APPROACH TO TRAUMA

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Objectives

- Describe the initial approach to the injured patient, including the primary and secondary surveys.
- Identify the types and clinical presentations of shock. Identify the classes (I, II, III, IV) of hemorrhagic shock.
- Understand basic principles of initial trauma resuscitation.
- Understand the aspects of airway management that are unique to the trauma patient.
- Describe the indications for cervical radiography in the trauma patient.
- Describe the clinical presentation and initial treatment measures for life threatening injuries.
ATLS

- Trimodal death distribution
  - First peak instantly (brain, heart, large vessel injury)
  - Second peak minutes to hours
  - Third peak days to weeks (sepsis, MSOF)
ATLS

- ATLS focuses on the second peak....Deaths from:
  - TBI, EDH, SDH
  - Basilar skull fractures, orbital fractures
  - Penetrating neck injuries...
  - Spinal cord syndromes...
  - Cardiac tamponade, tension pneumothorax, massive hemothorax, esophageal injury, diaphragmatic herniation, flail chest, sucking chest wounds, pulmonary contusion, tracheobronchial injuries, penetrating heart injury, aortic arch injuries ...
  - Liver laceration, splenic ruptures, pancreatico-duodenal injuries, retroperitoneal injuries
  - Bladder rupture, renal contusion, renal laceration, urethral injury...
  - Pelvic fractures, femur fractures, humerus fracture
Concepts of ATLS

- Treat the greatest threat to life first
- The lack of a definitive diagnosis should never impede the application of an indicated treatment
- A detailed history is not essential to begin the evaluation
- “ABCDE” approach
Trauma Team
Primary Survey

- Patients are assessed and treatment priorities established based on their injuries, vital signs, and injury mechanisms.

- ABCDEs of trauma care:
  - A  Airway and c-spine protection
  - B  Breathing and ventilation
  - C  Circulation with hemorrhage control
  - D  Disability/Neurologic status
  - E  Exposure/Environmental control
A- Airway

- **Airway should be assessed for patency**
  - Is the patient able to communicate verbally?
  - Inspect for any foreign bodies
  - Examine for stridor, hoarseness, pooled secretions or blood

- **Assume c-spine injury in patients with multisystem trauma**
  - C-spine clearance is both clinical and radiographic
  - C-collar should remain in place until patient can cooperate with clinical exam
Airway Interventions

- Supplemental oxygen
- Suction
- Chin lift/jaw thrust
- Oral/nasal airways
- Definitive airways
  - RSI for agitated patients with c-spine immobilization
Difficult Airway
B - Breathing

- Airway patency alone does not ensure adequate ventilation
- Inspect, palpate, and auscultate
  - Deviated trachea, crepitus, flail chest, sucking chest wound, absence of breath sounds
- CXR to evaluate lung fields
Flail Chest
Subcutaneous Emphysema
Simple Pneumothorax
Breathing Interventions

- Ventilate with 100% oxygen
- Needle decompression if tension pneumothorax suspected
- Chest tubes for pneumothorax / hemothorax
- Occlusive dressing to sucking chest wound
- If intubated, evaluate ETT position
C- Circulation

- Hemorrhagic shock should be assumed in any hypotensive trauma patient
- Rapid assessment of hemodynamic status
## Table 251-4 Estimated Fluid and Blood Losses Based on Patient's Initial Presentation

<table>
<thead>
<tr>
<th></th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
<th>Class IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood loss (mL)*</td>
<td>Up to 750</td>
<td>750–1500</td>
<td>1500–2000</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>Blood loss (percent blood volume)</td>
<td>Up to 15</td>
<td>15–30</td>
<td>30–40</td>
<td>40</td>
</tr>
<tr>
<td>Pulse rate</td>
<td>&lt;100</td>
<td>100–120</td>
<td>120–140</td>
<td>&gt;140</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>Normal</td>
<td>Normal</td>
<td>Decreased</td>
<td>Decreased</td>
</tr>
<tr>
<td>Pulse pressure (mm Hg)</td>
<td>Normal or increased</td>
<td>Decreased</td>
<td>Decreased</td>
<td>Decreased</td>
</tr>
</tbody>
</table>

*Assumes a 70-kg patient with a preinjury circulating blood volume of 5 L.
Circulation Interventions

- Cardiac monitor
- Apply pressure to sites of external hemorrhage
- Establish IV access
  - 2 large bore IVs
  - Central lines if indicated
- Cardiac tamponade decompression if indicated
- Volume resuscitation
Resuscitative strategies in traumatic hemorrhagic shock
Adrien Bouglé, Anatole Harrois, and Jacques Duranteau
Annals of Intensive Care 2013,
Traumatic haemorrhagic shock

- Haemorrhagic shock
- Inflammation
- Excessive activation of the coagulation
- Fibrinolysis
- Beside coagulation monitoring
- Tranexamic acid

- Fluid resuscitation
- Hypothermia
- Hypocalcemia

- Hypoxia
- Acidosis
- Anemia

- Tissue hypoxia
- Hypocalcemia

- Decrease of activity of coagulation factors and platelet function

- Acute Traumatic Coagulopathy

- Low volume resuscitation
- $80 \leq \text{SAP} \leq 90$ mmHg
- Early administration of vasopressor

