EMERGENCY MEDICINE

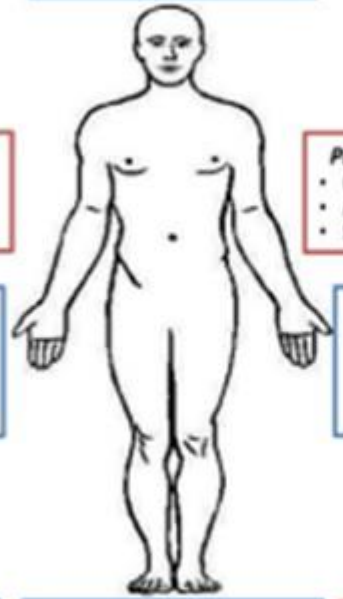
BOOT CAMP

INTRODUCTION TO TRAUMA

José A. Rubero, MD, FACEP, FAAEM

Professor in Emergency Medicine

Emergency Department Trauma Team Positioning and Roles



AIRWAY PHYSICIAN
(EM 2/3)
- Manage airway
- AMPLE Hx
- Document chart

SECONDARY ED ATTENDING
- Supervise Airway management
- Supervise Procedures

SECONDARY RESUS NURSE
- Obtain 2nd large bore IV
- Place Foley, set up Pleurovac
- Assist 1° RN

PRIMARY RESUS NURSE
- Obtain IV access (14 or 16G)
- Administer Meds/Blood
- Set up Rapid Transfuser

SURVEY PHYSICIAN 2
(SURG junior or EM1)
- Assist with 1° Survey
- Assist/Perform Procedures
- Accompany to imaging

SURVEY PHYSICIAN 1
(EM 1/2)
- 1° Survey
- Perform FAST
- Perform Procedures

SURGERY CHIEF
- Assist Procedures
- Coordinate dispo

TRAUMA TEAM LEADER
(ED/TRAUMA Attending)
- Identify oneself
- Direct & Delegate
- Periodic updates to entire team

SCRIBE NURSE
- Record
- Track team progress

CHARGE NURSE
- Trauma Activation
- Initial Briefing
- Crowd Control
- Activate MTP

Inside

Outside

Inside

Outside

General Team Principles

- ❑ Maintain role clarity
- ❑ Call out critical information
- ❑ Speak up if you see a safety issue
- ❑ Role flexibility as needed
- ❑ Employ closed loop communication
- ❑ Huddles to stay on same page
- ❑ Debrief to improve performance

Blood T&S Procedure

If **you** draw the blood...then only **you**

1) Label the blood
2) Sign the label
3) Check-stop for 2 RN confirmation
4) Handoff to PCT

Best Practice Reminders

- ❑ "30 second time-out" for EMS report
- ❑ 1° Survey within 5 minutes
- ❑ Fully undress & ROLL / check back

PRESENT INSIDE AS NEEDED

RESPIRATORY THERAPIST
- Airway assistance
- Portable Vent/O_2 transport

PCT
- Place on monitor
- Run to blood bank / lab
- Undress / gather belongings

XR TECH - trauma series

CLERK - Quick register

TRIAGE

- The situation exceeds the medical capacity
  - Treat the patient who has the best probability to survive
- The situation does not exceed the medical capacity
  - Treat the patient with the greater risk for his life

- 44-year-old male driver who crashed head-on into a wall
- Patient found unresponsive at the scene
- Arrives at hospital via basic life support with c-collar in place and strapped to a backboard; technicians assisting ventilations with bag-mask

BASIC SEQUENCE IN TRAUMA

- ABC's/Primary survey
- Initial management
- Secondary Survey
- Disposition

FEMC
Florida Emergency Medicine Clerkship

PRIMARY SURVEY

INITIAL ASSESSMENT / PRIMARY SURVEY

- Ac – Airway and c-spine
- B - Breathing
- C - Circulation
- D – Deficits (neurological)
- E - Expose
- ATLS continues to support prioritizing the rapid assessment and treatment of life- threatening airway and breathing problems ahead of circulation problems

FEMC
Florida Emergency Medicine Clerkship

THREE RULES FOR THIS COURSE

- If a patient has problems or multiple injuries, first treat those which are life threatening
- The indicated treatment shouldn't be delayed because the diagnosis is not clear
- Detailed history and physical exam is not required prior to initializing treatment

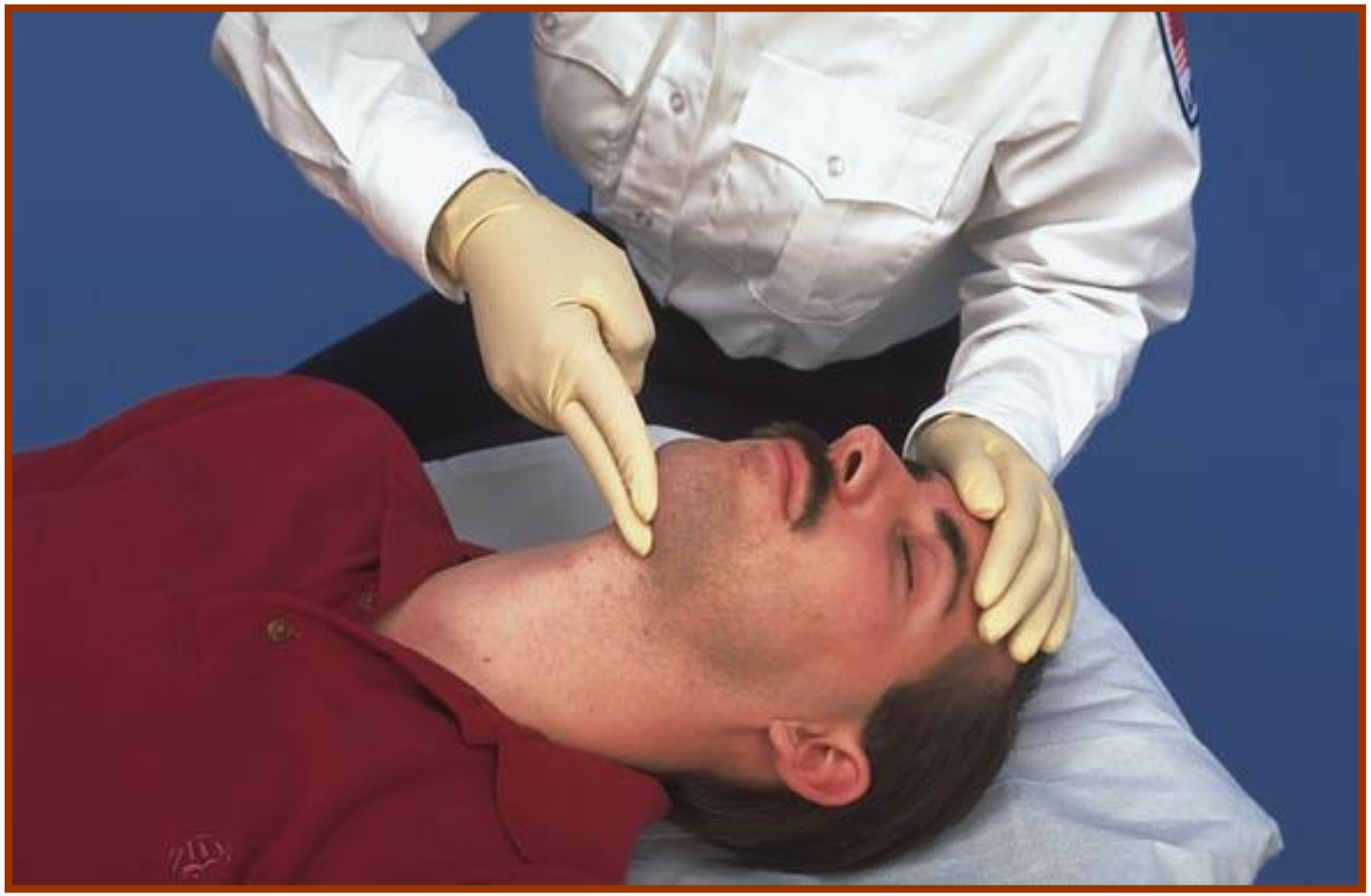
IDENTIFY THOSE PROBLEMS WHICH ARE MOST LIFE THREATENING

- Loss of airway
  - Expanding hematoma, bleeding, vomiting, foreign body
- Loss of breathing
  - Pneumothorax, Hemothorax, Lung Injuries
- Loss of Circulation
  - Bleeding, Heart Injuries, Arrhythmia
- Expanding intracranial mass

AIRWAY

- Airway obstruction is one of the most common cause of death in a patient with trauma
- Airway management is the first step in trauma

HEAD TILT/CHIN LIFT



FEMC
Florida Emergency Medicine Clerkship

MODIFIED JAW THRUST IN TRAUMA

FEMC
Florida Emergency Medicine Clerkship

JAW-THRUST MANEUVER

FEMC
Florida Emergency Medicine Clerkship

DEFINITIVE AIRWAY MANAGEMENT

- AMS (GCS < 9)
- Protect against aspiration of vomit or blood
- Head trauma that needs hyperventilation
- Need of sedation or anesthesia to do diagnostic studies

DEFINITIVE AIRWAY PROTECTION

- Major chest trauma
- Respiratory failure

ENDOTRACHEAL INTUBATION ADVANTAGES

- Protect the airway against aspiration
- Facilitate the ventilation and oxygenation
- Provide a route for the administration of medications (NAVEL)
- Maintain the airway when there is edema or compression

SURGICAL AIRWAY INDICATIONS

- Inability to do endotracheal intubation when a patient needs definitive airway

DOPE: VENTILATION MALFUNCTION

- Displacement
- Obstruction
- Pneumothorax
- Equipment failure

C

- c-spine lesions
  - immobilization

NEXUS VS. CANADIAN RULES

Nexus

- Paresthesias or weakness on extremities
- Unconscious
- Neck pain
- Neck crepitancy o deformity
- Altered mental status (intoxicated, etc)
- Neurological changes
- Distracting injuries

Canadian Rules

- Mechanism
- Age ≥ 65 years < 16 y/o

B

- Look, Listen, and Feel!
  - How good are the respiratory efforts?
  - Paradoxical motion of chest?
  - Sucking wounds?
  - Distant breath sounds?
  - Palpable subcutaneous air?

C

- What is the patient's color?
- Is the patient perfusing his head, his extremities?
- Are the jugular veins distended?
- What is the quality of the heart tones?
- Are the pulses bounding, thready?
- Is the skin cool and clammy?

D

- What is the Glasgow Coma Scale?
- Is there reason to suspect a brain injury?
- Is the patient attending to his environment?
- Is he responding appropriately?
- Is he intoxicated?

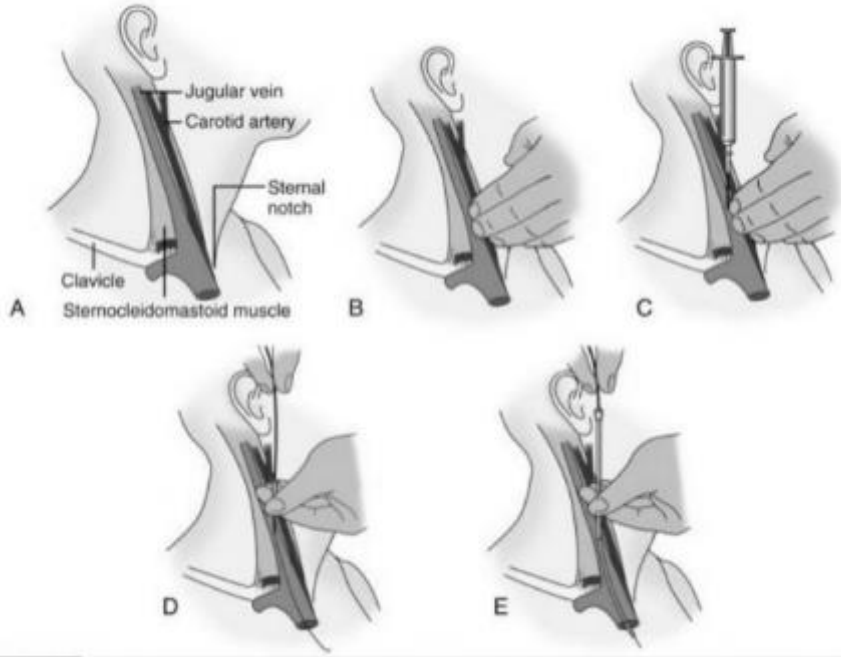
E

- Make sure the patient is completely exposed
- Re-check vital signs
- Re-examine from head to foot
- Nasogastric tube? Foley catheter?
- What films are needed? What additional tests should be done?

SECONDARY SURVEY

- History and mechanism
- AMPLE

SHOCK

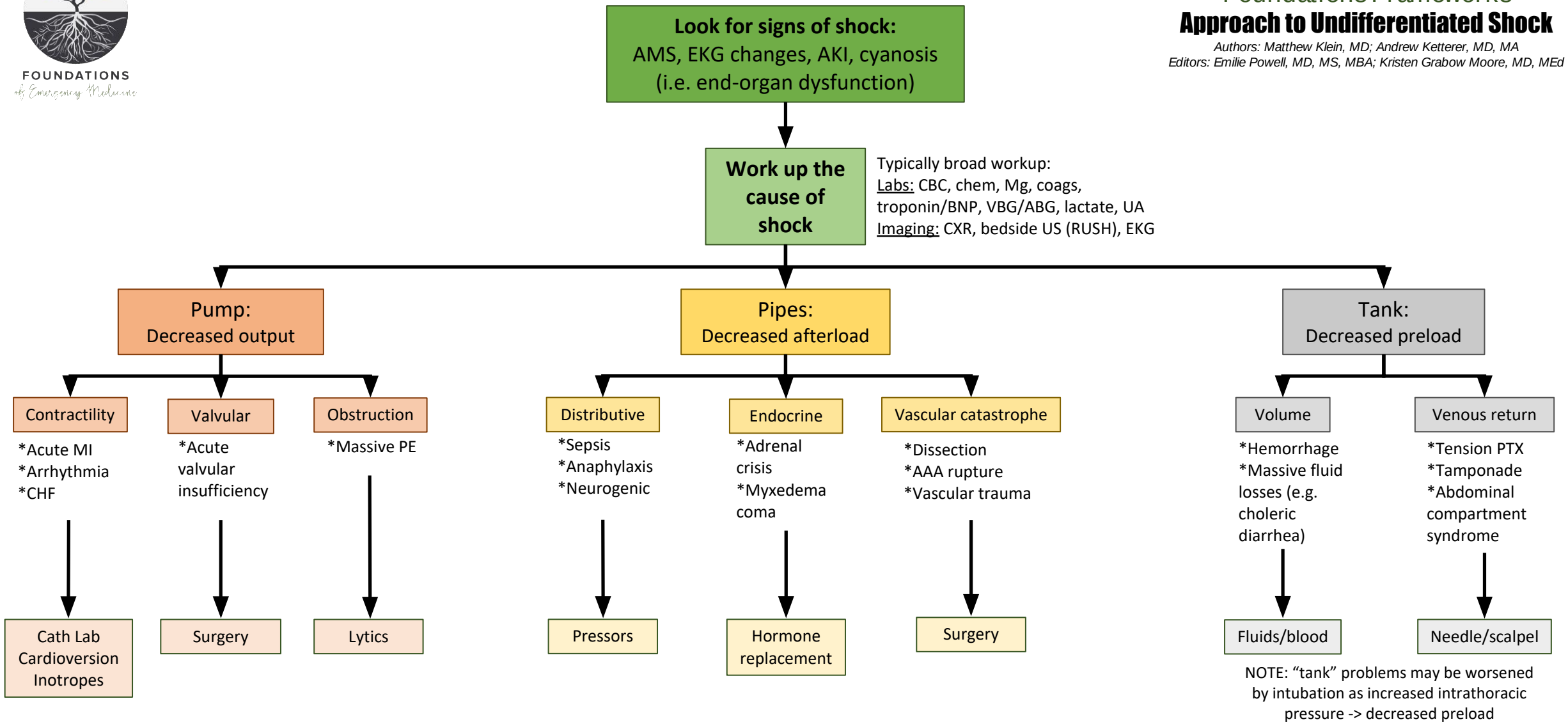

Jugular vein
Carotid artery
Sternal notch
Clavicle
Sternocleidomastoid muscle
A
B
C
D
E

FOUNDATIONS of Emergency Medicine

Foundations Frameworks

Approach to Undifferentiated Shock

Authors: Matthew Klein, MD; Andrew Ketterer, MD, MA
Editors: Emilie Powell, MD, MS, MBA; Kristen Grabow Moore, MD, MEd



Most shock states are preload-dependent to some degree, so fluid resuscitation is a key first step in nearly all types. Pressors and inotropes should be targeted therapies – pressors for diminished afterload (distributive shock) and inotropes for diminished cardiac squeeze.

SHOCK

- During the early management of the injured patient, shock is identified by evidence of end-organ hypoperfusion present on physical examination.
- Later, simple adjunctive measures can be added to improve the precision of the diagnosis.
- The classification of shock based on easily measured physiologic variables is attractive.

Signs and symptoms of hemorrhage by class

PARAMETER	CLASS I	CLASS II (MILD)	CLASS III (MODERATE)	CLASS IV (SEVERE)
Approximate blood loss	<15%	15–30%	31–40%	>40%
Heart rate	↔	↔/↑	↑	↑/↑↑
Blood pressure	↔	↔	↔/↓	↓
Pulse pressure	↔	↓	↓	↓
Respiratory rate	↔	↔	↔/↑	↑
Urine output	↔	↔	↓	↓↓
Glasgow Coma Scale score	↔	↔	↓	↓
Base deficit[a]	0 to –2 mEq/L	–2 to –6 mEq/L	–6 to –10 mEq/L	–10 mEq/L or less
Need for blood products	Monitor	Possible	Yes	Massive Transfusion Protocol

[a] Base excess is the quantity of base (HCO_3^-, in mEq/L) that is above or below the normal range in the body. A negative number is called a base deficit and indicates metabolic acidosis.

FEMC Florida Emergency Medicine Clerkship

SHOCK

- The initial resuscitation with crystalloid fluid still begins with a 1-liter bolus of warmed isotonic fluid.
- Large volume fluid resuscitation is not a substitute for prompt control of hemorrhage. Infusion of more than 1.5 liters of crystalloid fluid has been associated with increased mortality.

SHOCK

- Though direct pressure is the first measure instituted to control external hemorrhage in civilian trauma, military experience supports the judicious use of tourniquets placed above the area of injury in uncontrolled hemorrhage.
- Massive transfusion is defined as the transfusion of more than 10 units of blood in 24 hours or more than four units in one hour.

SHOCK

- Early resuscitation with blood and blood products in low ratios is recommended in patients with evidence of Class III and IV hemorrhage.
- Patients with severe shock resulting from trauma can present with or develop coagulopathy from blood loss, dilution from large volume crystalloid fluid resuscitation, or hypothermia.

