PITFALLS IN TRAUMA MANAGEMENT AT ED

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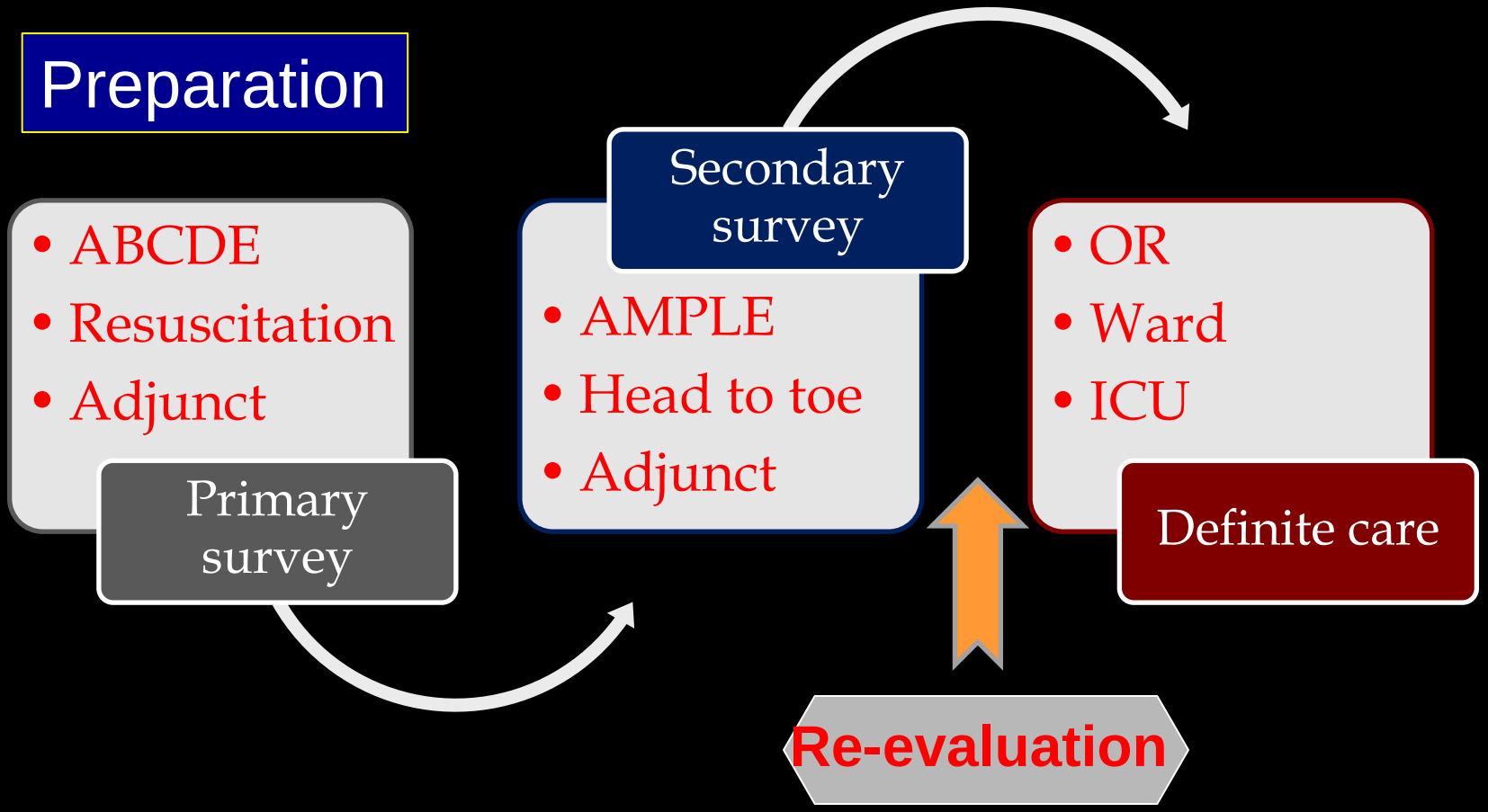
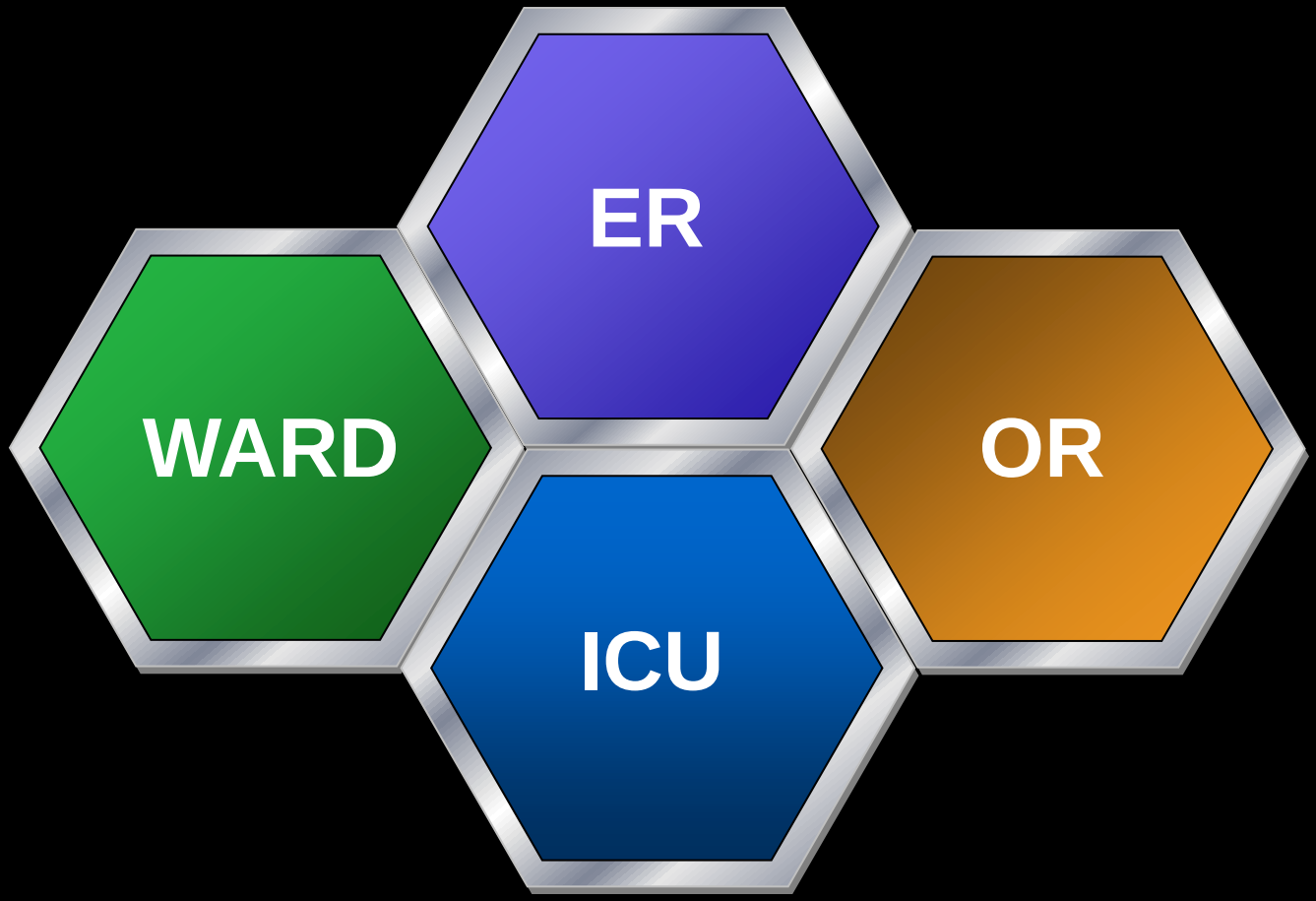
Initial Assessment & Management



