PITFALLS IN TRAUMA MANAGEMENT AT ED

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Initial Assessment & Management

Preparation
- ABCDE
- Resuscitation
- Adjunct

Primary survey
- Head to toe
- Adjunct

Secondary survey
- AMPLE
- Head to toe
- Adjunct

Definite care
- OR
- Ward
- ICU

Re-evaluation
Where is location of pitfall?
Standard Precaution

- Cap
- Gown
- Gloves
- Mask
- Shoe covers
- Goggles/face shield
Sequence of Primary Survey

- **A**: Airway with cervical spine protection
- **B**: Breathing and ventilation
- **C**: Circulation with controlled hemorrhage
- **D**: Disability (neurological)
- **E**: Exposure, Environmental controlled
Endotracheal intubation

- In-line cervical spine immobilization
Inline Immobilization
After intubation, one of the common reasons for loss of breath sounds in the left thorax is a right mainstem intubation.
Airway & Ventilation Management

Endotracheal intubation in Laryngeal trauma or incomplete upper airway transection

Precipitate total airway occlusion or complete airway transection
Pitfall in airway management

- Equipment failure:
  - light on the laryngoscope burns out
  - the cuff on the ET tube leaks
- Intubation *can not* be performed after neuromuscular blockade (RSI)
- Surgical airway *can not* be established expediently because of their obesity.

These pitfalls cannot always be prevented. However, they should be anticipated, and preparations should be made to minimize their impact.
Pitfall in airway management

- A rigid suction -- essential & available
- Mouth gag / Mouth guard
- Gastric distention
  - Result vomiting and aspiration
  - Against IVC -- resulting in hypotension & bradycardia
  - Occur after ventilating with a bag-mask device
Pitfall in airway management

- Trauma patients can occasionally extubate themselves, can occlude their ET tube or deflate the cuff by biting it.
- The pulse oximeter sensor should not be placed distal to the BP blood cuff
  - Misleading information regarding Hb saturation and pulse
Semirigid Cervical collar
Semi rigid Cervical Collar

Pressure sore
Airway & Ventilation

Need for **AIRWAY protection**
- Unconscious
- Severe maxillofacial fracture
- Bleeding
- Sustain seizure
- Risk for obstruction
- Neck hematoma
- Laryngeal or tracheal injury
- Stridor
- Inhalation injury

Need for **VENTILATION**
- Apnea
- Tachypnea
- Hypoxia
- Hypercarbia
- Cyanosis
- Severe head injury

**Dyspnea & Tachypnea** => inadequate airway & ventilation problem
Intubation & Ventilation in unconscious patient

- Aggravate a pneumothorax
- Re-evaluated of chest
- Chest x-rays should be obtained as soon after intubation
Pitfall !!!

- Pregnancy (late)
  - MV increases primarily as a result of an increase in TV
  - Hypocapnia (PaCO2 of 30 mm Hg) is common
  - PaCO2 of 35-40 mm Hg may indicate impending respiratory failure
Chest Drain Insertion

Triangle of Safety
Fourth to fifth intercostal space
anterior axillary line
Pitfall of Chest trauma

- Ignored / Overlooked Simple pneumothorax may progress to a tension pneumothorax.

- Not fully evacuated simple hemothorax can result in a clotted hemothorax, if infected, it can develop into an empyema thoracis.
Miss Diagnosis of Trauma pneumothorax
Pitfall of Chest trauma

- Chest x-ray findings suggestive of aortic disruption / *Widen mediastinum*
  - Delayed or extensive evaluation $\rightarrow$ rupture of the contained hematoma and rapid death from exsanguination.
  - Rapid definitive diagnosis and treatment
Pitfall of Chest trauma

- Miss diagnosis of Diaphragmatic injuries
  - May be missed during the initial trauma evaluation
  - Can result in pulmonary compromise, entrapment and strangulation of peritoneal contents
Miss diagnosis of Diaphragmatic injury
Pitfall of Chest trauma

- **Elderly patients**
  - May not tolerate even relatively minor chest injuries
  - Early invasive monitoring and treatment

- **Pediatric trauma**
  - Often significant injury to the intra-thoracic structures without evidence of thoracic skeletal trauma
**Bleeding**

- Direct manual pressure on the wound
- Tourniquets should **not be used except** in traumatic amputation