SHOCK

- A large prospective study demonstrated decreased mortality when tranexamic acid (TXA) is given within three hours of injury. When a 1 g dose is given in the prehospital setting, a repeat dose is administered in the emergency department.
- Early monitoring of coagulation and replacement of clotting factors can minimize transfusion needs, which is particularly important in patients who are taking anticoagulant medications.

VASCULAR ACCESS

- Peripheral veins
- Central veins
  - Subclavian or internal jugular
  - Femoral

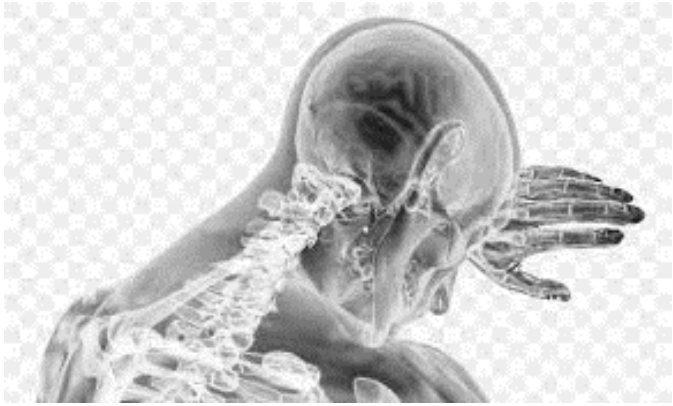
VASCULAR ACCESS

- Intraosseous access
- Cut down
- Intraperitoneal

MONITORING SHOCK

- AMS
- Pulse, BP, respiration
- Urinary output (1 mL/kg/hr or 30 cc/hr in adults)
- Capillary refill, skin perfusion
- CVP
- Laboratories

HEAD TRAUMA



- 58-year-old male fell from a roof in a small rural town
- Initial GCS score = 12
- On admission after 2-hour transfer, GCS score is 6

HEAD TRAUMA

- Elderly patients suffering ground-level falls are an increasing trauma patient demographic. Many of these patients are treated with anticoagulation, and the use of these medications should be relayed to consulting neurosurgeons.
- The new Glasgow Coma Scale (GCS) is introduced in the 10th edition. This version of the GCS stresses reporting the numerical components of the score and adds a new designation, NT (not testable), to be used when a component of the score cannot be assessed.

HEAD TRAUMA

- The early management of the brain-injured patient have been included in the new edition of the ATLS course. These guidelines include:
  - Avoiding prolonged hyperventilation with PC02 <25 mm Hg;
  - Maintaining systolic blood pressure >100 mm Hg for patients 50–69 years and >110 mm Hg or higher for patients ages 15–49 or older than 70 years old to decrease mortality and improve outcomes;
  - Diprivan (Propofol) is recommended for the control of increased intracranial pressure but not for improvement of six-month outcomes;
  - Barbiturates are not recommended to induce burst suppression measured by electroencephalogram to prevent the development of intracranial hypertension;
  - Prophylactic use of phenytoin or valproate is not recommended for preventing late posttraumatic seizures. Phenytoin is recommended to decrease the incidence of early posttraumatic seizures (within seven days of injury).

QUICK NEUROLOGICAL EXAM

- Level of consciousness
- Pupil reactivity
- Movement of extremities
- Glasgow Coma Score

FEMC
Florida Emergency Medicine Clerkship

GLASGOW COMA SCORE

Eye Opening

Spontaneous	- 4
To voice	- 3
To pain	- 2
Closed	- 1

Verbal Response

AAOx3	- 5
Confused	- 4
Inappropriate	- 3
Incompressible	- 2
None	- 1

Motor Response

Spontaneous	-6
Localize pain	-5
Pain withdrawal	-4
Flexion	-3
Extension	-2
No movement	-1

FEMC Florida Emergency Medicine Clerkship

GLASGOW COMA SCALE

Dead	- 3
Coma	< 6
Severe	< 8
Moderate	- 9 to 12
Mild	- 13 to 14
Normal	- 15

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

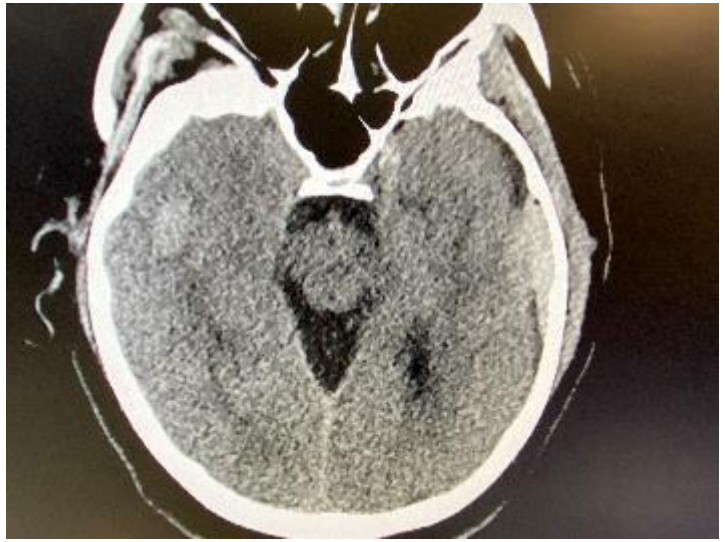
SCALP LACERATIONS

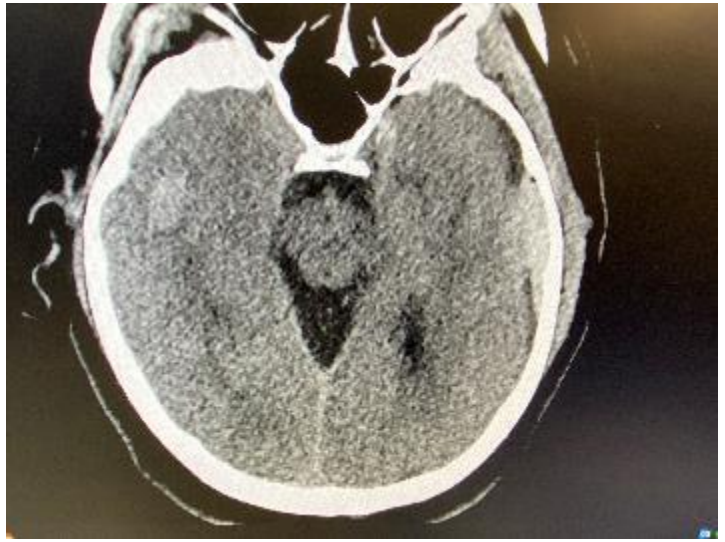
- Fast suturing to prevent shock, hemorrhage
- May need ligation of vessels
- Shaving of hair is not necessary

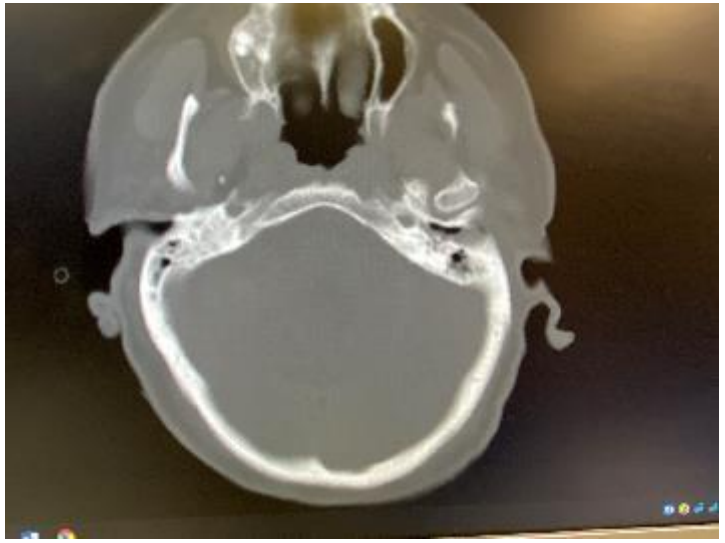
FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship







FEMC
Florida Emergency Medicine Clerkship

SYMPTOMS OF CONCUSSION

Define "LOC"

Headache

Dizziness

Nausea or vomiting

Neurologic complaints

CAT SCAN

Indications:

- LOC
- Mental status changes
- Severe headache
- Vomiting
- Neurologic deterioration
- Open injuries
- Basilar skull fracture sign
- MECHANISM!!!!!!!!

INTRACRANIAL HEMATOMA

Define lesion

Surgical or non-surgical lesion

Neurosurgical consultation

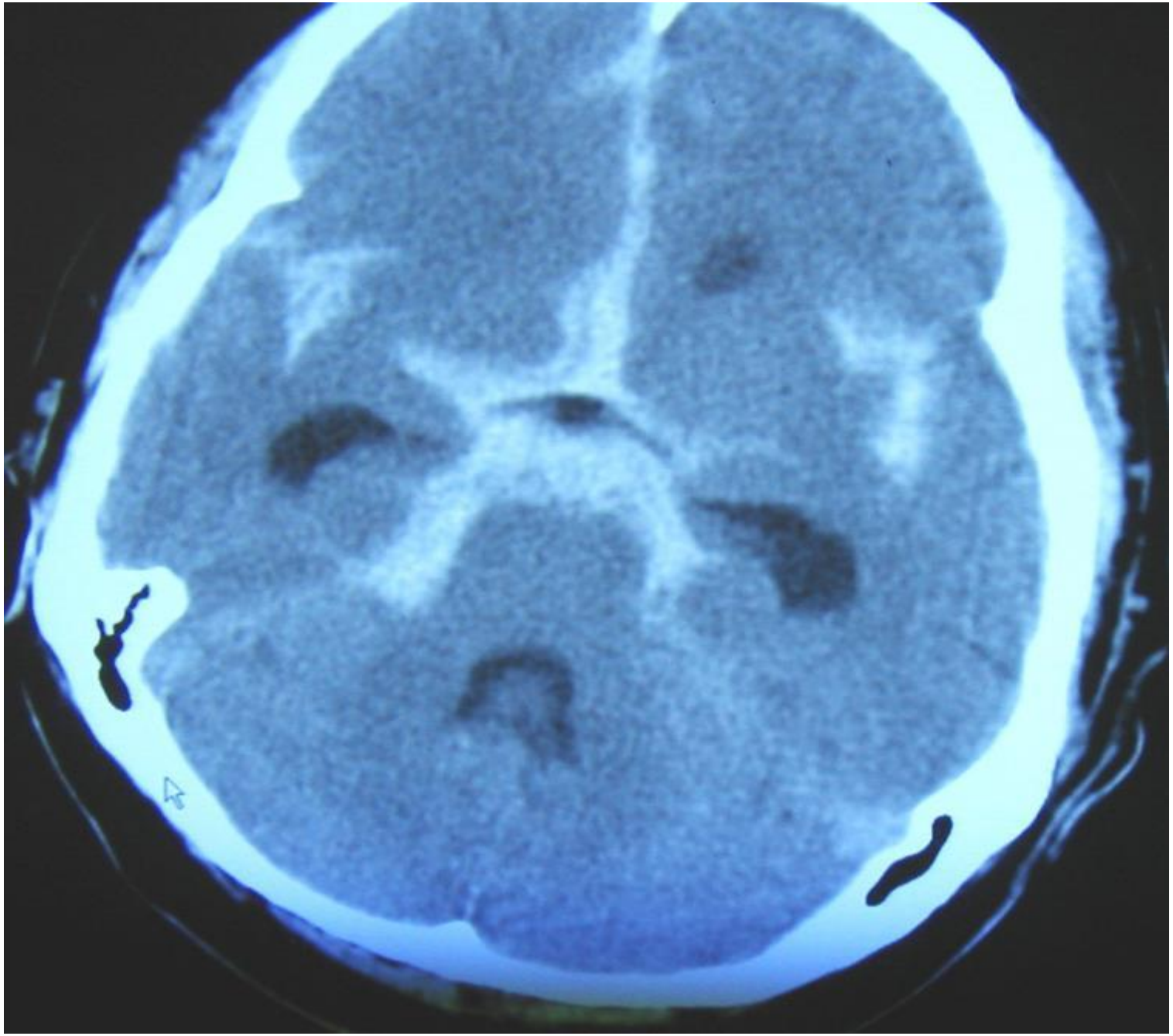
Can be associated to DAI or cerebral edema

SUBARACHNOID HEMORRHAGE

Blood in subarachnoid space

Poor prognosis if intracerebral source

Consider looking for source if small



FEMC
Florida Emergency Medicine Clerkship

EPIDURAL HEMATOMA

Least Common

Middle meningeal artery laceration

Biconvex shape

Classic presentation (20%)

- Brief LOC
- Transient lucid interval
- Deterioration thru time

FEMC
Florida Emergency Medicine Clerkship

SUBDURAL HEMATOMA

High mortality (40 a 60%)

Cerebral damage

Venous bleed

Predispositions

- ETOH
- Age
- Underlying disease

Treatment is craniotomy

SUBDURAL HEMATOMA

Presentation

- Acute *vs.*. Sub-acute *vs.* Chronic

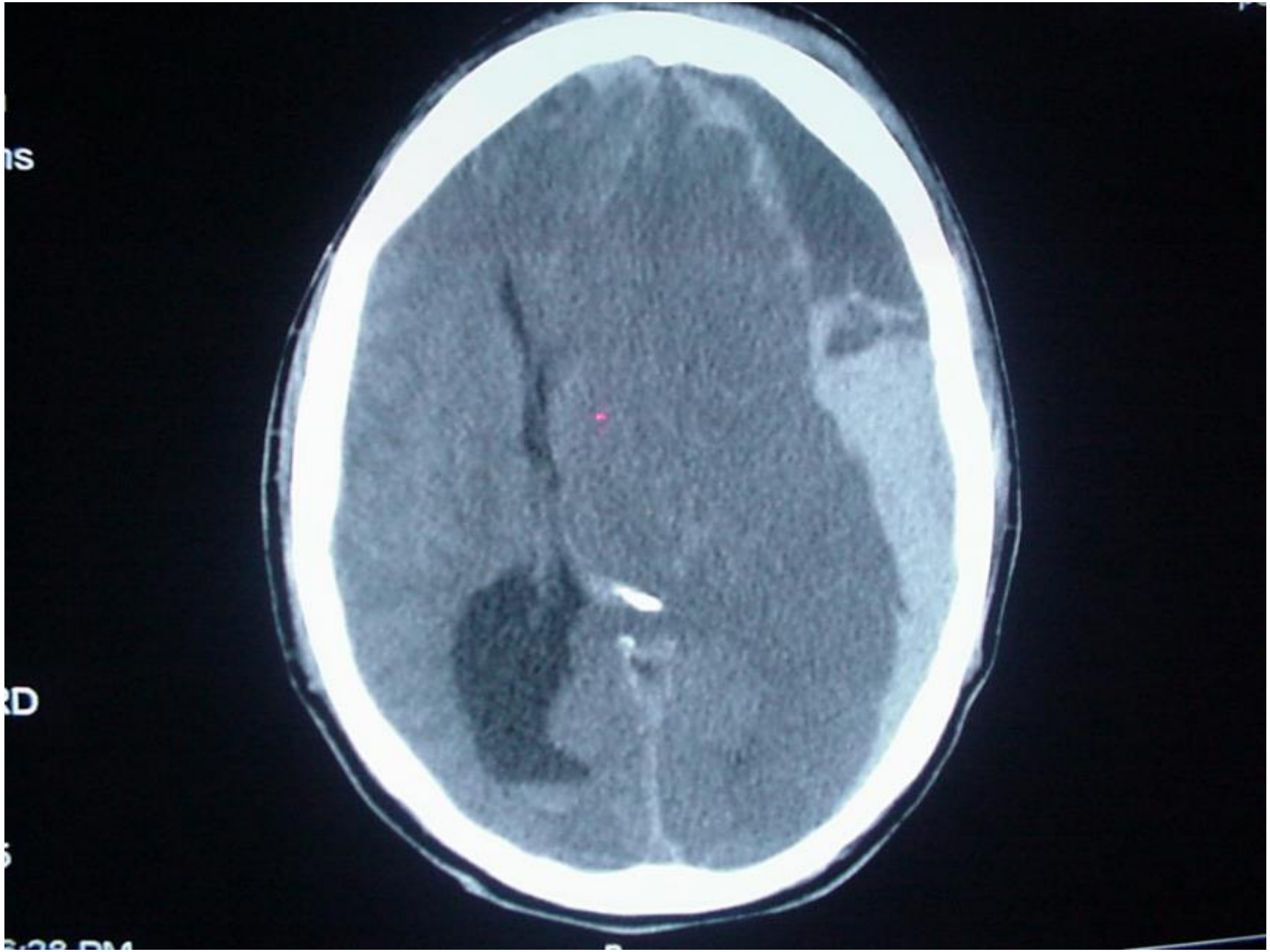
Brain damage

Crescent shape

Urgency of evacuation

Prognosis depends on pre-op morbidity

FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

DIFFUSE AXONAL INJURY

Shearing injury to neurons

Reticular activating system

Deep coma

Edema or normal CT

Poor prognosis

TREATMENT

Early Head CT
Neurosurgical consultation early
Osmotic diuretics (mannitol)
Hypertonic
Elevate head of bed
Hyperventilation?
Ventriculostomy?
Anticonvulsant
ICP monitoring

HEAD TRAUMA SUMMARY

Primary survey AcBCDE

Treat shock

Level of consciousness and GCS part of "D"

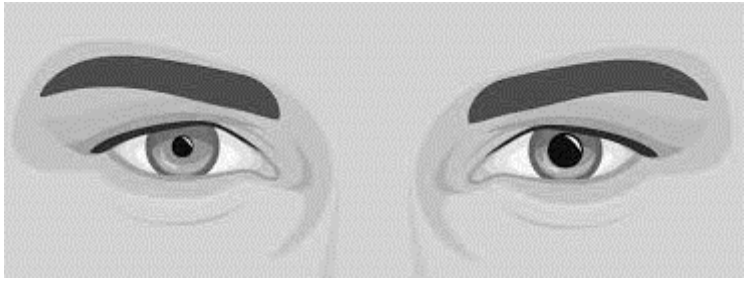
Early Head CT

Operative lesion

Neurosurgical consultation

Prognostic considerations

FACIAL TRAUMA



MORTALITY

- Acute
  - Airway compromise
  - Bleeding
  - C-Spine injury
  - Head injury
- Delayed
  - Meningitis
  - Oropharyngeal infections

ACBCDE'S

Oxygen
Patient position
Suction
Orotracheal intubation with RSI
C-Spine immobilization
Surgical airway

BLEEDING

- Airway bleeding
- Universal precautions
- Compression
- No blind clamping
- Nasal tamponade
- OR exploration
- ***Shock*** usually not from facial injuries

AIRWAY COMPROMISE

- Blood
- Vomit
- Tissue swelling
- Teeth
- Foreign bodies
- Tongue or retropharyngeal displacement
- Fractures