Where is location of pitfall ?



Standard Precaution

- Cap
- Gown
- Gloves
- Mask
- Shoe covers
- Goggles/face shield

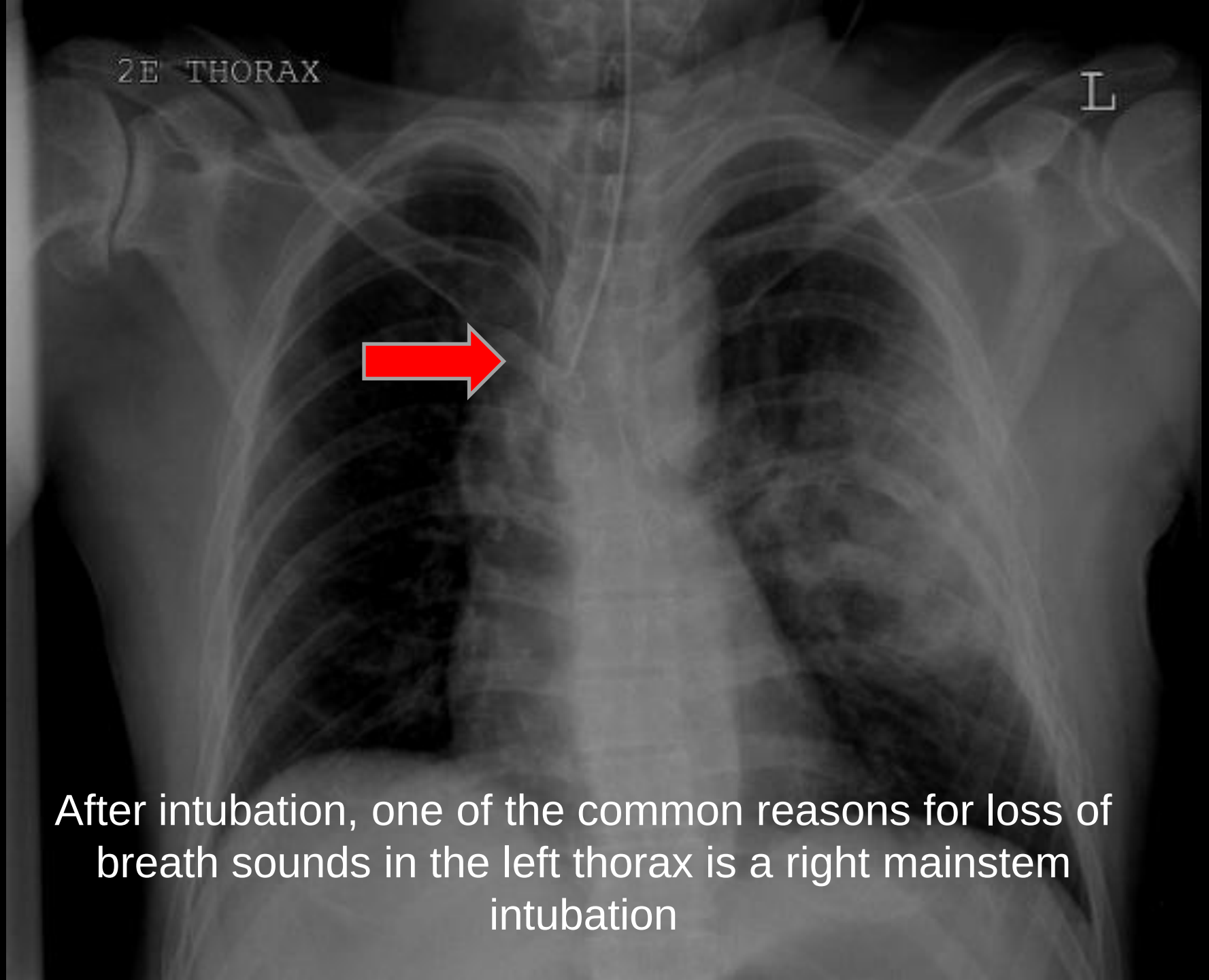
Sequence of Primary Survey

- **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

Philadelphia Collar

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

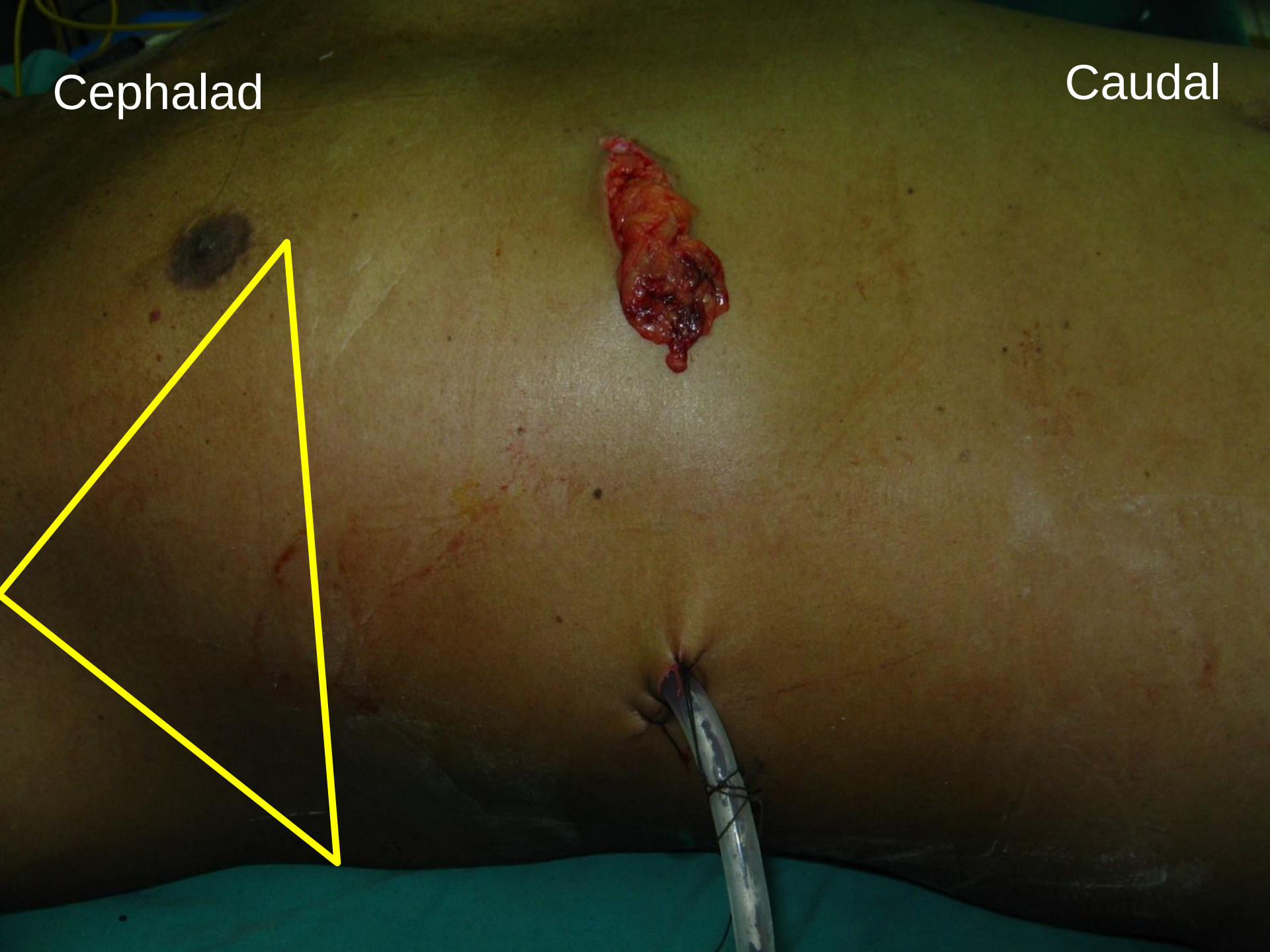
Airway & Ventilation

- 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 ($PaCO_2$ of 30 mm Hg) is common
  - $PaCO_2$ of 35-40 mm Hg may indicate impending respiratory failure

