypothermia from 24% to 6%


Gives relative risks for >3 000 combat casualties


Shafi S, Elliot AC, Gentilello L. Is hypothermia simply a marker of shock and injury severity or an independent risk factor for mortality in trauma patients? Analysis of a large national trauma registry. J Trauma 2005 59(5) 1081 – 1085

Hypothermia predicts mortality independently of ISS OR 1.05-1.35


2 patients, 1 fall in CPP


7 patients, 5 fall in CPP


RCT 25 patients KM v opiate/BDZ: no difference in ICP


RCT 35 patients KM/midaz v opiate/BDZ. Ketamine increased CPP


Paix BR and Griggs WM. Emergency surgical cricothyroidotomy: 24 successful cases leading to a simple ‘scalpel-finger-tube’ method. EMA 2012, 24:23-30

Quick JA, MacIntyre AD and Barnes SL. Emergent Surgical Airway: Comparison of the three-step method and conventional cricothyroidotomy utilizing high-fidelity simulation. J. Emerg Med 2014, 16(2): 304 – 307

higher success rates with three step compared to conventional method under simulated conditions


surgical technique faster than percutaneous needle set
18/34 trauma arrest victims decompressed, 4 ROSC


3x smaller gap with binder than without


The CRASH-2 trial collaborators. Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomized, placebo-controlled trial. The Lancet 2010; 376(9734): 32 – 32