FEMC
Florida Emergency Medicine Clerkship

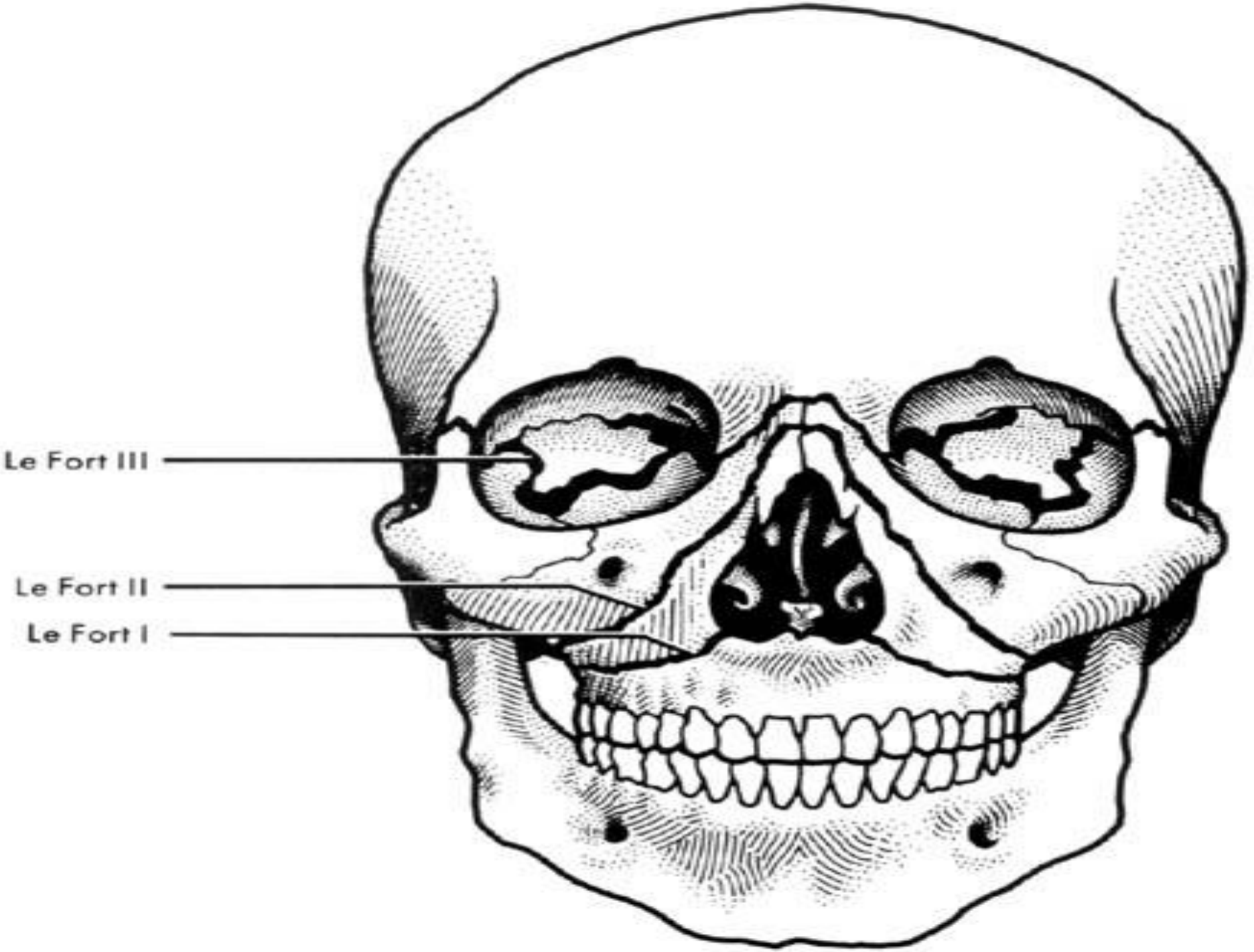
FACIAL FRACTURES

- Multiple fractures are common
- Most fractures are of circular force
- LeFort fractures may have other fractures
- Mandible is a “ring”

FACIAL FRACTURE CLASSIFICATIONS

- **Majors :**
  - LeFort I,II&III
  - Mandible

FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine CI

FACIAL FRACTURES CLASSIFICATIONS

- **Minors:**
  - Nasal
  - Sinus
  - Zygomatic
  - Orbital floor
  - Antral wall
  - Alveolar border

LEFORT FRACTURES

- Pull maxillary teeth:
  - If the maxilla only moves: LeFort I
  - If the maxilla and the nose base move: LeFort II
  - If all the face moves: LeFort III

LEFORT I - NASOMAXILLARY

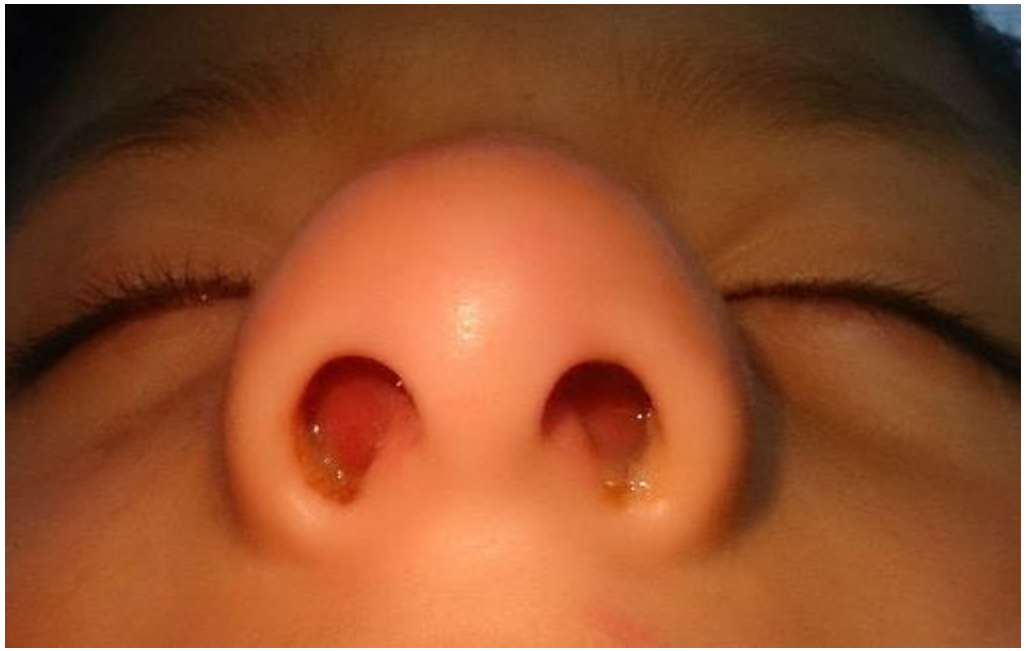
- Definition: horizontal fracture from the maxilla to the orbital floor
- Signs and symptoms:
  - Maxillary crepitus
  - Trismus
  - Ecchymosis about the mouth
  - Epistaxis B/L
  - Malocclusion
  - Maxillary movement
- Treatment: closed reduction or ORIF plus antibiotics

LEFORT II - PYRAMIDAL

- Definition
  - Mid-face sub-zygomatic fracture, pyramidal fragment separated from the skull and lateral aspect of the face
- Symptoms and signs:
  - Mid-face crepitus and deformity
  - Malocclusion
  - Epistaxis bilateral
  - Infraorbital paresthesia
  - Ecchymosis: mouth, periorbital, subconjunctival
- Treatment: ORIF, Antibiotics, Edema reduction

LEFORT III - CRANIO-FACIAL DISSOCIATION

- Definition:
  - Suprazygomatic B/L fracture, Floating mid-face
- Symptoms and signs
  - Facial deformity
  - Malocclusion
  - Lateral orbital wall deformity & pupil position
  - Infraorbital paresthesia
  - Ecchymosis: periorbital, subconjunctival
  - Epistaxis bilateral
- Treatment:
  - ORIF, Antibiotics, Edema reduction

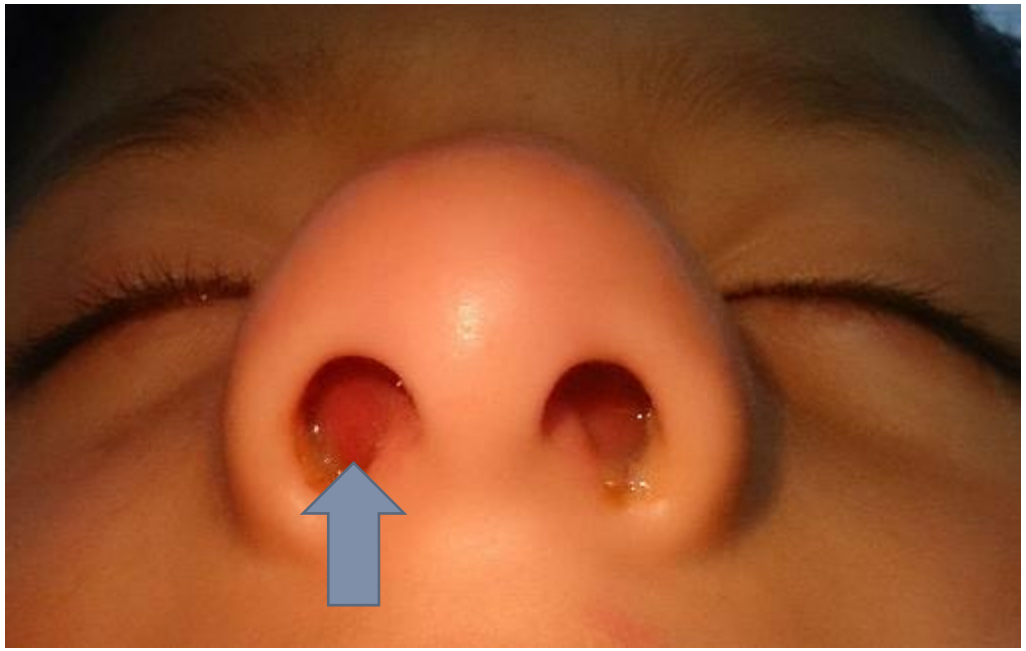


Facial Trauma

Name the complication.

What is the treatment?

FEMC
Florida Emergency Medicine Clerkship



Facial Trauma

Nasal Septal Hematoma

Requires I&D

FEMC Florida Emergency Medicine Clerkship

WHAT AREAS OF THE FACE ARE MOBILE WITH THE FOLLOWING FRACTURE PATTERNS?

Le Fort I **Le Fort II** **Le Fort III**

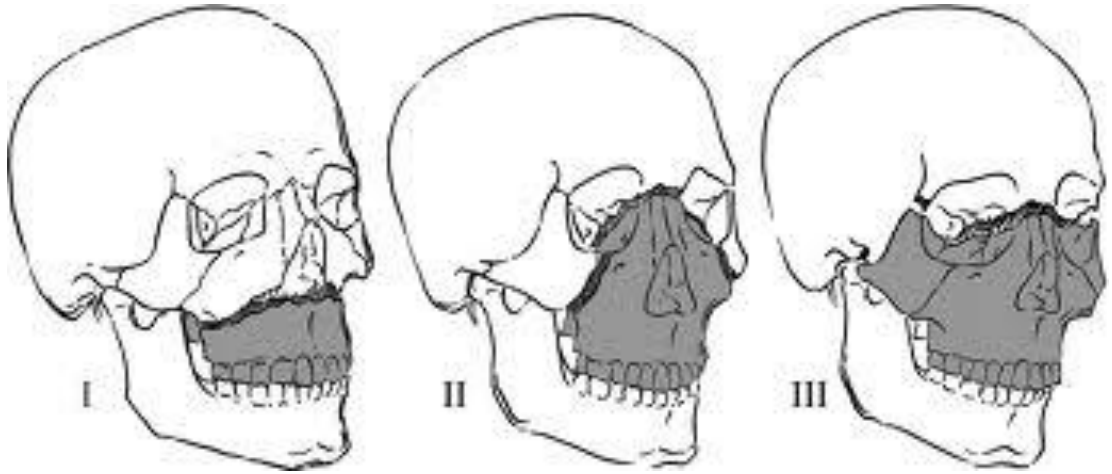
WHAT AREAS OF THE FACE ARE MOBILE WITH THE FOLLOWING FRACTURE PATTERNS?

Le Fort I -> Palate

Le Fort II -> Palate + Nose

Le Fort III -> Entire Face

Le Fort Fractures

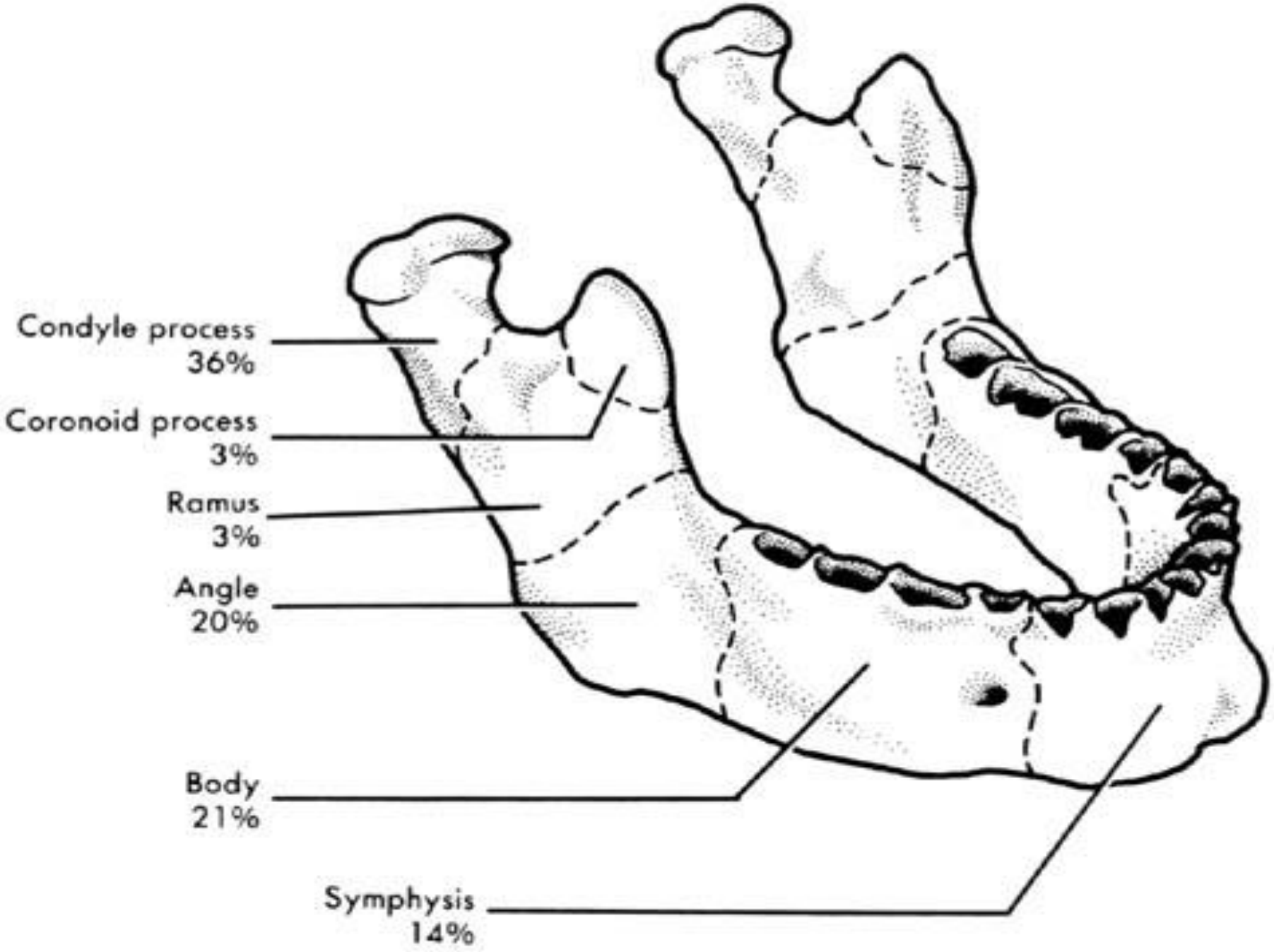


I -> Fx below Nose -> Palate Mobile
II -> Fx Inferior Orbits -> Palate + Nose Mobile
III -> Fx Zygomatic Arch -> Entire Face Mobile

FEMC
Florida Emergency Medicine Clerkship

MANDIBULAR FRACTURES

- Can cause airway compromise
- 50% are multiple fractures
- Condyle Fx ~ external ear canal & C1
- High infection rate if intra-oral mucosa violated
  - Malocclusion
  - Trismus or decreased movement
  - Dental abnormalities
  - Ecchymosis of the floor of the mouth
  - Palpable deformity
- Temporary fixation, ± Antibiotics



FEMC
Florida Emergency Medicine Clerkship

NASAL FRACTURE

- Clinical diagnosis
- Delayed treatment
- Antibiotics are not necessary
- Rhinorrhea
- Epistaxsis
- Septal Hematoma

SUPRAORBITAL FRACTURE

- Frontal bone fracture
  - High incidence of intracranial injury
  - Glabellar deformity
  - Posterior fracture indicates dura violation
  - Outer vs. inner table fractures
- Ethmoid fracture
  - Nasal trauma
  - Associated with disruption of the cribiforme plate
  - CSF leak
  - Medial canthus disruption must be repaired