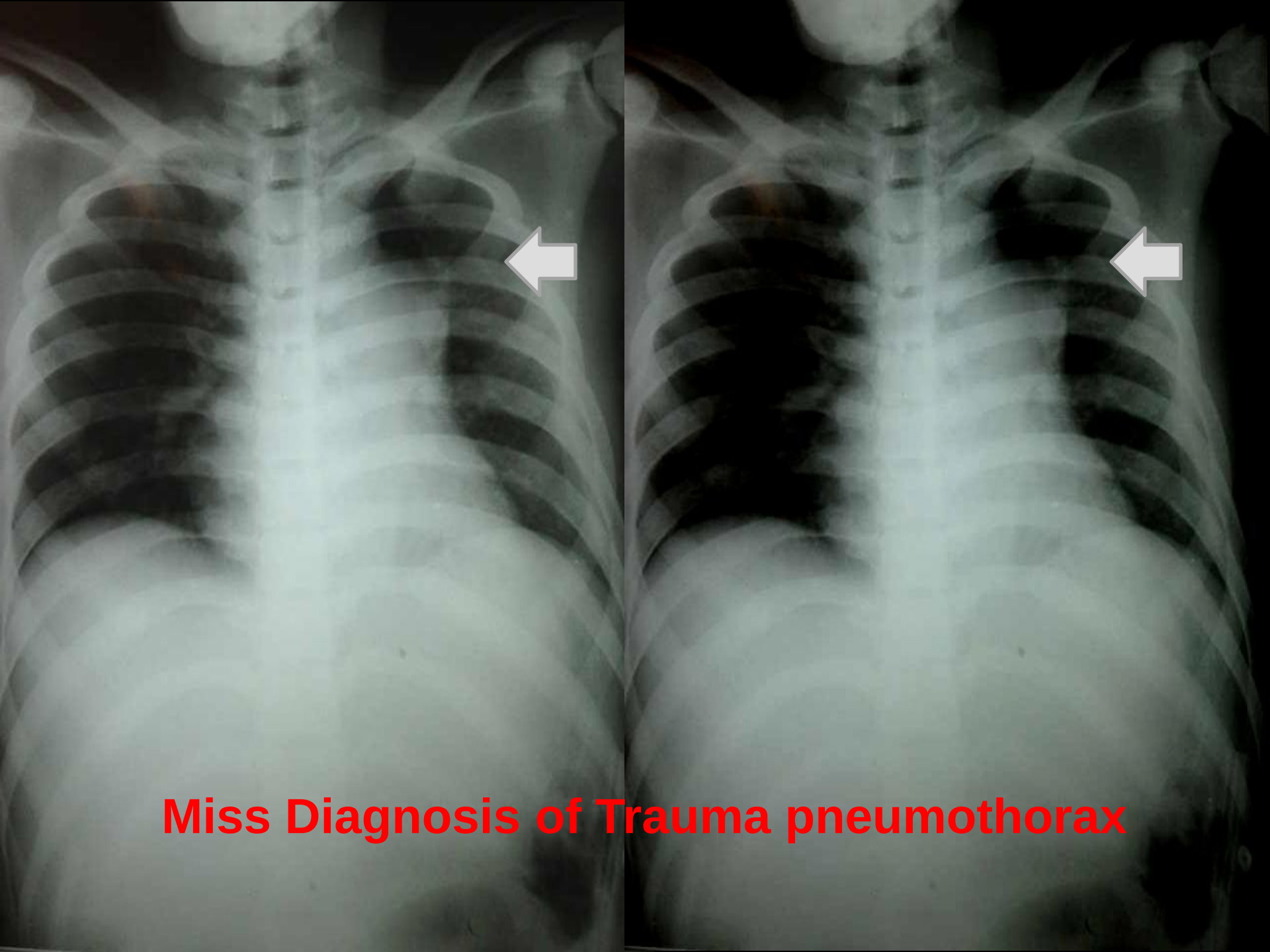
Chest Drain Insertion


Cephalad
Caudal

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

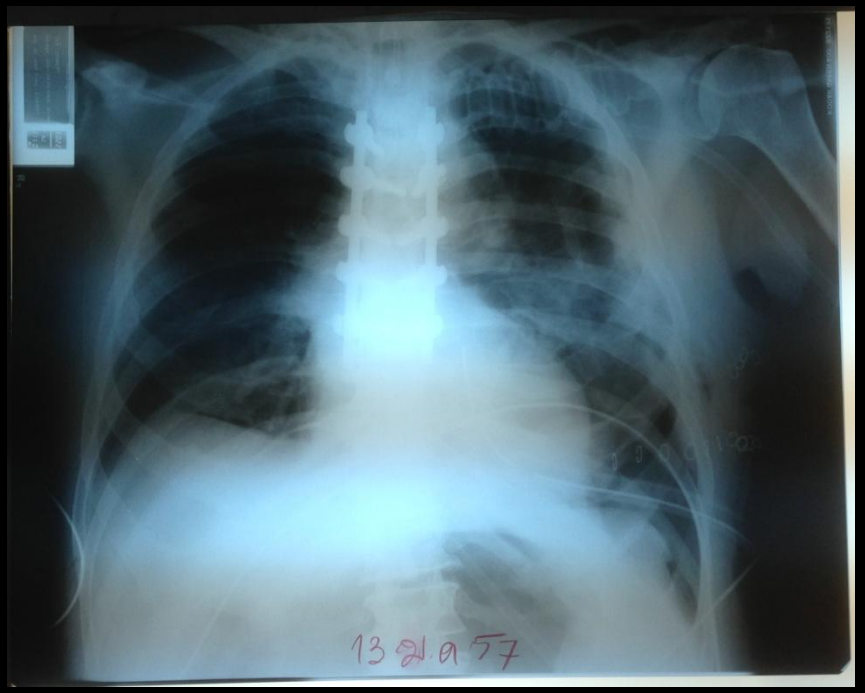
Pitfall of Chest trauma

- Chest x-ray findings suggestive of aortic disruption /Widen mediastinum
  - Delayed or extensive evaluation → 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