Recognize the source of occult hemorrhage. Remember, “**Blood on the floor + four more.**” Chest, Pelvis (retroperitoneum), Abdomen, and Thigh
### TABLE 3.1 Estimated Blood Loss 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 (% blood volume)</td>
<td>Up to 15%</td>
<td>15%–30%</td>
<td>30%–40%</td>
<td>&gt;40%</td>
</tr>
<tr>
<td>Pulse rate (BPM)</td>
<td>&lt;100</td>
<td>100-120</td>
<td>120-140</td>
<td>&gt;140</td>
</tr>
<tr>
<td>Systolic b 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>
<tr>
<td>Respiratory rate</td>
<td>14–20</td>
<td>20–30</td>
<td>30–40</td>
<td>&gt;35</td>
</tr>
<tr>
<td>Urine output (mL/hr)</td>
<td>&gt;30</td>
<td>20–30</td>
<td>5–15</td>
<td>Negligible</td>
</tr>
<tr>
<td>CNS/mental status</td>
<td>Slightly anxious</td>
<td>Mildly anxious</td>
<td>Anxious, confused</td>
<td>Confused, lethargic</td>
</tr>
<tr>
<td>Initial fluid replacement</td>
<td>Crystalloid</td>
<td>Crystalloid</td>
<td>Crystalloid and blood</td>
<td>Crystalloid and blood</td>
</tr>
</tbody>
</table>
Circulatory Management

- Normal blood pressure VS Normal perfusion

- Limitation of **FAST**
  - Obesity
  - Intraluminal bowel gas
  - Subcutaneous emphysema
  - Pelvic fracture
  - Retroperitoneal hemorrhage
CT Liver Hematoma

Negative FAST Examination
Abdominal Trauma

- Accuracy of physical examination in abdominal trauma?
- Adjunction and Imaging for diagnosis
- Repeated or Serial physical examination
Pitfall in pelvic fracture management

- Excessive manipulation of the pelvis
- **First clot** is the **best** clot
- Reduce volume ? or Fixation ?
- The AP pelvic x-ray--provide valuable informational

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**Figure 5-10** Pelvic Stabilization. Pelvic binder (A) and pelvic stabilization using a sheet (B).
Circulatory Management

**Geriatric Trauma**
- HR response to blood loss
- Less cardiopulmonary reserve
- Medication:
  - Anticoagulation therapy
  - B-blocker
  - Anti-diuretic

**Pediatric Trauma**
- Abundant physiologic reserve
- Sudden deterioration
- Increased vagal tone

![Physiologic Impact: Hemodynamic Changes](image)
Pitfall in circulatory management

- Fluid Resuscitation: NSS vs RLS
- Blood transfusion
- Appropriated venous access
  - Upper-extremity peripheral line (prefer)
  - Venous cut down
  - Central venous line / serious complication
  - Intraosseous (IO) access
Pitfall in circulatory management

- “controlled resuscitation,” “balanced resuscitation,” “hypotensive resuscitation,” and “permissive hypotension”
  - Balancing the goal of organ perfusion with the risks of re-bleeding by accepting a lower than normal blood pressure
- The goal is the balance--not the hypotension
- Resuscitation strategy—bridge to definitive surgical control of bleeding— not a substitute
Hematocrit (Hct) & Hemoglobin (Hb)

- May be unreliable for estimating acute blood loss
- Massive blood loss – may minimal acute decrease in Hct or Hb
- Very low Hct obtained shortly after injury -- massive blood loss or a preexisting anemia
- Normal Hct does not exclude significant blood loss
Disability & Neuro Management

- The lucid interval; Epidural hematoma
- “Talk and Die”
- High index of suspicious / High energy impact
- Frequent neurologic reevaluation & early detection of changes
- Early consultation with a neurosurgeon
Influence factors for GCS evaluation

1. Hypotension (shock)
2. Hypothermia
3. Hypoxemia
4. Drunken (blood alcohol >100 mg%)
5. Under sedation
6. Electrolyte imbalance
Pitfall in Neurological management

- CPP = MAP-ICP
- Prevention of Secondary brain injury (shock, hypoxia)
- Diagnostic and therapeutic procedure—may increase ICP eg. tracheal intubation
- Narcotic analgesics –hypercapnia, inability to manage their airway
Hyperventilation

- To reduce PaCO2 and Cerebral vasoconstriction
- Aggressive and prolonged hyperventilation = Cerebral ischemia
- In most patients preferred -- Normocarbia
  - Optimized PaCO2 = 35-45 mmHg
- Brief periods of hyperventilation (PaCO2 of 25-30 mm Hg)
  - For acute neurologic deterioration while other treatments are initiated
  - For deteriorating patient with expanding intracranial hematoma until emergent craniotomy can be performed
MANNITOL

- To reduce elevated ICP
- **Strong indication**
  - Acute neurologic deterioration: dilated pupil, hemiparesis, or loss of consciousness while the patient is being observed
- Should *not be* given to patients with hypotension
  - Does not lower ICP in hypovolemia
  - Potent osmotic diuretic
  - Exacerbate hypotension and cerebral ischemia
- Beware – **rebound effect**
Seizures & Muscle relaxant use
- May devastating to brain function
- Undiagnosed tonic-clonic muscle contractions (vecuronium or succinylcholine)