FEMC
Florida Emergency Medicine Clerkship

ORBITAL FRACTURES

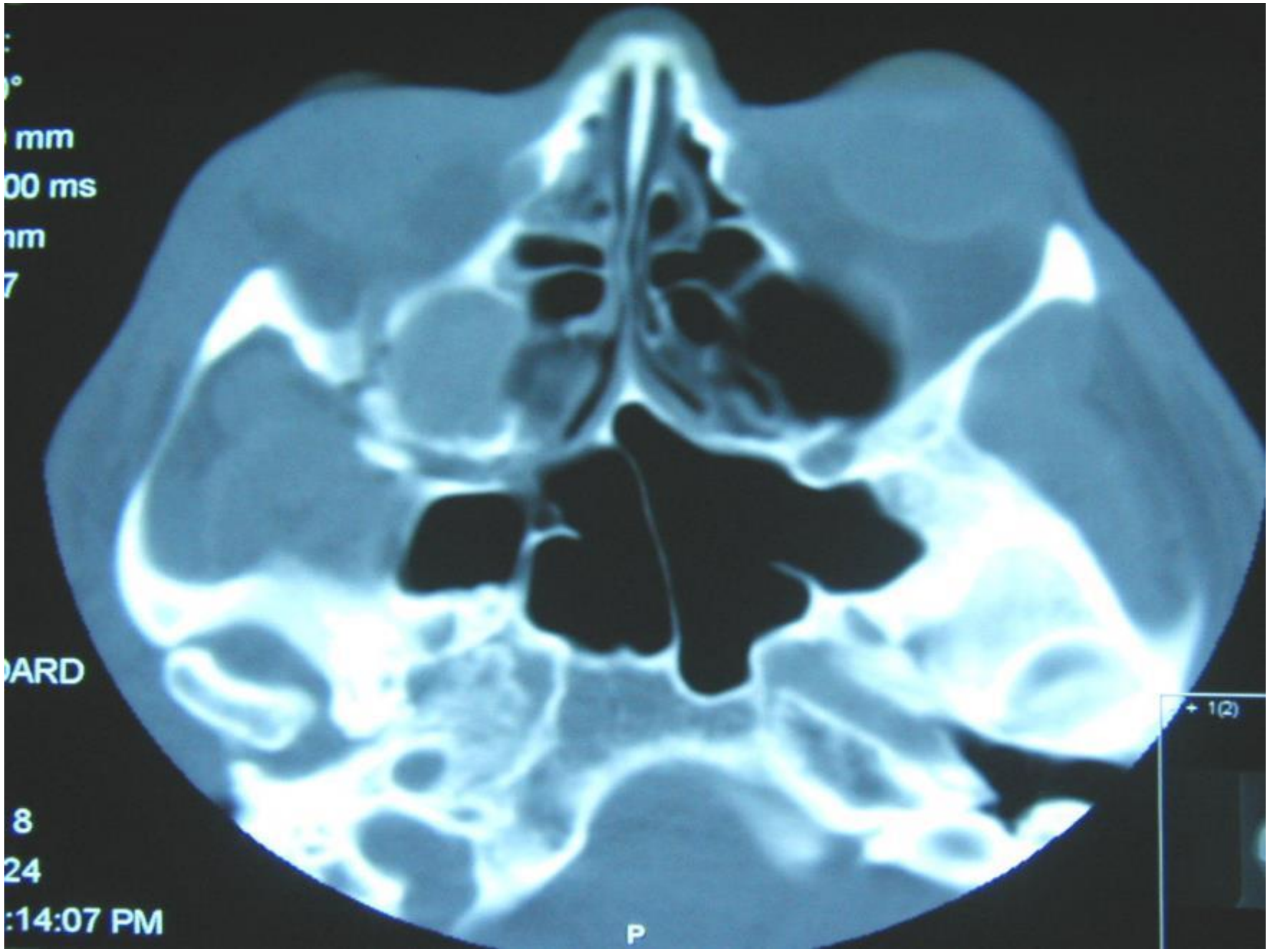
- Associated with other fractures
- Inferior & medial walls are weakest (90%) SO, IR
- Lateral wall (10%) MR
- Ocular exam
  - Globe integrity
  - Visual acuity and fields
  - EOM
  - Anterior chamber
  - Fundus
  - Florescence

ORBITAL FRACTURES

- Diplopia
- Endophtalmus
- Restricted EOM
- Infraorbital anesthesia
- Opacification of maxillary sinus on X-ray
- CT of orbits
- Treatment depends on entrapment

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

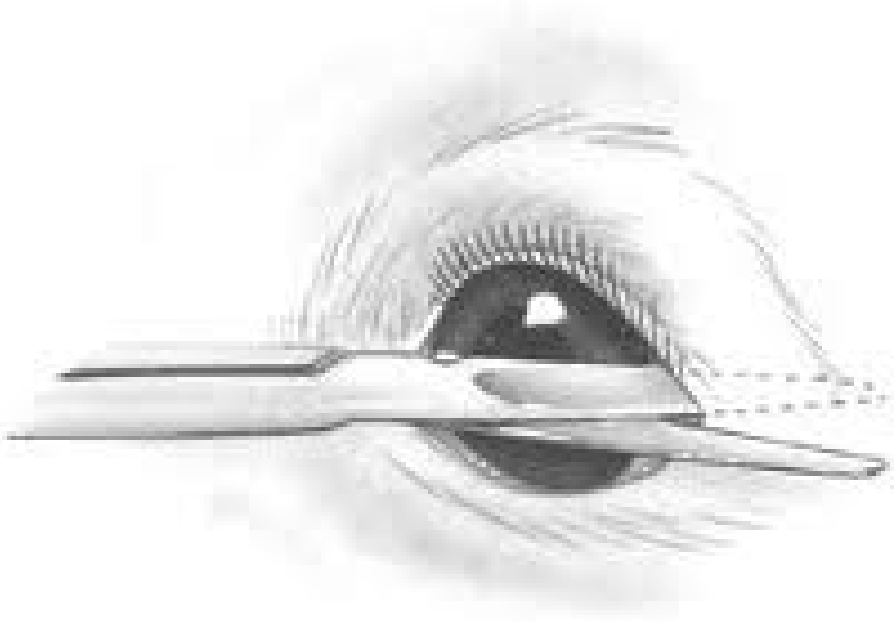
FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship



DENTAL FRACTURES

- Ellis type I: Enamel
  - Ca(OH)2 paste
- Ellis type II: Dentin
  - Dentist in 24 hours
- Ellis type III: Pulp
  - Same day dental referral

FACIAL LACERATIONS

- Suture removal in 3-5 days
- Bites can be sutured

NECK/CERVICAL SPINE AND SPINAL CORD INJURIES

SPINE AND SPINAL CORD TRAUMA

- Determining which patients require imaging to evaluate for spine and spinal cord injury is not always straightforward. The Canadian Cervical-Spine Rule (CCR) and the National Emergency X-Radiography Utilization Study (NEXUS) provide guidelines that can aid in the decision-making process, and these guidelines are included in the chapter and skills stations.
- Another change in chapter 7 pertains to the term "spinal immobilization," which has been replaced with "spinal motion restriction.

NEUROLOGICAL EVALUATION

- Motor strength
- Sensory deficit
- Reflexes changes
- Autonomic malfunction
- Decreased rectal tone

EXAMINATION

Respiration Pattern

Neurogenic shock

Reflexes

Sensory level

Priapism

Complete *vs.* Incomplete lesion

Cord Syndromes

NEUROLOGICAL EXAM

- GCS
- Motor exam
- Sensory Levels
- Reflexes
- Cord Syndromes
  - Brown Sequad
  - Central cord syndrome
  - Anterior cord syndrome

COMPLETE VS INCOMPLETE

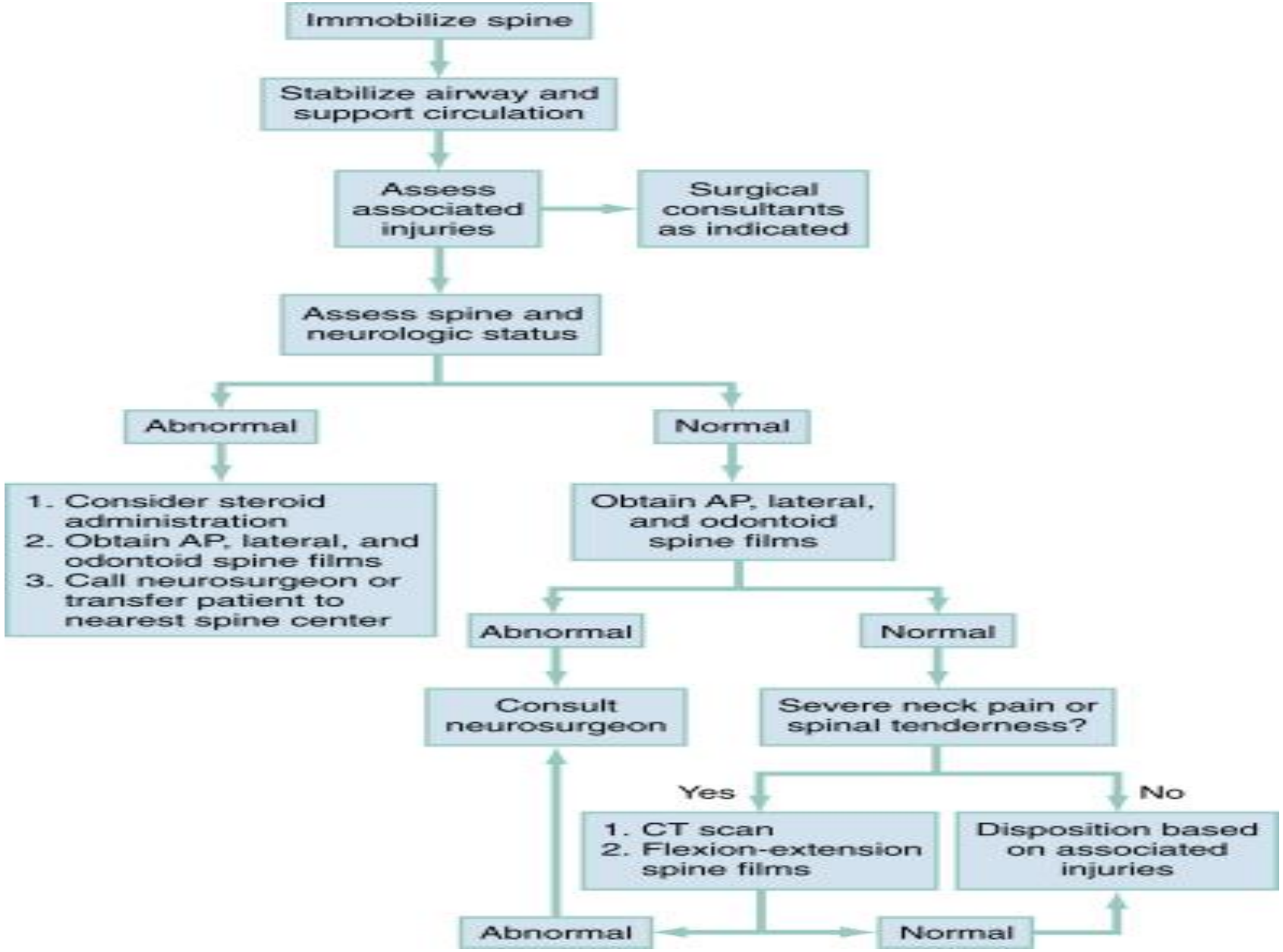
- Incomplete:
  - Sensory, motor or both functions are partially present below the neurologic level of injury
  - Some degree of recovery
- Complete:
  - Absence of sensory and motor function below the level of injury
  - Loss of function to lowest sacral segment
  - Minimal chance of functional motor recovery

ED STABILIZATION

- ABCs
- Airway:
  - Low threshold for definitive airway in patient with cervical spine injury especially if higher then C5
  - Spinal immobilization very important

IMAGING INDICATIONS

- Mechanism
- Midline neck tenderness/deformity
- Neurological abnormalities
- Impaired sensorium
  - Injury or intoxication
- Distracting injury



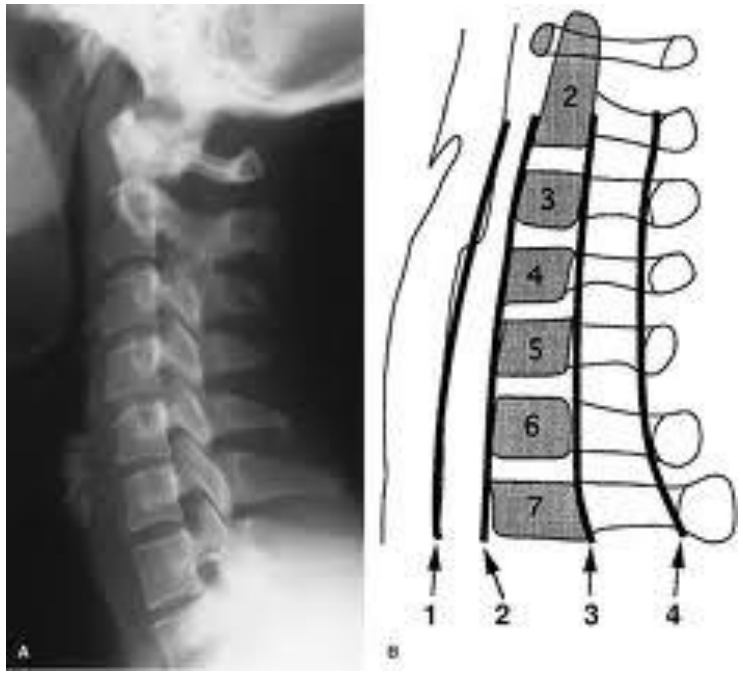
FEMC
Florida Emergency Medicine Clerkship

INDICATIONS FOR SURGERY

- Ascending levels of neurological deficit
- Compound Fractures
  - GSW
  - Penetrating trauma
  - associated with trauma of the posterior pharynx
- Pedicle Fracture
- Vertebral artery injury

RADIOLOGICAL EVALUATION

- 7 cervical vertebrae and part of the superior T1
- 3 Lines
  - Anterior border
  - Posterior border
  - Anterior border of the spinal process
- Pre-vertebral space
  - C2 to C4: <5mm C4: <22mm



Alignment

Adequate

B Bone

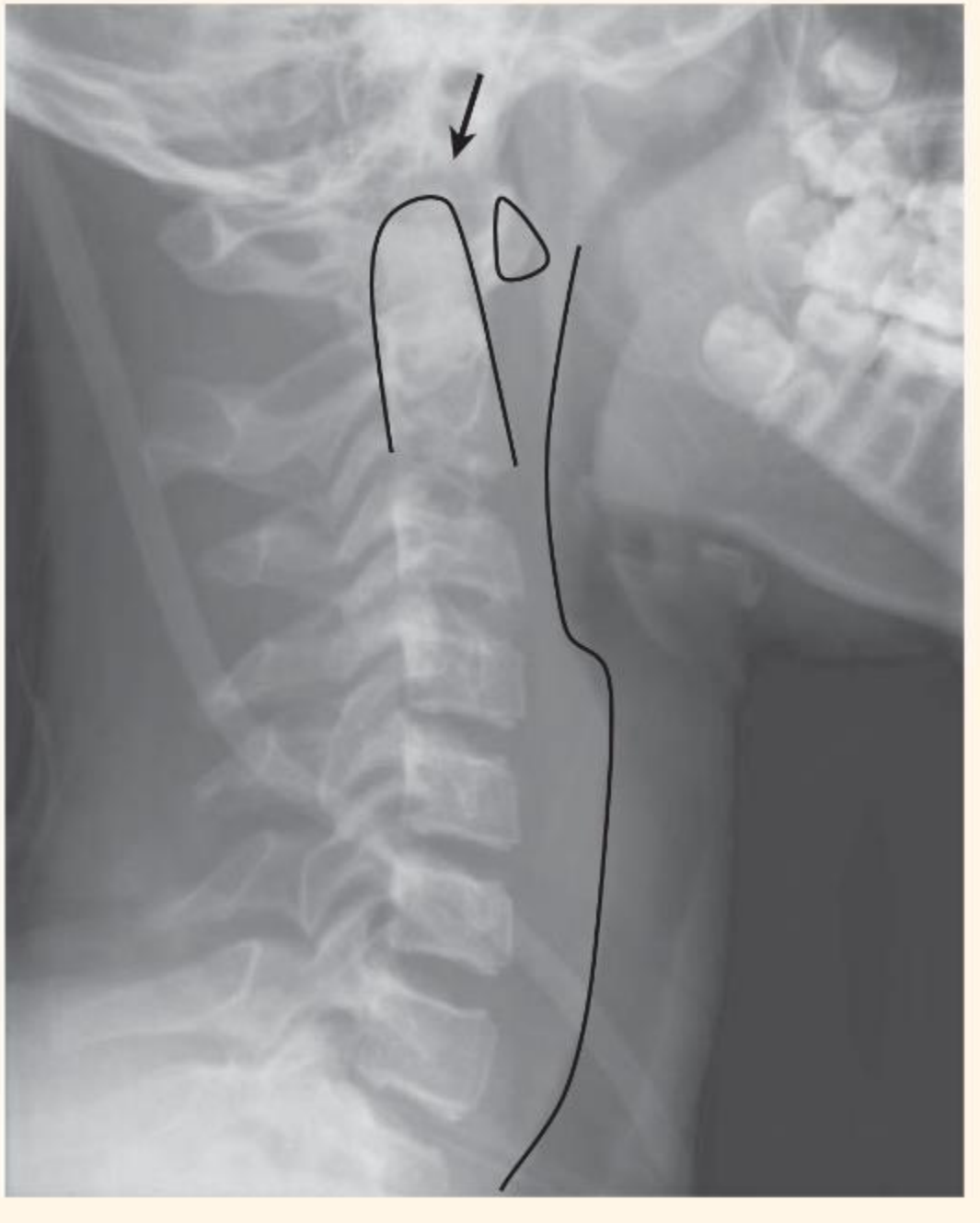
FEMC
Florida Emergency Medicine Clerkship

C Cartilage

D Dens

E Extra axial soft tissues

F Facets

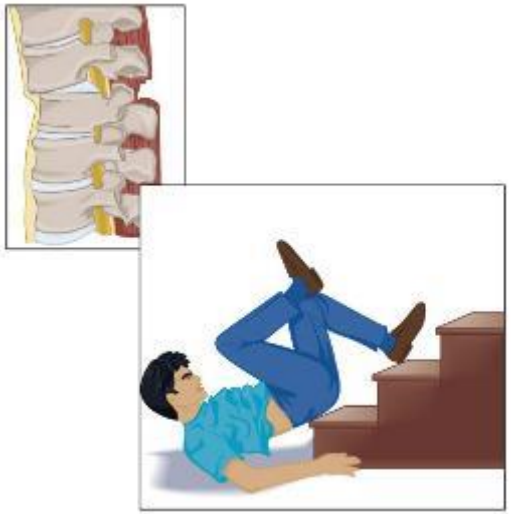


FEMC Florida Emergency Medicine Clerkship

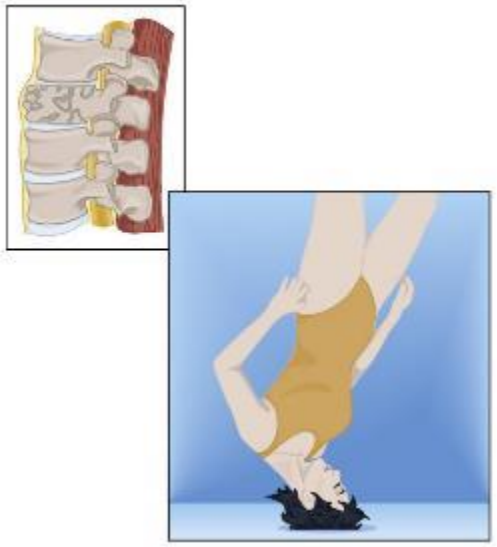
RADIOLOGICAL EVALUATION

- Predental space
  - Adults: <3mm ; children: < 5mm
- Bones structures
- Tissues