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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

Circulation with Hemorrhage control

- **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

Recognize !!

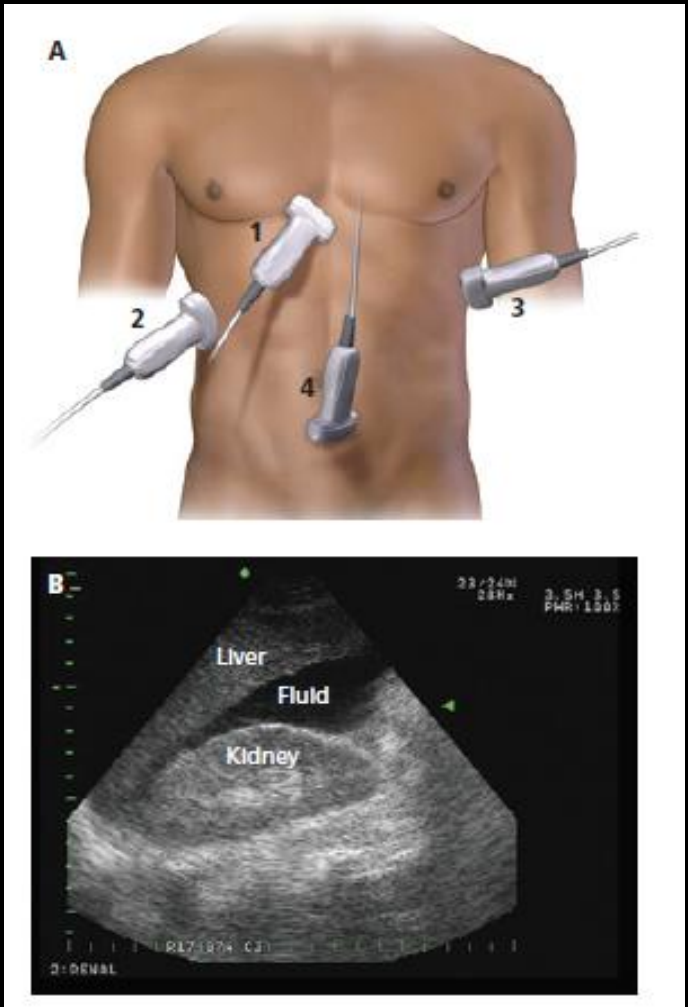
TABLE 3.1 Estimated Blood Loss[1] Based on Patient's Initial Presentation