- Normothermia
- Ionised $\text{Ca}^{++} = 1.1 - 1.3$ mmol/l

- Avoid delays in the delivery
- Massive transfusion protocol
- RBCs:FFP $\leq 2:1$
- Early administration of FFP
- Fibrinogen $\geq 1.5 - 2$ g.L$^{-1}$
D- Disability

- Abbreviated neurological exam
  - Level of consciousness
  - Pupil size and reactivity
  - Motor function
  - GCS
    » Utilized to determine severity of injury
    » Guide for urgency of head CT and ICP monitoring
<table>
<thead>
<tr>
<th>EYE</th>
<th>VERBAL</th>
<th>MOTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous</td>
<td>4</td>
<td>Oriented</td>
</tr>
<tr>
<td>Verbal</td>
<td>3</td>
<td>Confused</td>
</tr>
<tr>
<td>Pain</td>
<td>2</td>
<td>Words</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>Sounds</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>Decerebrate</td>
</tr>
</tbody>
</table>
Disability Interventions

- Spinal cord injury
  - High dose steroids if within 8 hours

- ICP monitor- Neurosurgical consultation

- Elevated ICP
  - Head of bed elevated
  - Mannitol
  - Hyperventilation
  - Emergent decompression
**E- Exposure**

- Complete disrobing of patient
- Logroll to inspect back
- Rectal temperature
- Warm blankets/external warming device to prevent hypothermia
Always Inspect the Back
Secondary Survey

- AMPLE history
  - Allergies, medications, PMH, last meal, events
- Physical exam from head to toe, including rectal exam
- Frequent reassessment of vitals
- Diagnostic studies at this time simultaneously
  - X-rays, lab work, CT orders if indicated
  - FAST exam
Diagnostic Aids

- Standard trauma labs
  - CBC, K, Cr, PTT, Utox, EtOH, ABG

- Standard trauma radiographs
  - CXR, pelvis, lateral C-spine (traditionally)

- CT/FAST scans

- Pt must be monitored in radiology

- Pt should only go to radiology if stable
Bilateral Pubic Ramus Fractures and Sacroiliac Joint Disruption

What should this injury make you worry about?
Airway Management

Control of Hemorrhage Exploratory: thoracotomy or laparotomy, Pelvic external fixation, Neck Exploration

Intracranial Mass Excision: EDH, SDH with mass effect

Threatened Limb or Eyesight
- Traumatic near amputation
- Peripheral vascular Trauma
- Compartment Syndrome
- Open globe injury

High risk of sepsis
- Perforated Stomach or bowel
- Massive soft tissue infection

Control of ongoing Hemorrhage
- Exploratory thoracotomy or laparotomy Wound

Early mobilization
- Closed long bone fixation
- Spinal fixation

Better cosmetic Outcome
- Facial fracture repair
- Soft tissue closure
Priorities in Orthopedia

- Life threatening
- Limb threatening
- Function threatening
Priorities

- Life threatening
  - pelvic hemorrhage
- Limb threatening
  - vascular injury
  - compartment syndrome
  - open fracture
  - irreducible dislocation
- Function threatening
  - articular fracture
  - distal extremity fx
Patients can be generally divided into 4 groups:

- stable: can be treated with immediate fixation
- unstable, and *in extreme*: should be treated with damage control
Borderline:

- most difficult one to define and identify.
- decision regarding the optimal course of action is most critical
- complications of the "incorrect" decision are profound.
Borderline:

- In general, the borderline patient has multiple thoracic and abdominal injuries and is suffering from hemorrhagic shock or its sequel.
- Early total care of major bone fractures in theses patients may be potentially harmful.
- Such patient is probably best treated with damage control.
damage control

- emphasizes the stabilization and control of the injury rather than repair will add little additional physiologic insult to the patient and is a treatment option that should be considered
A few scenarios deserve special mention
- **femoral fracture external fixation**, for reduce the "second hit" injury especially in the setting of bilateral femur fx in the multiply injured patient

- **pelvic ring fx & hemorrhage** appropriate skeletal and/or hemodynamic stabilization procedure(s): pelvic binder/external fix, to therapeutic angiography, to emergent open pelvic packing.
The timing of definitive fixation of secondary injuries or is also a crucial decision.

Most patients treated can be definitively stabilized within one week, but this may depend on the overall physiologic state of the patient.

Days 2-4 following the injury have been defined as the time of greatest systemic inflammation and any additional unnecessary surgery should be avoided during this period.
What to do?

Clinical status?

- stable
- borderline
- unstable

- resuscitate
- reevaluate

- stabilized
- uncertain

ETC

?DCO
Resuscitation before stabilization of femoral fractures limits acute respiratory distress syndrome in patients with multiple traumatic injuries despite low use of damage control orthopedics.

J Trauma. 2009 Nov;67(5):1013-21; O'Toole RV, O'Brien M, Scalea TM, Habashi N, Pollak AN, Turen CH.
Summary

- Trauma is best managed by a team approach (there’s no “I” in trauma)
- A thorough primary and secondary survey is key to identify life-threatening injuries
- Once a life-threatening injury is discovered, intervention should not be delayed
- Decision is determined by the patient’s condition as well as available resources.
References

- ATLS Student Course Manuel, 6th edition.
References

- The right team at the right time: Multidisciplinary approach to multi-trauma patient with orthopedic injuries. OPUS 12 Scientist 2012 Vol. 6, No. 1. John A et al.