FLEXION INJURY

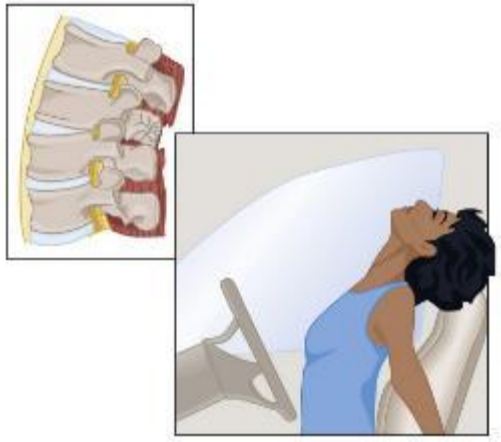


COMPRESSION INJURY



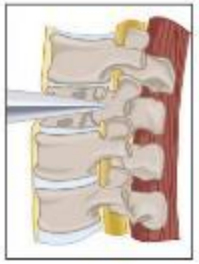
DISTRACTION INJURY

HYPEREXTENSION INJURY

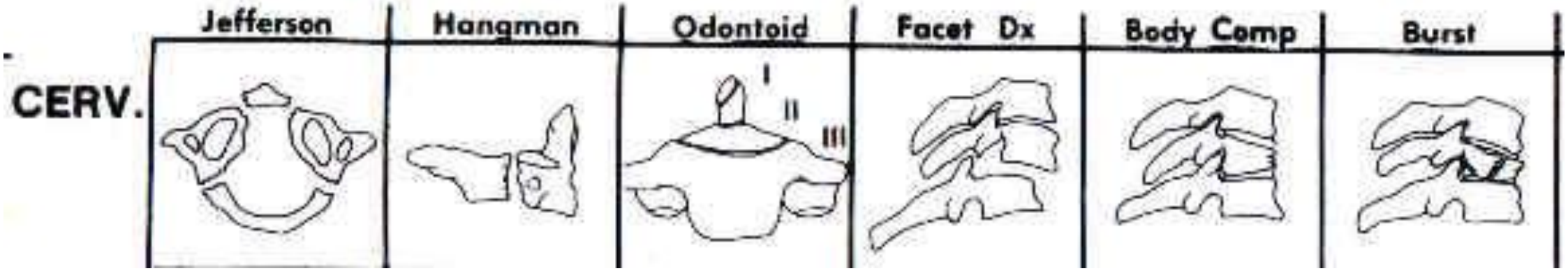


FLEXION-ROTATION INJURY

PENETRATION INJURY



FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

CLASSIFICATIONS SECONDARY TO MECHANISMS

- Flexion
  - Anterior subluxation
  - Bilateral facet dislocation
  - Flexion tear drop fracture
  - Clay-Shoveler's Fracture
  - Wedge fracture
  - Anterior Cord Syndrome
    - Motor paralysis distal to the lesion
    - Loss of pain and temperature
    - Retention of posterior cord function
      - Vibration
      - Proprioception

CLASSIFICATIONS SECONDARY TO MECHANISMS

- Extension
  - Central Cord Syndrome – normal radiography
    - Arms weaker than legs
    - Upper > Lower Extremities
    - Distal > Proximal
    - Clumsy Hands
  - Extension tear drop fracture
  - Hangman's Fracture
  - Posterior arch facture of the atlas

CLASSIFICATIONS SECONDARY TO MECHANISMS

- Rotation
  - Unilateral facet dislocation
  - Unilateral pillar fracture
- Vertical Compression
  - Atlas fracture
  - Burst fracture

BROWN SEQUARD SYNDROME

- Penetrating injury
- Ipsilateral loss of motor, position, vibration, touch
- Contralateral loss of pain and temperature

Normal

FEMC
Florida Emergency Medicine Clerkship

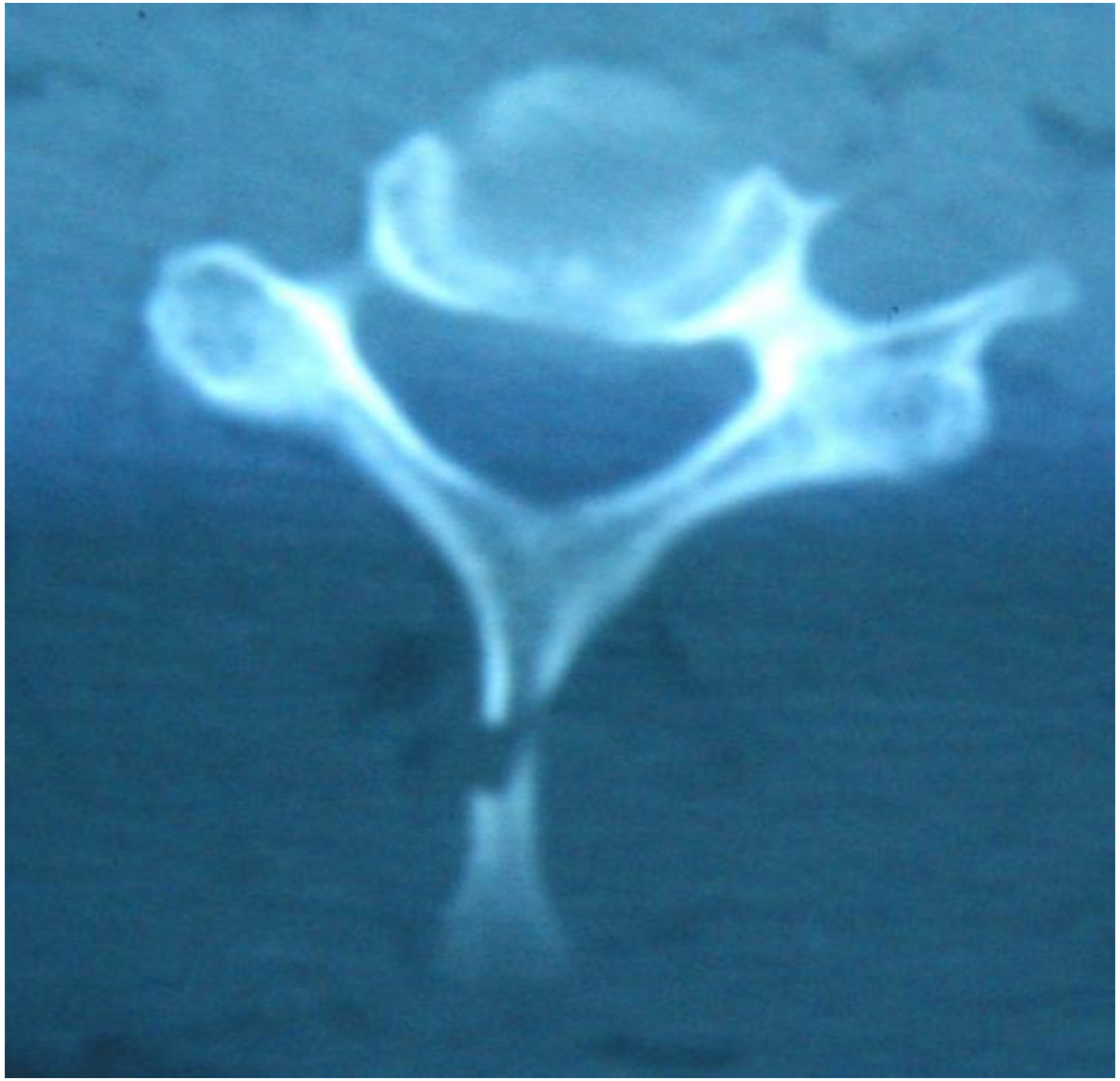
54 Y/O HIT A TREE HEAD ON; COMPLAINTS OF NECK PAIN AND NUMBNESS

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

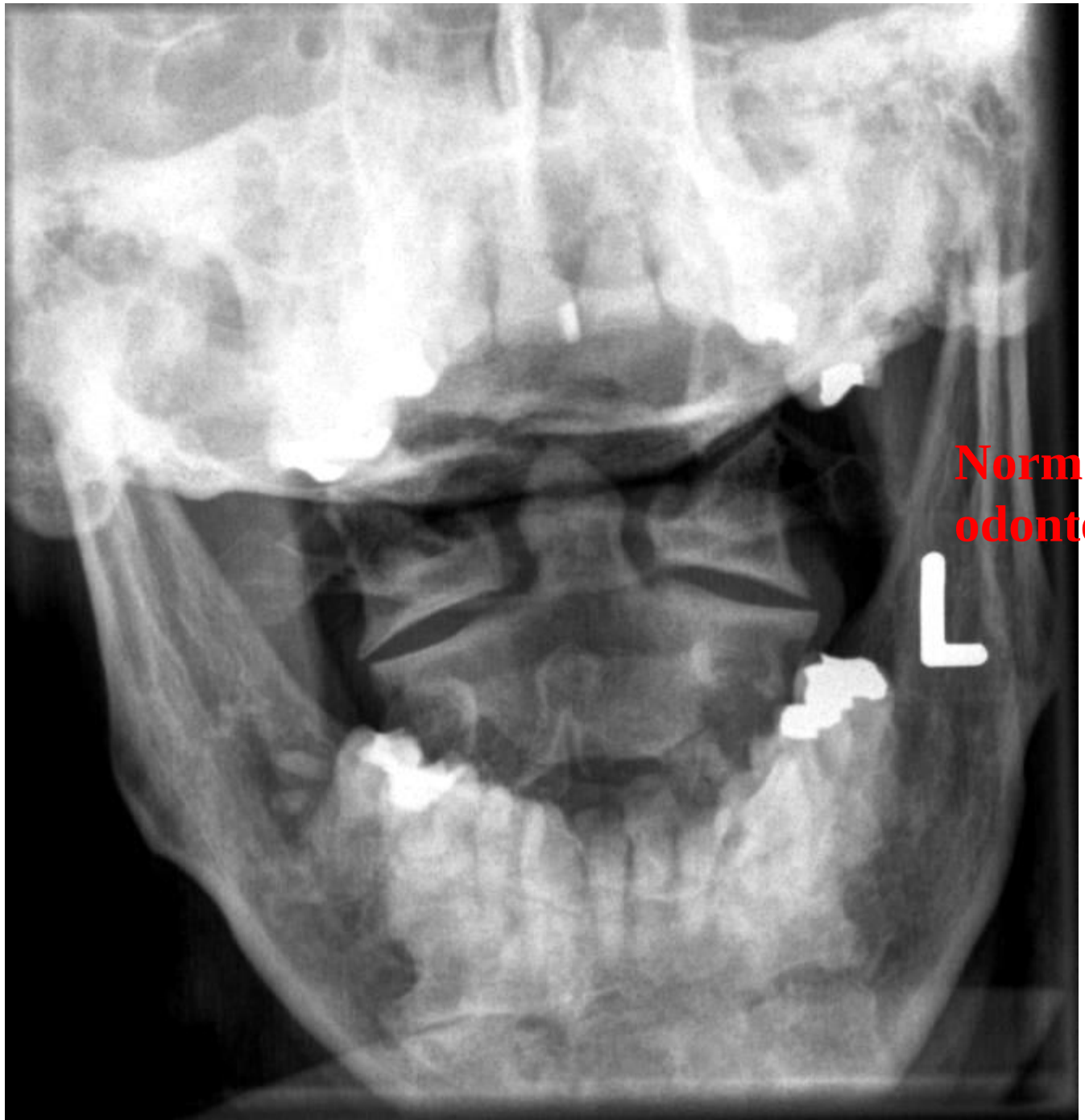
FEMC
Florida Emergency Medicine Clerkship

Clay-Shoveler's Fracture (C7, C6, T1 spinous process)

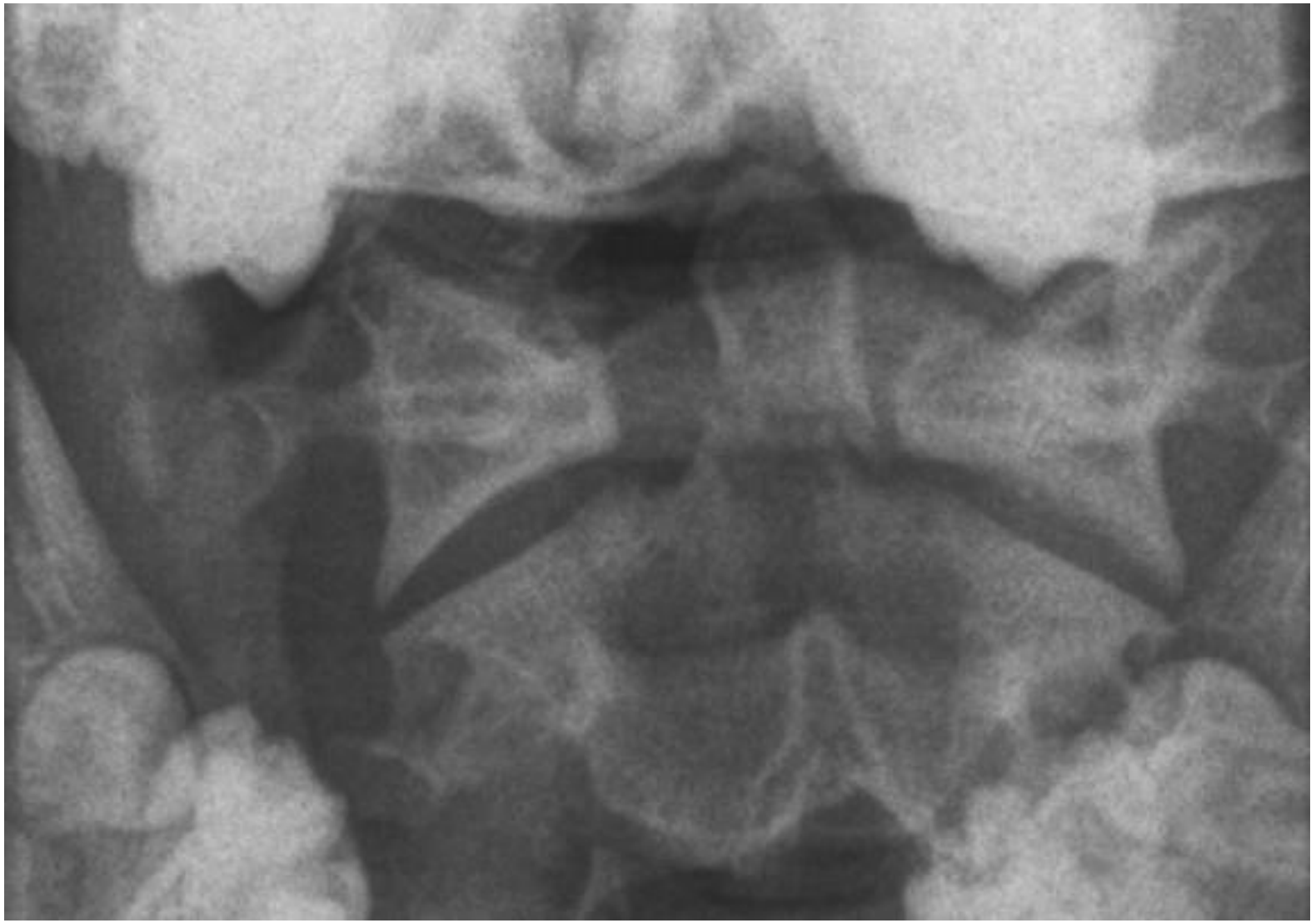


FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

- 53 y/o female that is BIBA after a suicidal attempt
- You are working in a not trauma level hospital
- When you see the patient, she has the following injury….

FEMC
Florida Emergency Medicine Clerkship

WHAT SHOULD YOU DO NEXT?

- Explore/probe it to see how deep?
- Call surgery?
- Repair it?
- Go to the bathroom?
- By the way, she has an expanding hematoma

- Remember always AcBC's
- Intubate is needed
- Control the bleeding
- Decide what zone are the injuries
- Do not probe/explore; platysmus involved?
- Do not remove any penetrating injury that most likely is "clogging" the bleeding

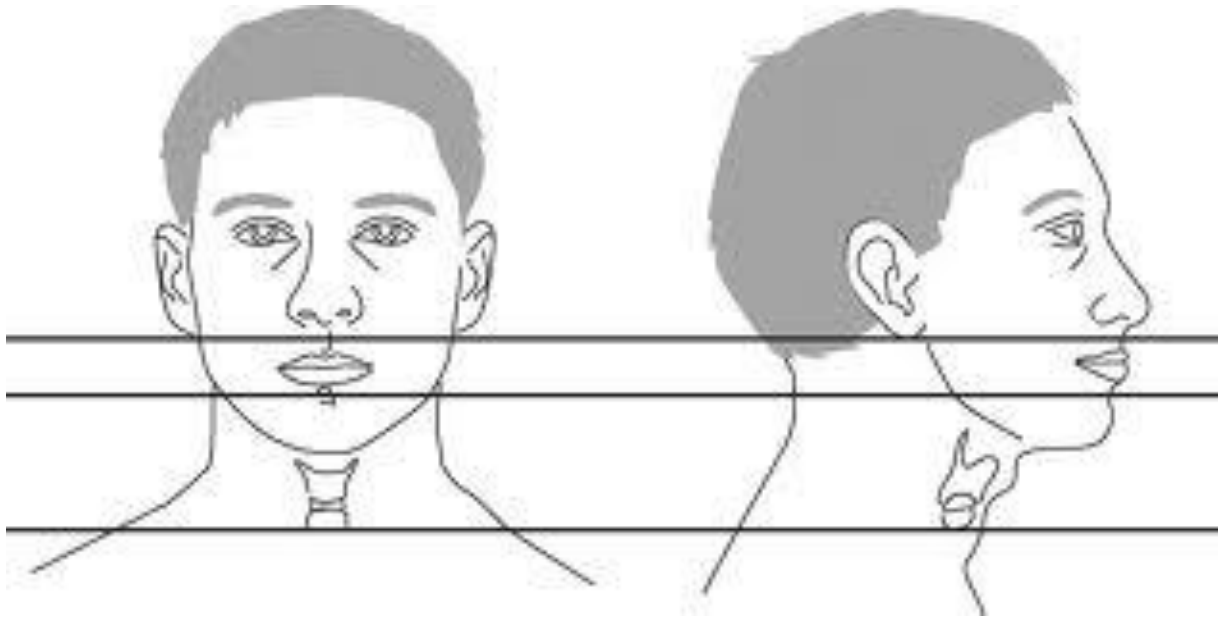
FEMC
Florida Emergency Medicine Clerkship