	CLASS I	CLASS II	CLASS III	CLASS IV
Blood loss (mL)	Up to 750	750–1500	1500–2000	>2000
Blood loss (% blood volume)	Up to 15%	15%–30%	30%–40%	>40%
Pulse rate (BPM)	<100	100-120	120-140	>140
Systolic b pressure	Normal	Normal	Decreased	Decreased
Pulse pressure (mm Hg)	Normal or increased	Decreased	Decreased	Decreased
Respiratory rate	14–20	20–30	30–40	>35
Urine output (mL/hr)	>30	20–30	5–15	Negligible
CNS/mental status	Slightly anxious	Mildly anxious	Anxious, confused	Confused, lethargic
Initial fluid replacement	Crystalloid	Crystalloid	Crystalloid and blood	Crystalloid and blood

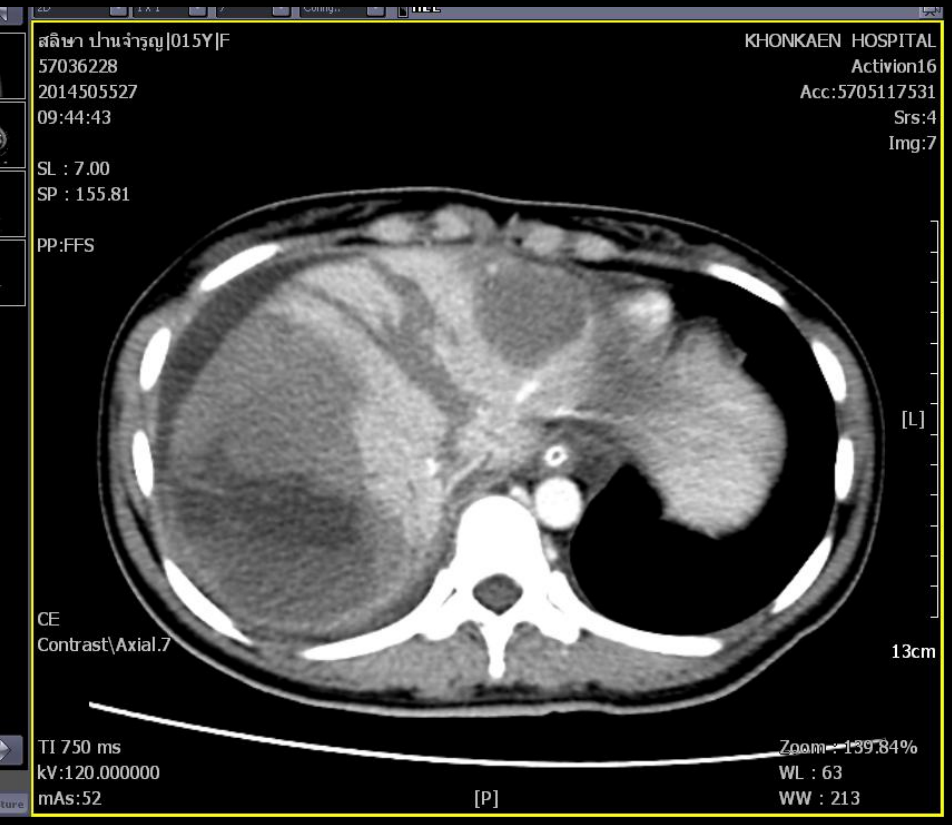
Circulatory Management

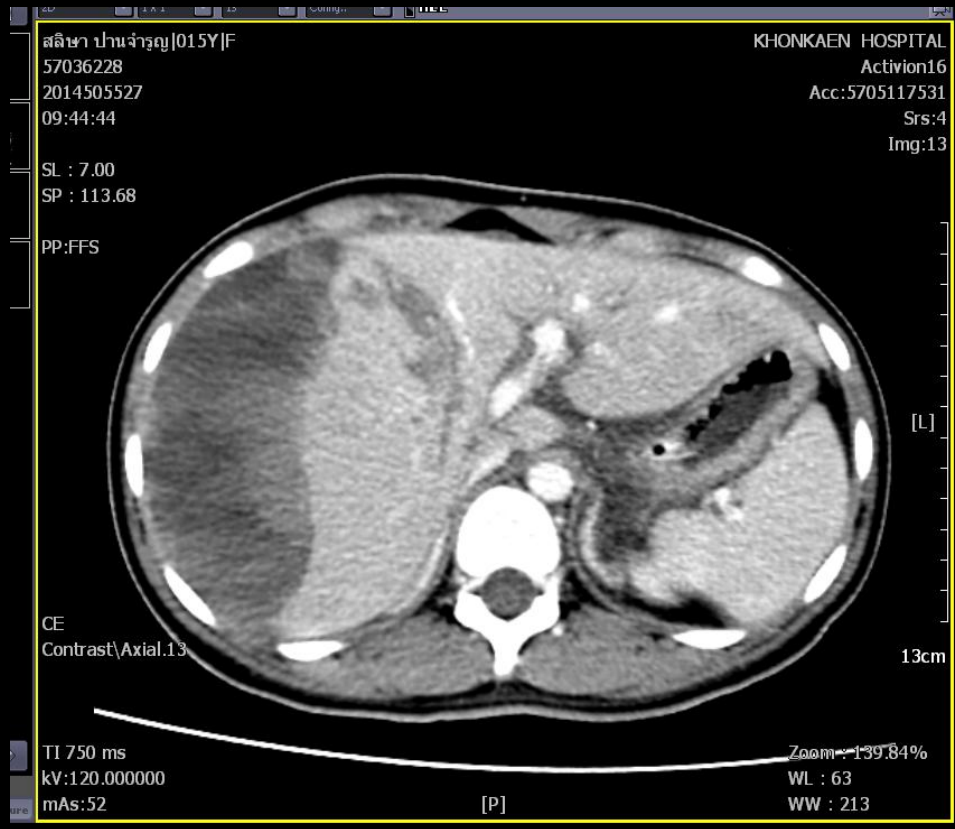
- Normal blood pressure VS Normal perfusion