To make sure that
- Appropriate anti-seizure therapy is being initiated
- The seizure is under control before initiating neuromuscular blockade
Exposure and Environmental control

- Hypothermia

- **Cause**: On arrival, massive transfusions and crystalloid resuscitation and ATLS protocol

- Rewarm the patient & Prevent hypothermia
Trauma triad of death

- Coagulopathy
- Hypothermia
- Metabolic Acidosis

- Halt coagulation cascade
- Decreased myocardial performance
- Lactic acids
Exposure & Environment Control

- Undress
- PR
- Keep warm
Urethral injury?
Mechanism of Injury and evidence of high-energy impact

- **Fall**
  - Adult > 20 ft. (1 story = 10 ft.)
  - Child > 10 ft. / 2-3 times the height of child

- **High-risk Auto crash**
  - Intrusion >12 in. , Occupant site >18 in. , any site.
  - Ejection (partial / complete) from automobile
  - Death in same passenger compartment
  - Vehicle telemetry data consistent with high risk of injury
  - Auto vs Pedestrian/Bicyclist thrown, run over or with significant (>20 mph) impact
  - Motorcycle crash > 20 mph
Adjuncts to primary survey

- Monitoring
  - Ventilatory rate
  - ABG
  - Pulse oximetry
  - EKG
  - End tidal CO2

- X-ray and diagnostic study
  - AP chest film
  - AP pelvis
  - Lateral Cross-table C-spine film

- DPL
- FAST
Adjuncts to primary survey

- **Foley catheter**
  - Decompress urinary bladder
  - Monitor urine output
  - Check for KUB injury; gross hematuria?

- **Gastric tube / NG tube**
  - Decompress stomach
  - Reduce risk of aspiration
  - Check for bile or blood
Non-specialists should avoid excessive manipulation of the urethra or use of specialized instrumentation.

Placement of a gastric catheter can induce vomiting or gagging and produce the specific problem that its placement is intended to prevent—aspiration.

NG tube insertion in penetrating neck injury—precaution
What is pitfall?
Pitfall of vascular injury management

- Miss diagnosis
  - Compartmental syndrome
  - Occult injury with fracture
- Delayed definite treatment
  - Imaging
  - Complex limb injury
- Fasciotomy
- Surgical technique
Diagnosis of Arterial bleeding

- **Hard signs of Vascular injury**
  1. Active or pulsatile hemorrhage
  2. Pulsatile or expanding hematoma
  3. Signs of limb ischemia: 5 Ps-pain, pallor, paralysis, paresthesias, poikilothermia (coolness)
  4. Bruit or thrill
  5. Diminished or absent pulses

*hard signs of vascular injury มี sensitivity = 92-95% และมีความจำเป็นในการทำ intervention ที่ positive predictive value (PPV) = 95%*
Absence of distal pulse may occur in:

- True vascular injury
- Hypovolemic shock
- No re-alignment of fracture & dislocation
- Vascular spasm
- Pre-existing PVDs

Note: Palpable Pulse *can not* be rule out vascular injury
<table>
<thead>
<tr>
<th>Orthopedic injury</th>
<th>Associated vascular injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee dislocation **</td>
<td>Popliteal artery</td>
</tr>
<tr>
<td>Femur fracture</td>
<td>Superficial femoral injury</td>
</tr>
<tr>
<td>Supracondylar humerus fracture</td>
<td>Brachial artery</td>
</tr>
<tr>
<td>Clavicle fracture</td>
<td>Subclavian artery</td>
</tr>
<tr>
<td>Shoulder dislocation</td>
<td>Axillary artery</td>
</tr>
</tbody>
</table>
Sign and Symptom of compartmental syndrome

- Increasing pain greater than expected and out of proportion to the stimulus
- Palpable tenseness of the compartment
- Asymmetry of the muscle compartments
- Pain on passive stretch of the affected muscle
- Altered sensation
Vascular injury VS Compartmental syndrome

- Acute compartment syndrome may be masked
  - Unconscious patients
  - Severe hypovolemic

- The absence of distal pulse -- late finding of compartmental syndrome (uncommon)
Compartmental Syndrome?
Compartamental Syndrome?
Re-Alignment & Vascular assessment

**FIGURE 8-2** Application of 1) in-line traction, and then 2) rotation of the distal leg to normal anatomic position.
Limb and Vascular injury

- AAI < 0.9 => Suspected Vascular injury
- Limitation of AAI (Arterial-Arterial Index)
  - AV fistula / Aneurysm
  - Pre-existing PVD
"Mistakes are always forgivable, if one has the courage to admit them."

Bruce Lee
มองไปข้างหน้า
อย่างมีความหวัง
มองไปข้างหลัง
อย่างมีบทเรียน
สวัสดีครับ