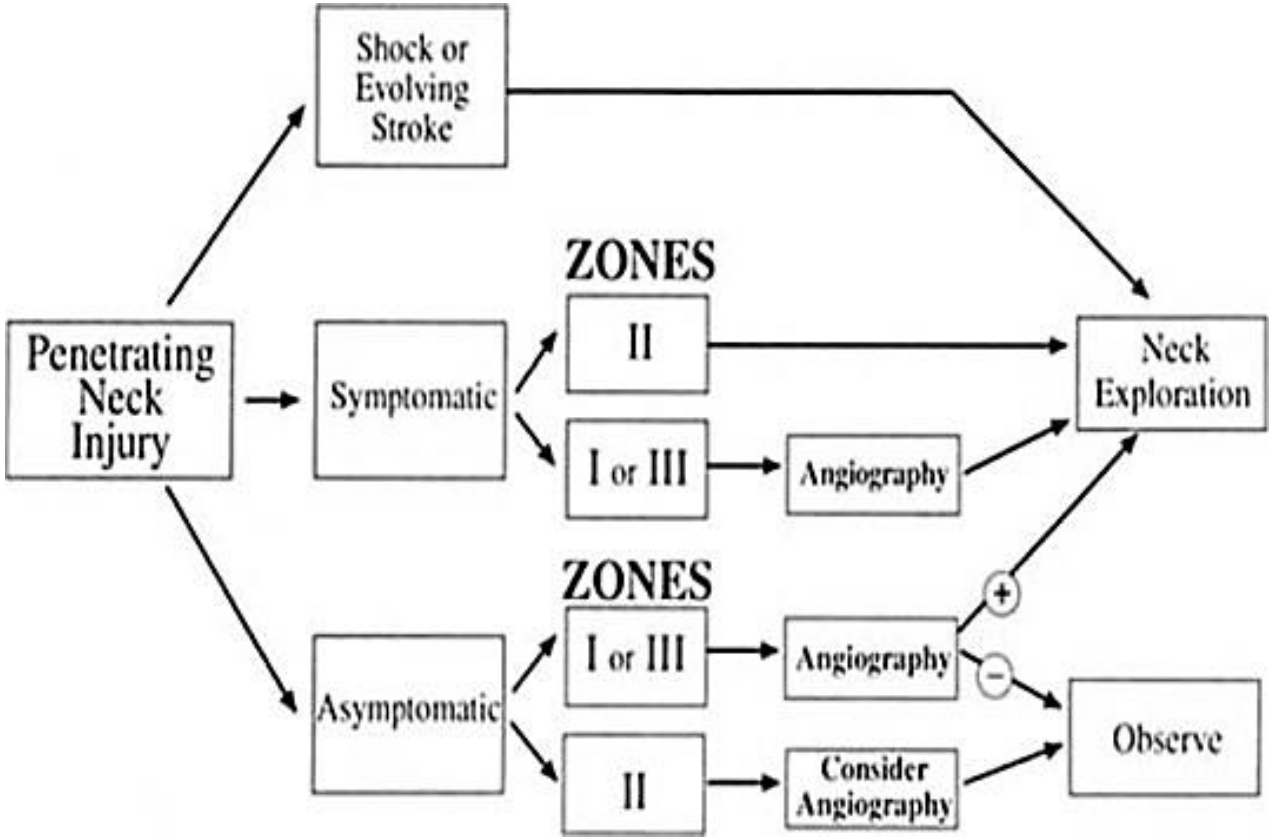
Zone 3

Zone 2

Zone 1

FEMC
Florida Emergency Medicine Clerkship


ZONE III
ZONE II
ZONE I


Shock or Evolving Stroke
Penetrating Neck Injury
Symptomatic
ZONES
II
I or III
Angiography
Neck Exploration
Asymptomatic
ZONES
I or III
Angiography
+
−
II
Consider Angiography
Observe

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

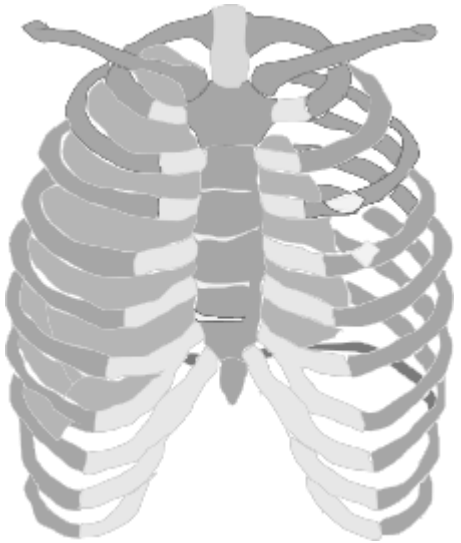
FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

CHEST TRAUMA



THORACIC TRAUMA

- Life-threatening thoracic injury can result from airway obstruction, tracheal bronchial tree injury, tension pneumothorax, open pneumothorax, massive hemothorax, and cardiac tamponade.
- Patients with tension pneumothorax who are spontaneously breathing generally present with tachypnea, air hunger, and desaturation.
- Most of these injuries can be managed through relatively simple maneuvers such as airway control or decompression of the chest.

THORACIC TRAUMA

- Successful decompression is dependent on the needle reaching the thoracic cavity, the patency of the catheter, and the correct identification of the appropriate landmarks.
- Increasing chest wall thickness has led to recommendations to use longer angiocatheters to ensure successful access to the thoracic cavity.

THORACIC TRAUMA

- Studies of both prehospital and hospital providers have demonstrated that though landmarks can be appropriately recited, they are not always accurately identified.
- Cadaver studies have shown improved success in reaching the thoracic cavity when the fourth or fifth intercostal space mid-axillary line is used instead of the second intercostal space mid-clavicular line in adult patients.
- ATLS now recommends this location for needle decompression in adult patients.

THORACIC TRAUMA

- Needle decompression can fail to improve clinical decompensation in patients who have hemothorax or in whom the angio-catheter has kinked.
- Performing a finger thoracostomy can ensure adequate decompression of the chest and eliminate tension pneumothorax as the cause of decompensation.

THORACIC TRAUMA

- Evidence-based research and clinical experience indicate that size matters with respect to the optimal size chest tube required to drain a hemothorax. Prospective analysis has shown 28–32 F to effectively drain hemothorax without resulting in increased retained hemothorax.
- The focused abdominal sonography for trauma (also known as FAST) technique has been modified to include evaluation of the thoracic cavity for the presence of air. It can aid in the rapid diagnosis of pneumothorax in the emergency department.

THORACIC TRAUMA

- The presentation and treatment of blunt aortic injury has evolved with the use of thoracic computerized tomographic angiography (also known as CTA) to evaluate for blunt aortic injury.
- Hemodynamically normal patients with partial injury are now managed with endovascular techniques. The injury is medically managed by decreasing the heart rate (<80 bpm) and mean arterial pressure (60–70 mm Hg) through the use of beta blockers.

- 27-year-old male brought to trauma center
- Unrestrained driver in high-speed, frontal-impact collision
- Prolonged extrication at scene
- Blood pressure: 90/70; heart rate: 110; respiratory rate: 36
- Initial assessment: GCS score 15, patent airway

SECTION 5: CHEST TRAUMA

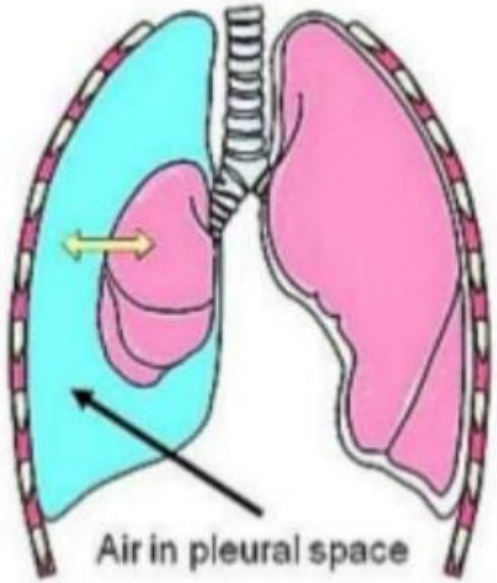
- 25% of deaths from trauma
- 85% can be treated easily
- Mechanism: Blunt and penetrating
- 15% or less requires thoracotomy

CHEST X-RAYS
ABCDEFGHI

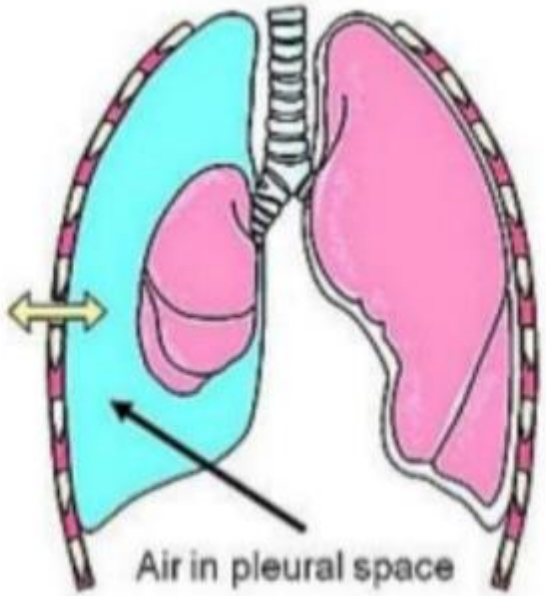
- Aortic transection / dissection
- Bronchial rupture/Bone
- Cord injury
- Diaphragmatic rupture
- Esophageal tear
- Flail chest
- Gas (pneumothorax)
- Heart injury
- Iatrogenic

Pneumothorax

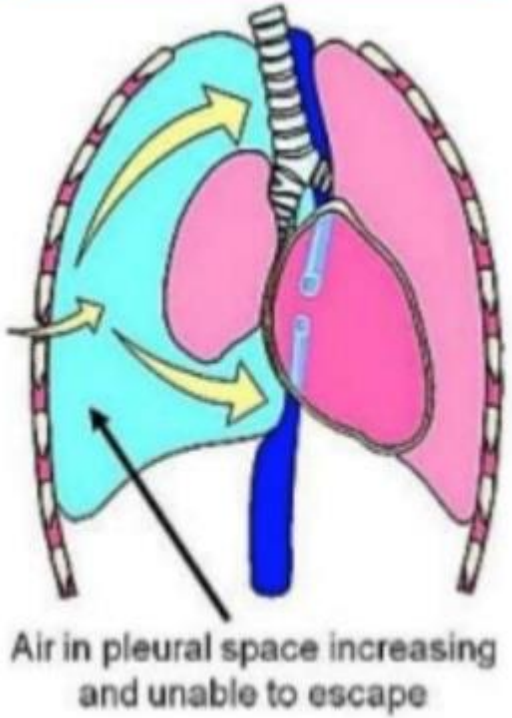
Closed pneumothorax



Open pneumothorax

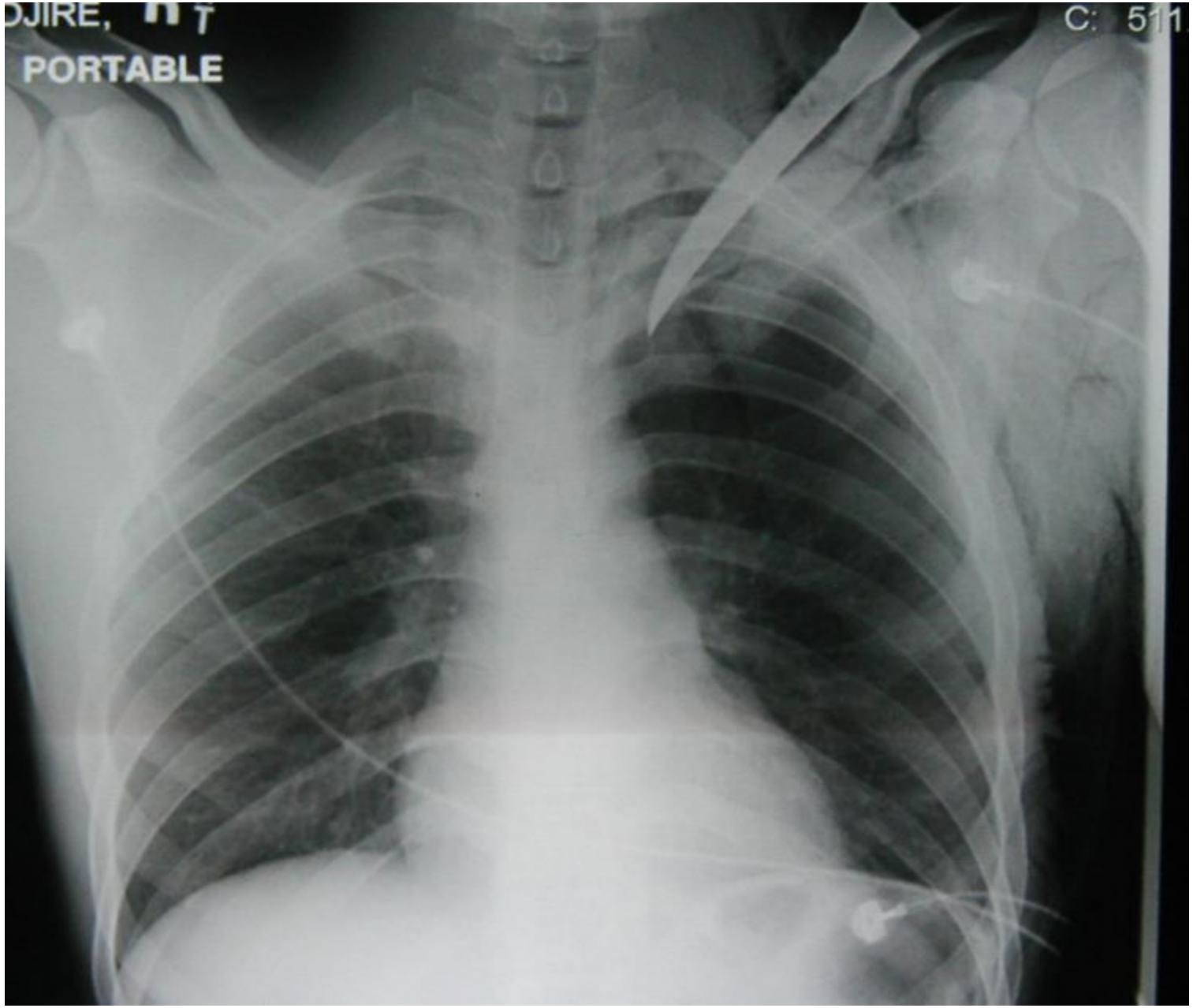


Tension pneumothorax



FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

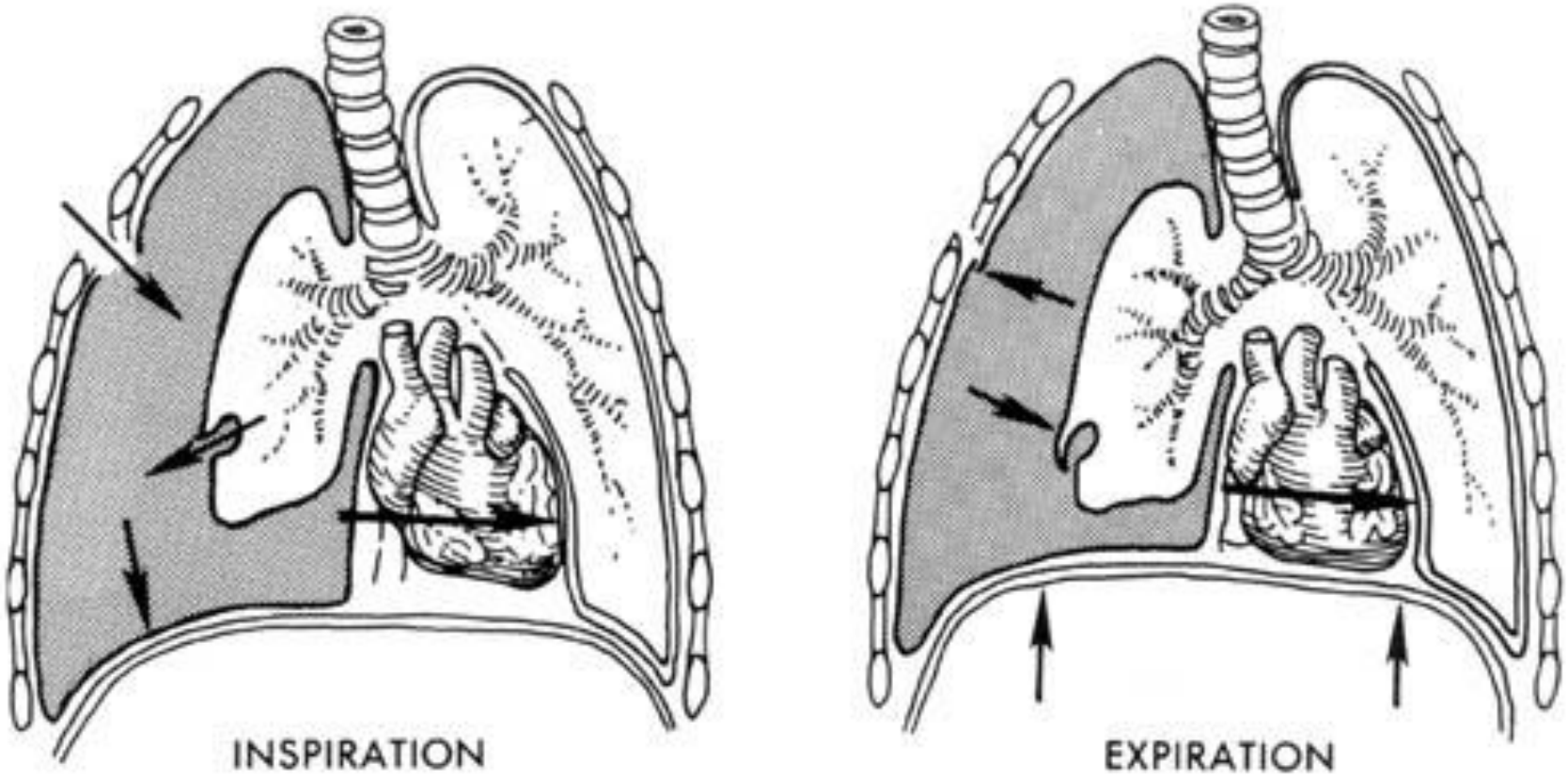


FEMC
Florida Emergency Medicine Clerkship

TENSION PNEUMOTHORAX

- Signs:
  - Shortness of breath
  - Deviated trachea
  - Diminished breath sounds
  - Tympani to percussion of chest
  - Distended neck veins
  - Hypotension