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



CT Liver Hematoma



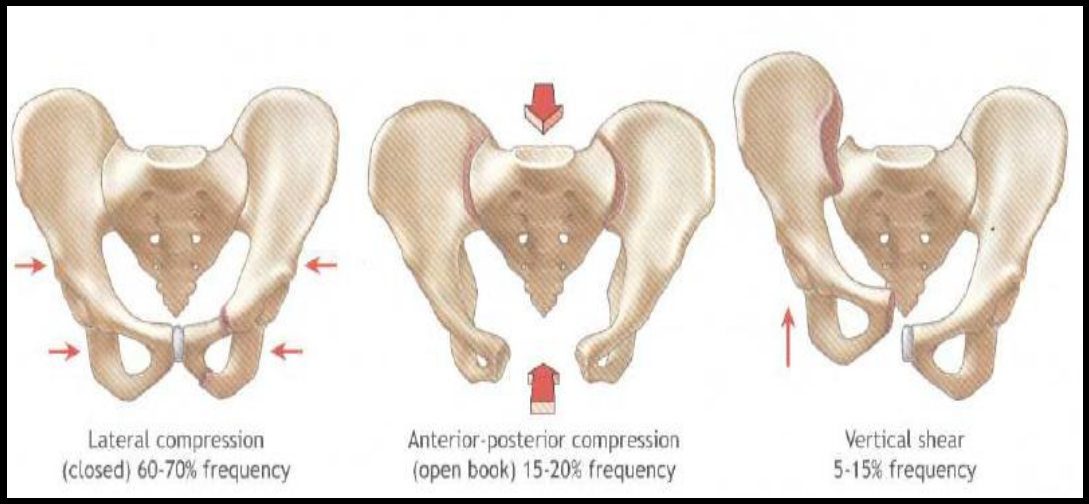


Negative FAST Examination

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

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

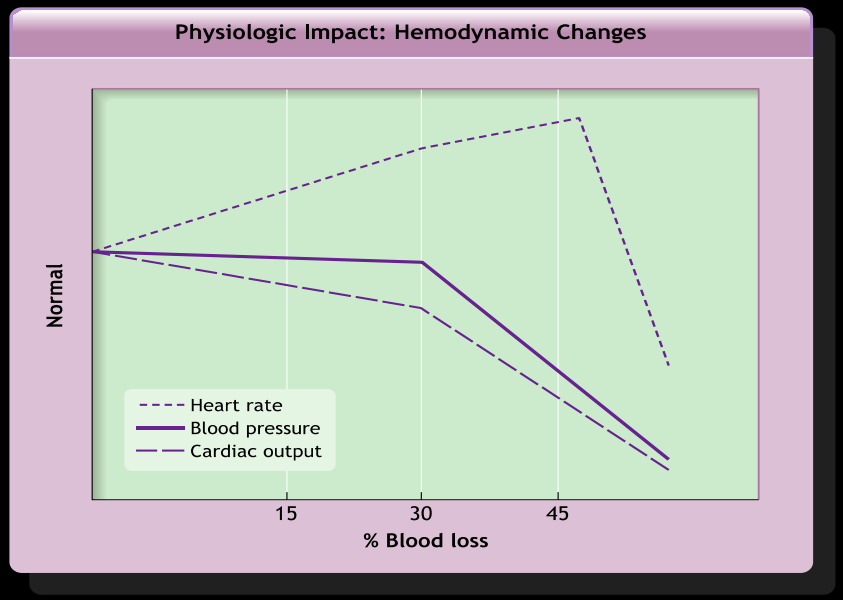
Circulatory Management

Geriatric Trauma

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

PediatricTrauma

- Abundant physiologic reserve
- Sudden deterioration
- Increased vagal tone



Pitfall in circulatory managment

- 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 managment

- "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

Pitfall in circulatory managment

- **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 $PaCO_2$ and Cerebral vasoconstriction
- Aggressive and prolonged hyperventilation= Cerebral ischemia
- In most patients prefered --Normocarbia
  - Optimized $PaCO_2$ = 35-45 mmHg
- Brief periods of hyperventilation ($PaCO_2$ 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

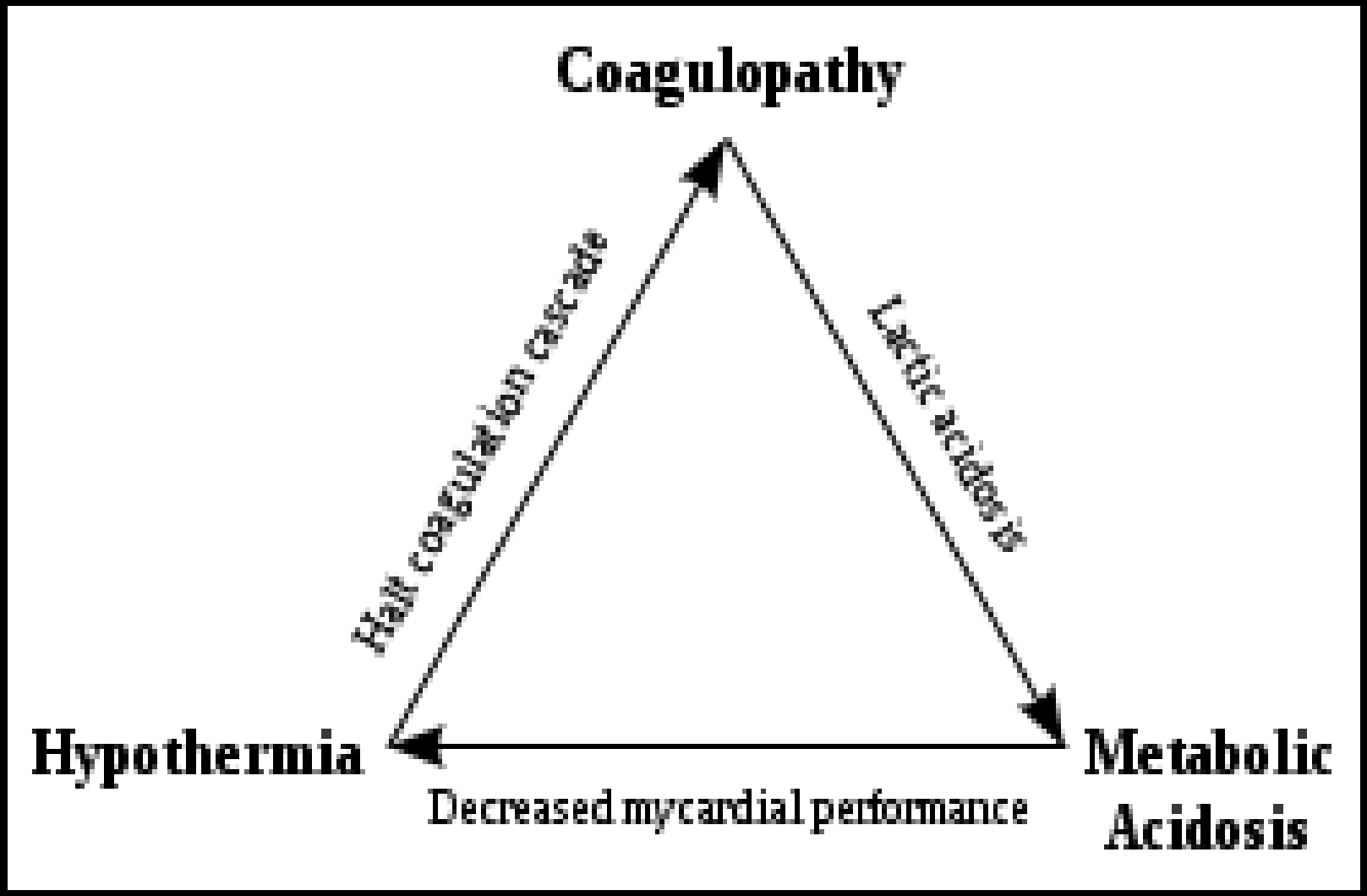
Pitfall in Neurological management

- 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

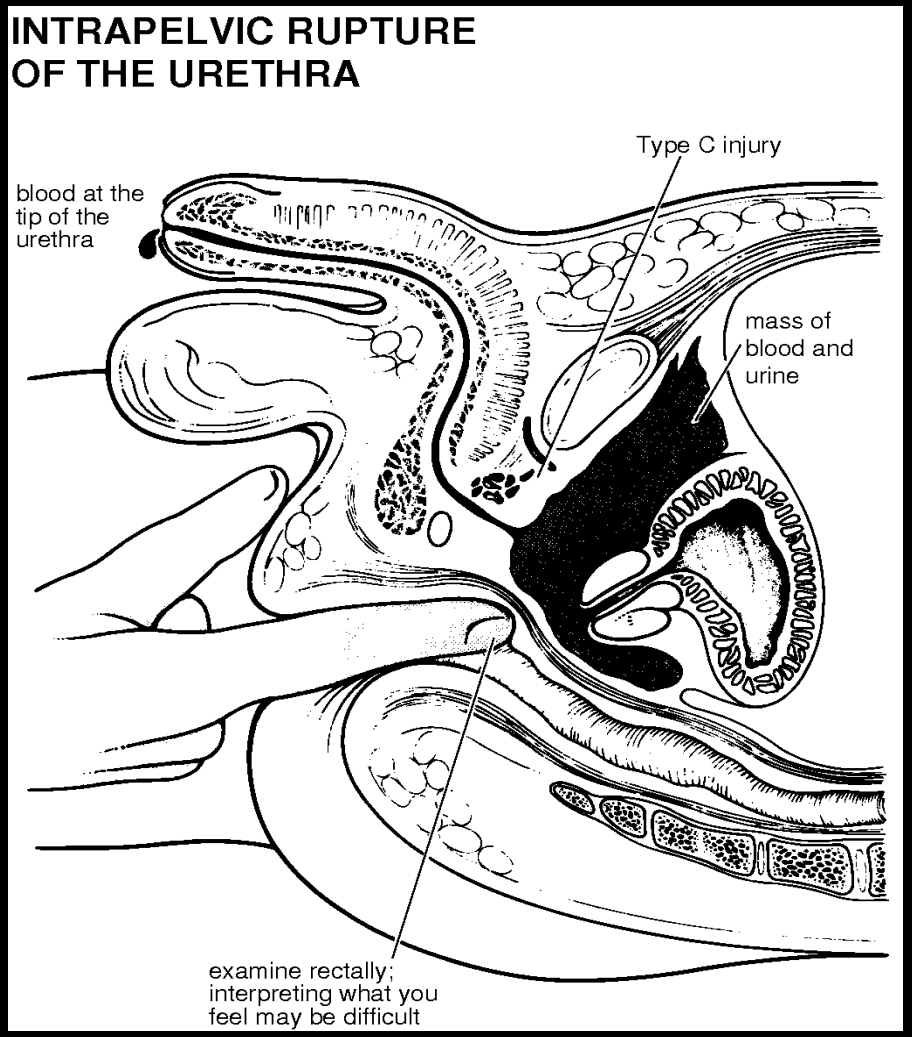
- Hypothermia
- **Cause** : On arrival , massive transfusions and crystalloid resuscitation and ATLS protocal
- Rewarm the patient & Prevent hypothermia

Trauma triad of death



Exposure & Environment Control

- Undress
- PR
- Keep warm



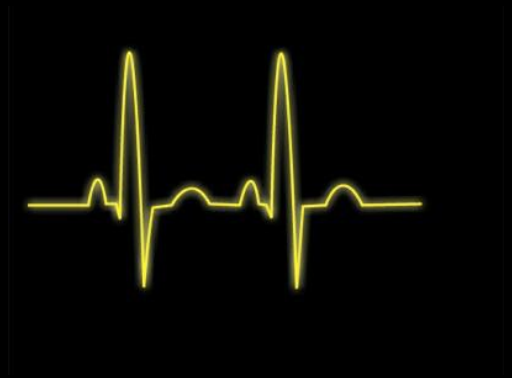
Urethral injury ?