TENSION PNEUMOTHORAX



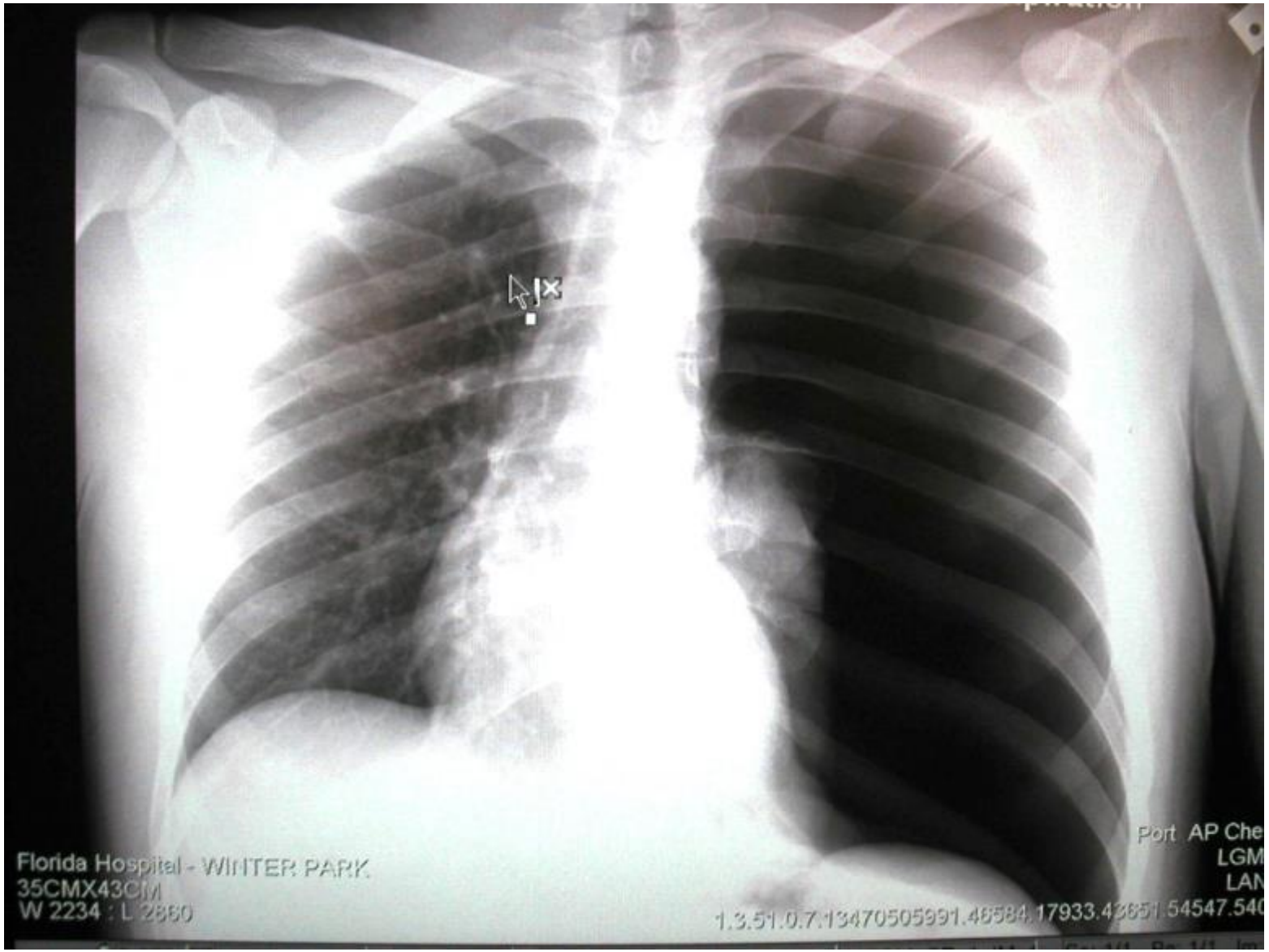
FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

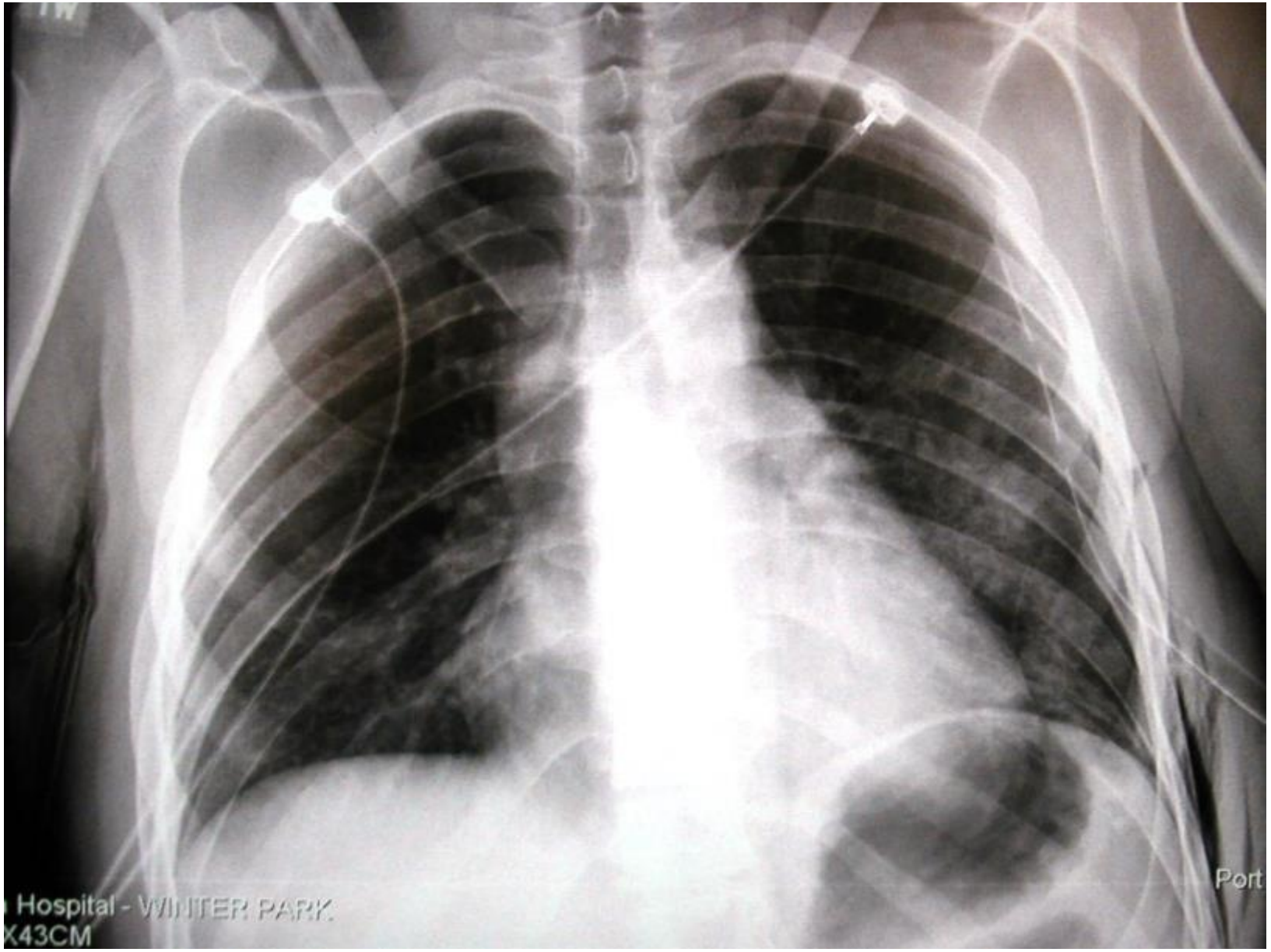
TENSION PNEUMOTHORAX

- Treatment
  - Don’t wait for x-rays
  - Needle decompression
  - Chest tube

FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

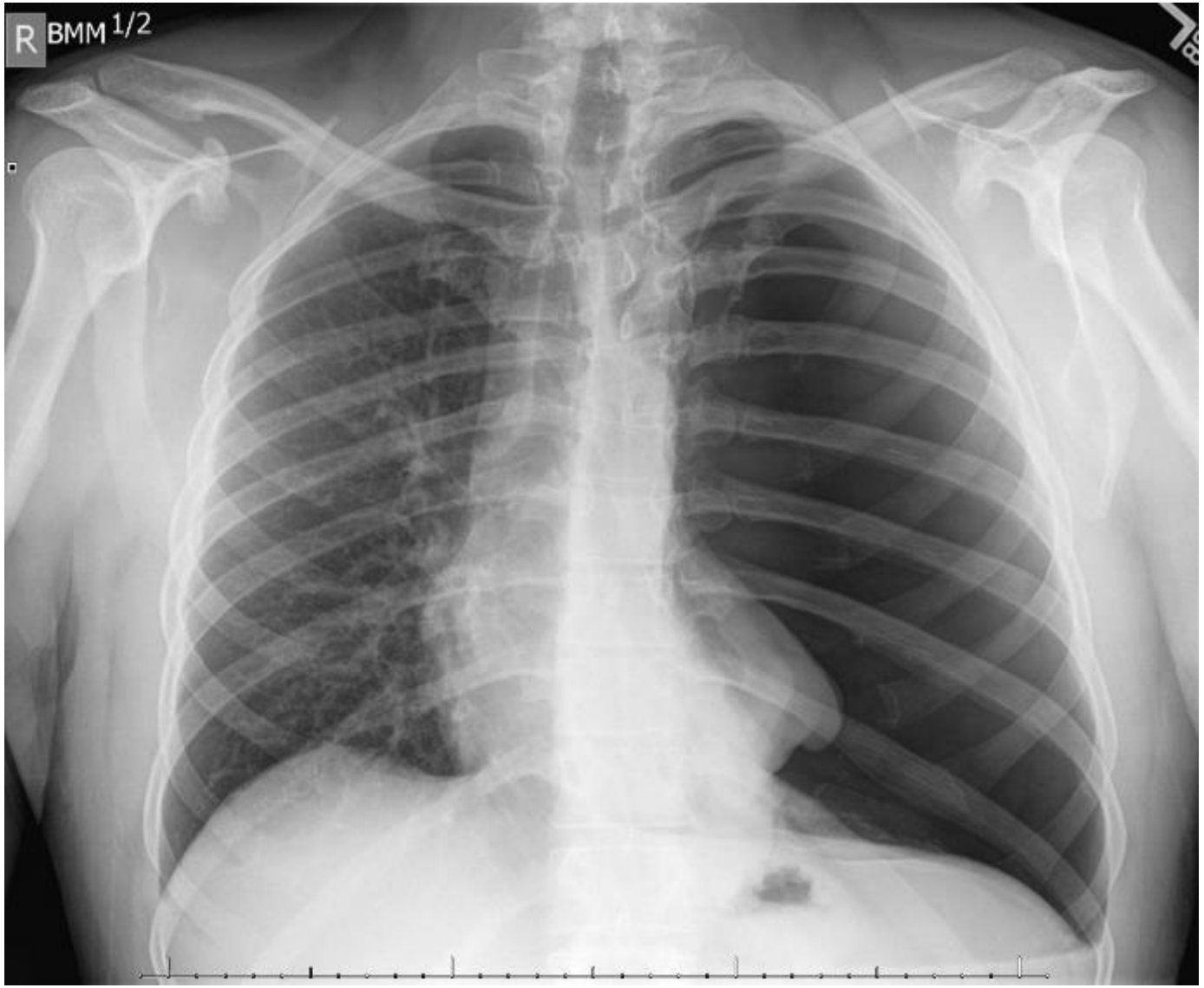
FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

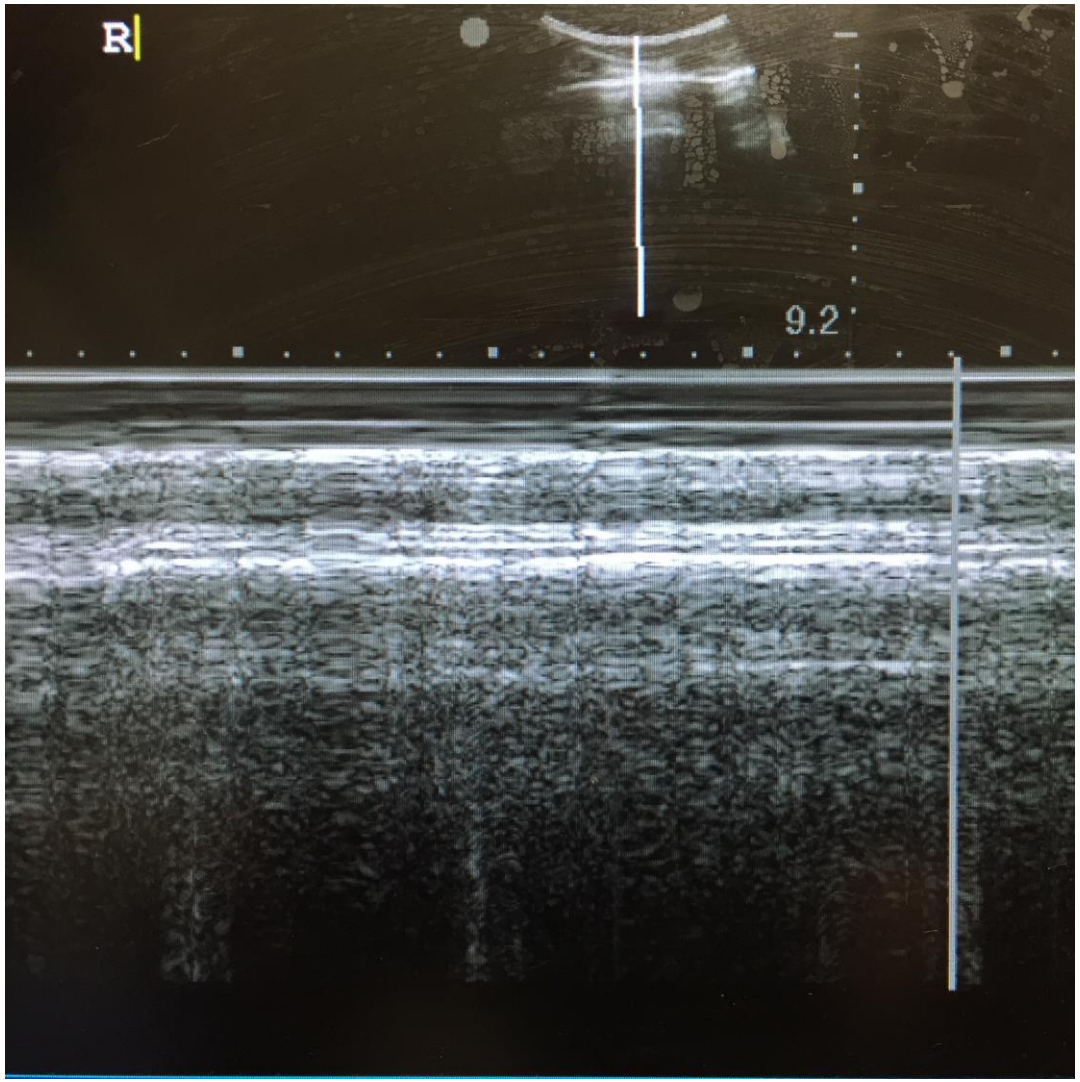
OPEN PNEUMOTHORAX

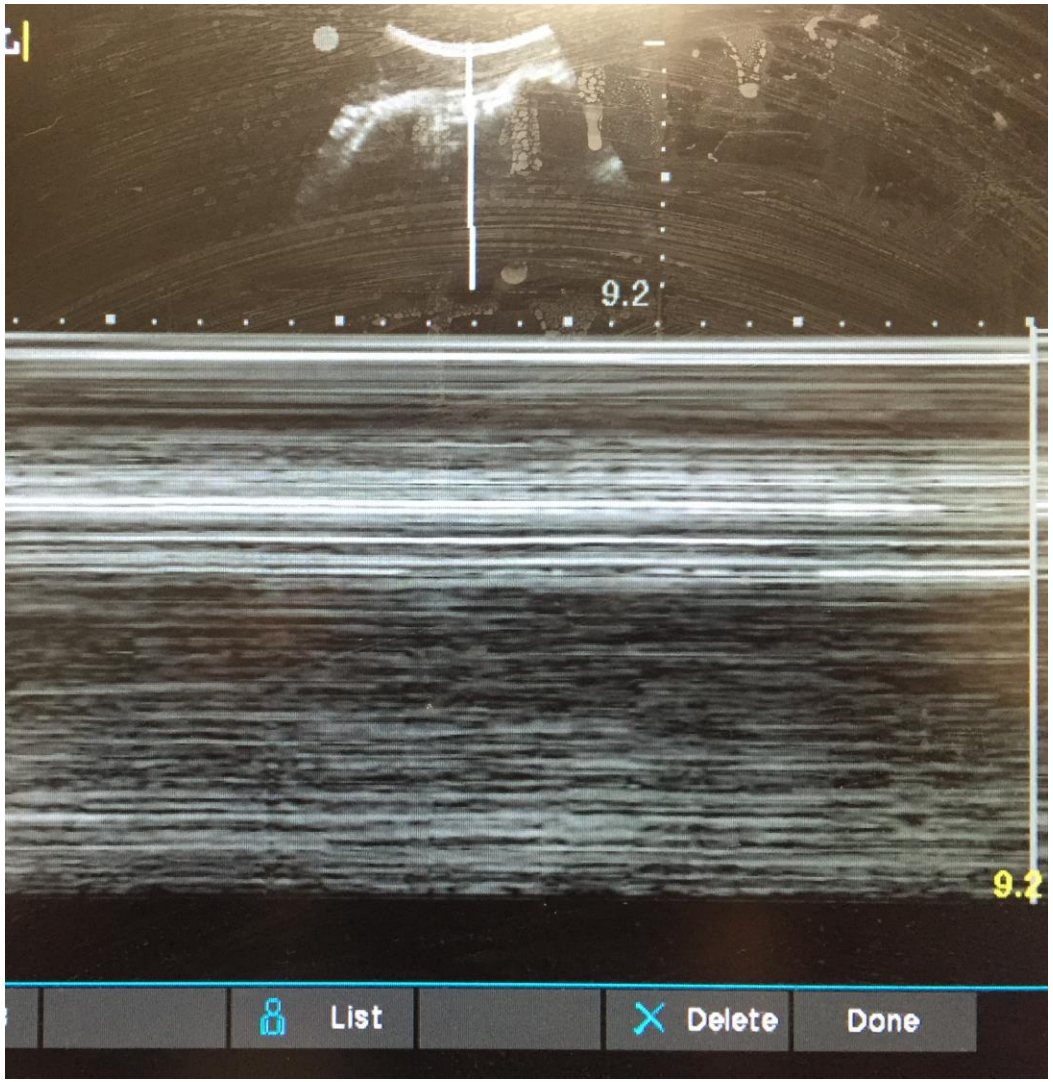
- Can occur with large sucking chest wound
- Treatment:
  - Non-occluded dressing
  - Chest tube placement

OPEN PNEUMOTHORAX



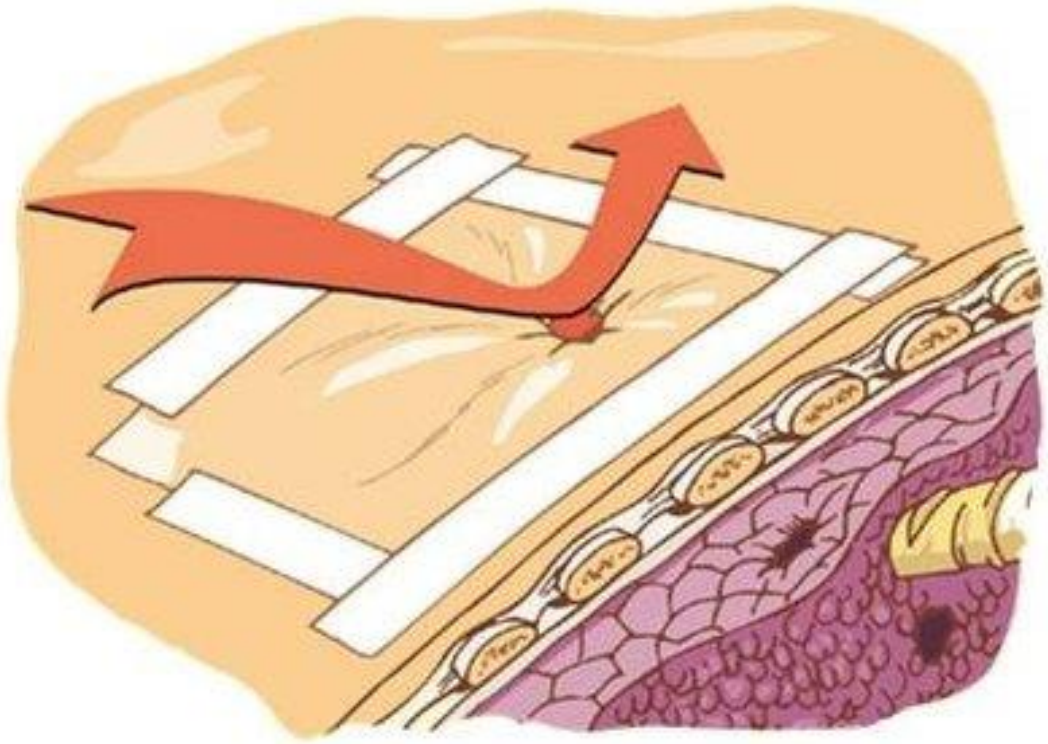
FEMC
Florida Emergency Medicine Clerkship