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

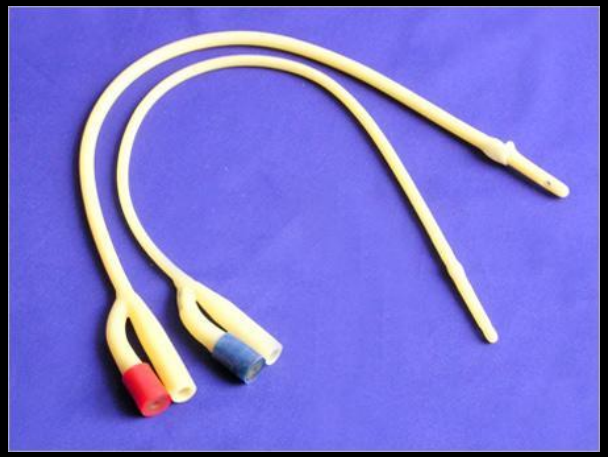
- Monitoring
  - Ventilatory rate
  - ABG
  - Pulse oximetry
  - EKG
  - End tidal CO2
- DPL
- FAST



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

Adjuncts to primary survey

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

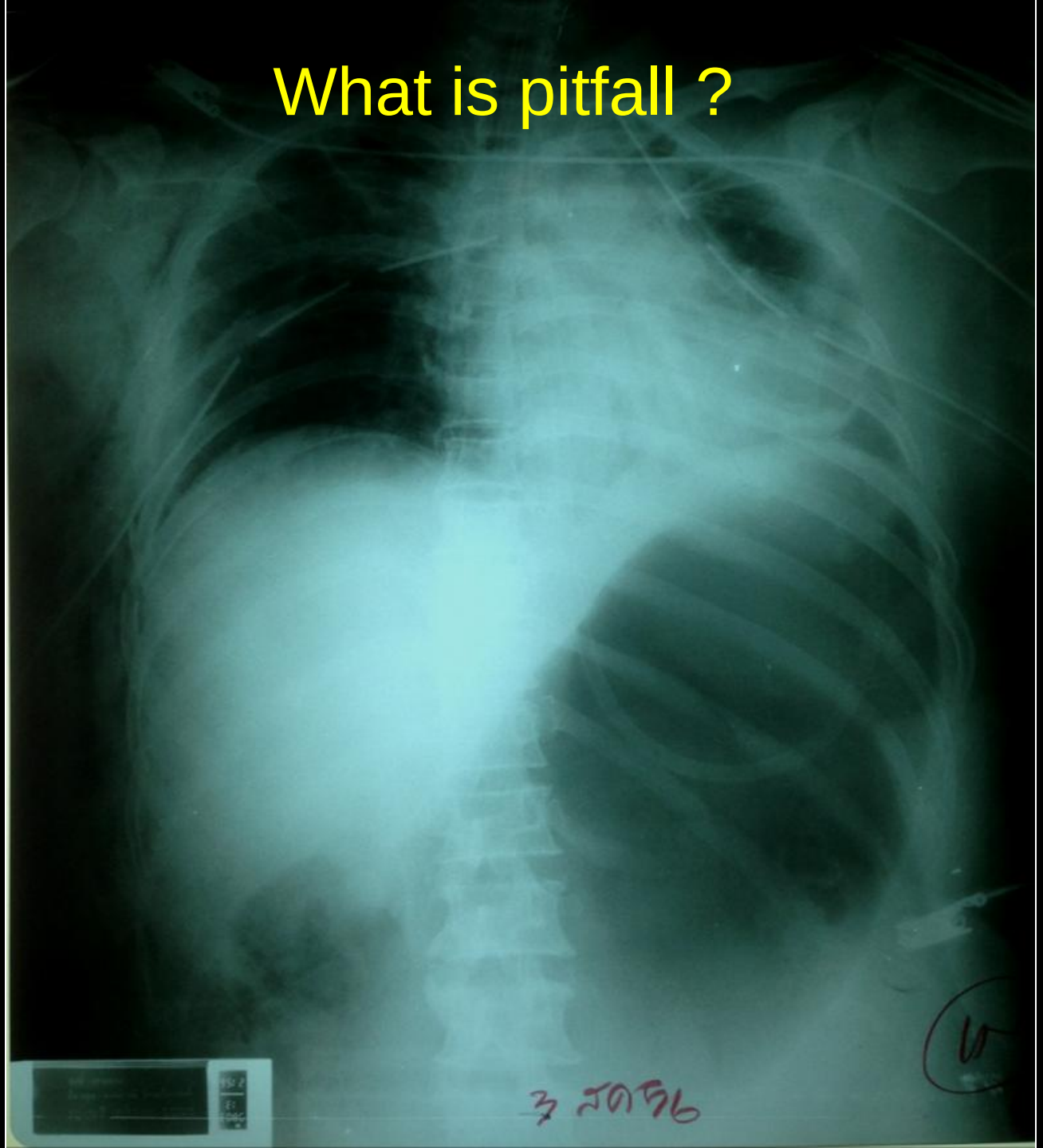


- Gastric tube / NG tube
  - Decompress stomach
  - Reduce risk of aspiration
  - Check for bile or blood

Pitfall !!!

- 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%

Diagnosis of Arterial bleeding

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

Vascular injuries associated with specific orthopedic injuries

Orthopedic injury	Associated vascular injury
Knee dislocation **	Popliteal artery
Femur fracture	Superficial femoral injury
Supracondylar humerus fracture	Brachial artery
Clavicle fracture	Subclavian artery
Shoulder dislocation	Axillary artery

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

Pitfall !!!!

- Vascular injury VS Compartmental syndrome
- Acute compartment syndrome may be masked
  - Unconscious patients
  - Severe hypovolemia
- The absence of distal pulse –- late finding of compartmental syndrome (uncommon)

Compartmental Syndrome ?

Compartmental 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


“ความผิดพลาดทั้งหลาย
เป็นสิ่งที่ให้อภัยได้เสมอ
ถ้าคนนั้น
มีความกล้า
ที่จะยอมรับผิด”
“Mistakes are always forgivable,
if one has the courage
to admit them.”
บรูซ ลี (Bruce Lee)

มองไปข้างหน้า

อย่างมีความหวัง

มองไปข้างหลัง

อย่างมีบทเรียน


สวัสดีครับ