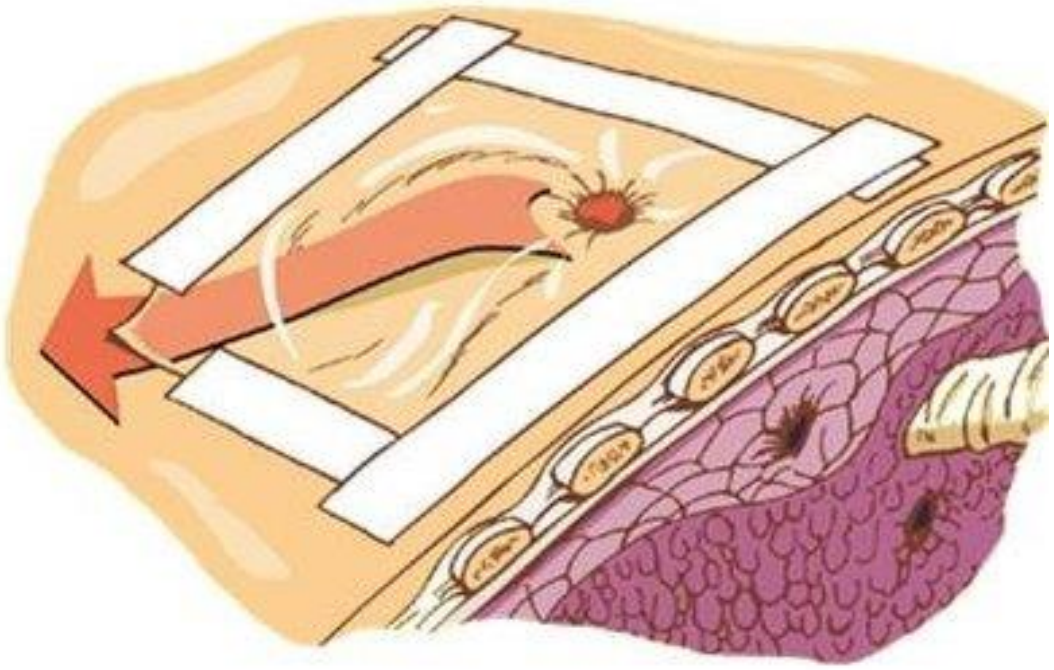




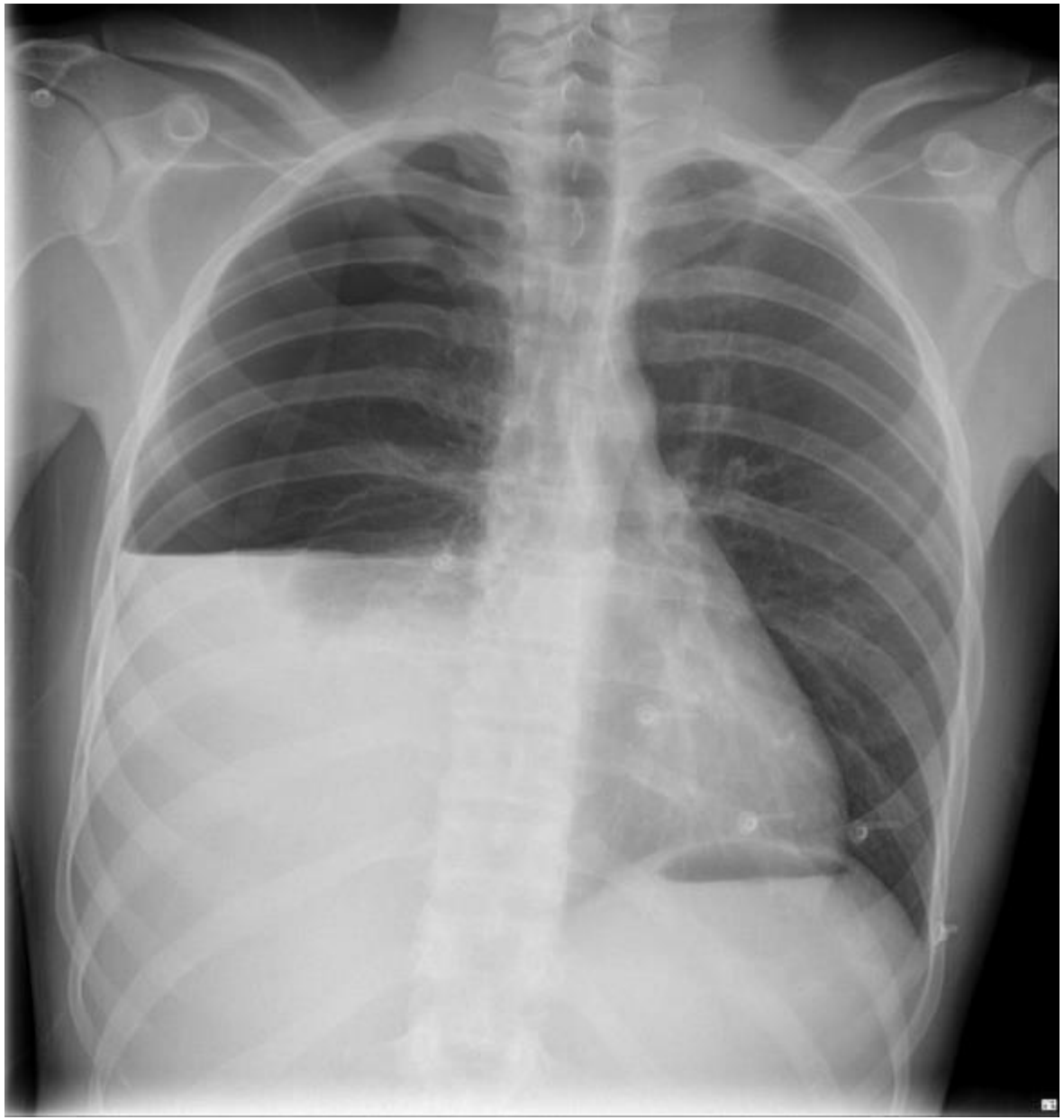
FEMC
Florida Emergency Medicine Clerkship

CHEST TUBE





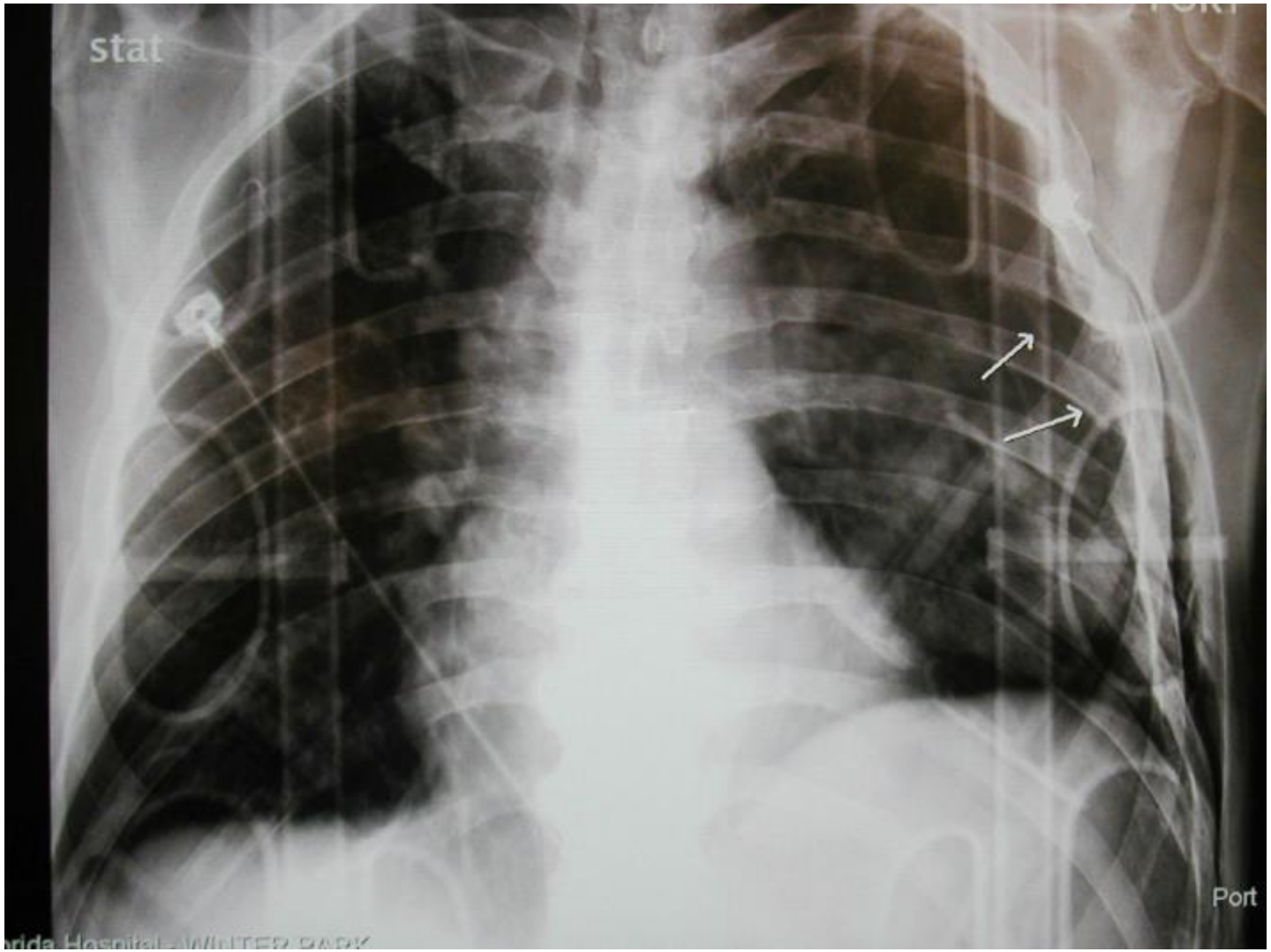
HEMO-PNEUMOTHORAX



FEMC
Florida Emergency Medicine Clerkship

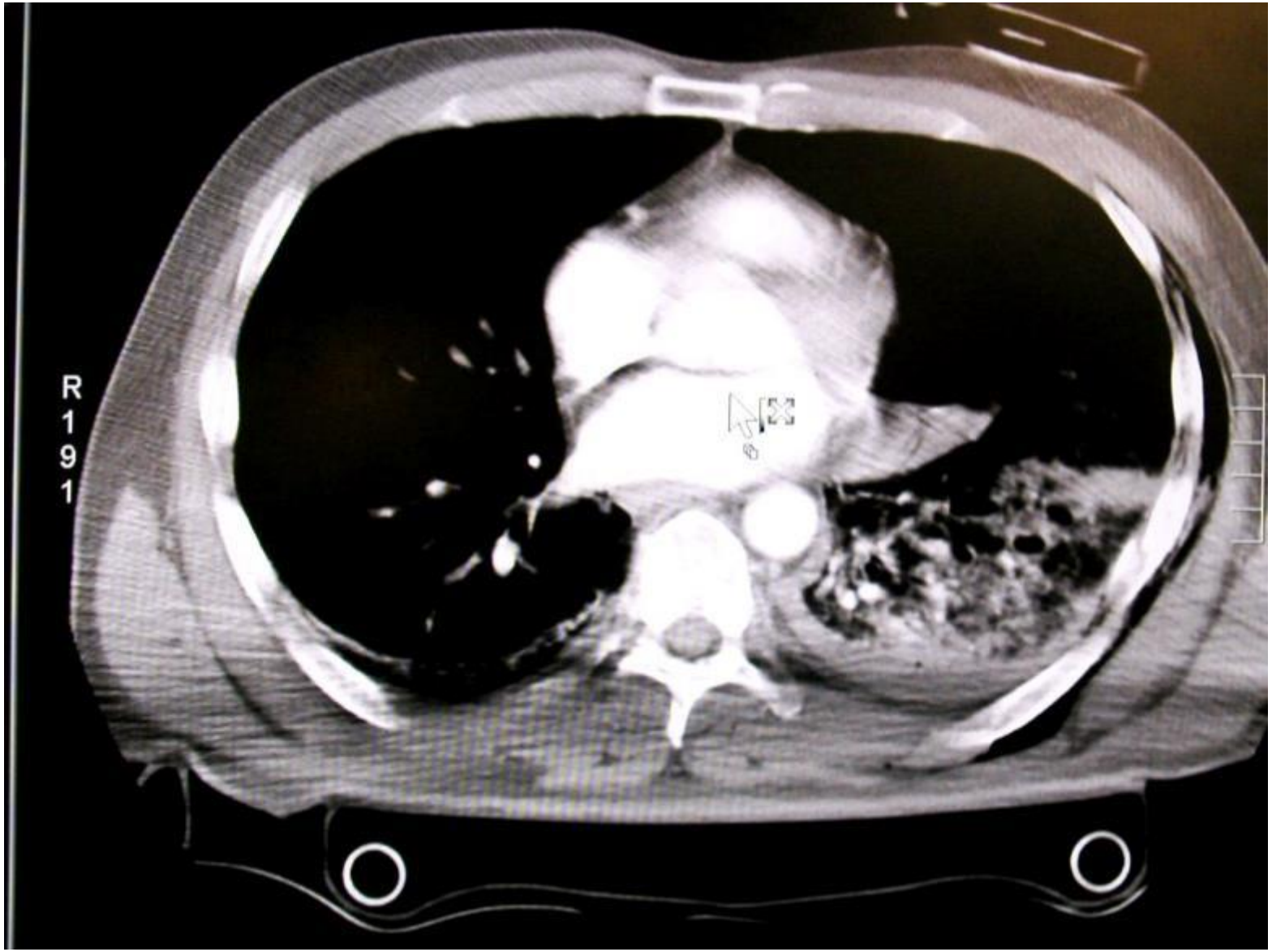
HEMO-PNEUMOTHORAX

- Treatment:
  - Non-occluded dressing
  - Chest tube placement



FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

MASSIVE HEMOTHORAX

- >1500 mL of blood in the pleural cavity
- Signs:
  - "shock"
  - flat neck veins
  - diminished breath sounds
  - 'fullness' to percussion

MASSIVE HEMOTHORAX

- Treatment
  - Consider losses from vascular space
  - Transfuse blood
  - Autotransfusion if possible
  - Chest tube may be needed
  - Thoracotomy/ OR

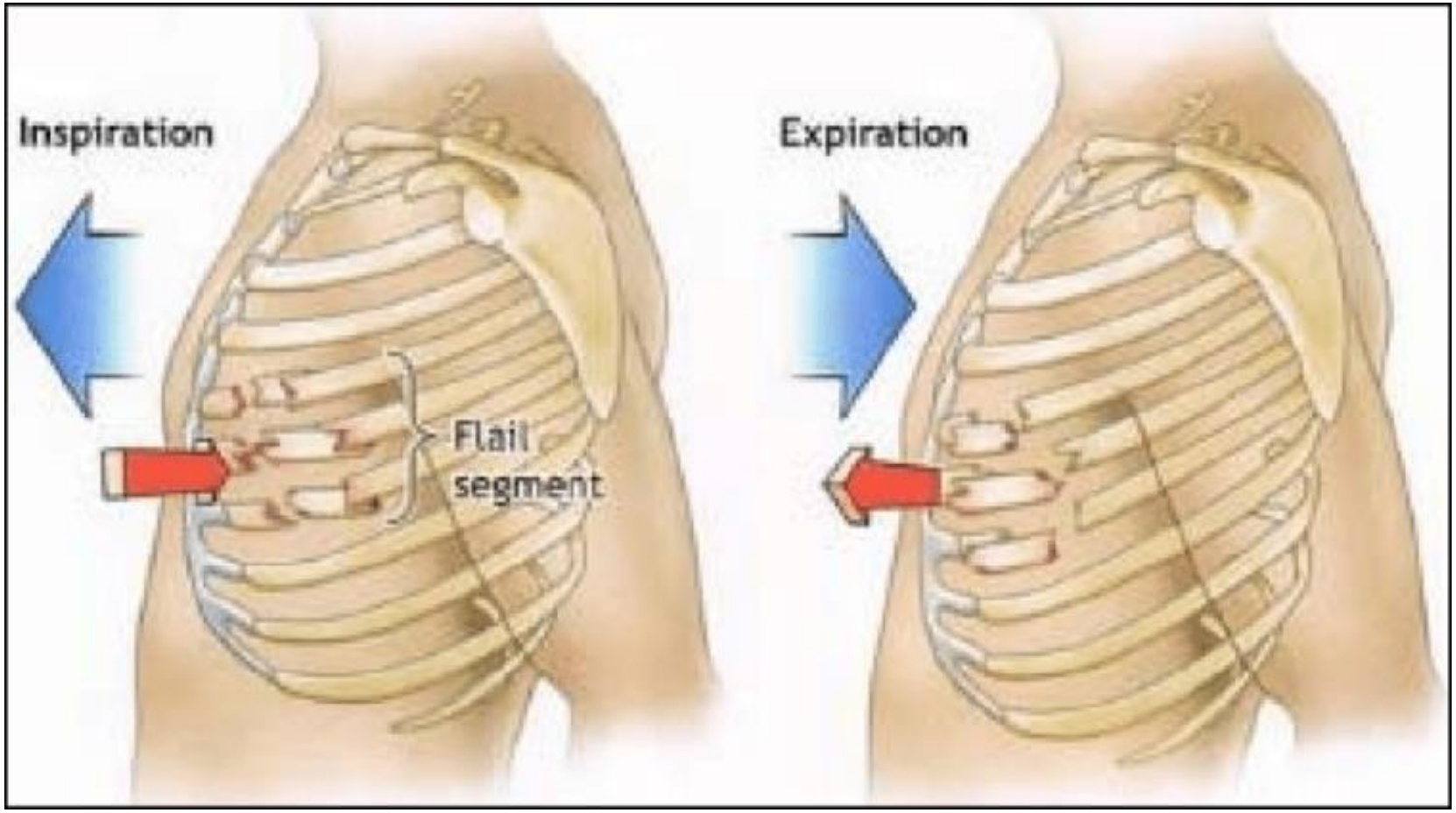
FEMC
Florida Emergency Medicine Clerkship

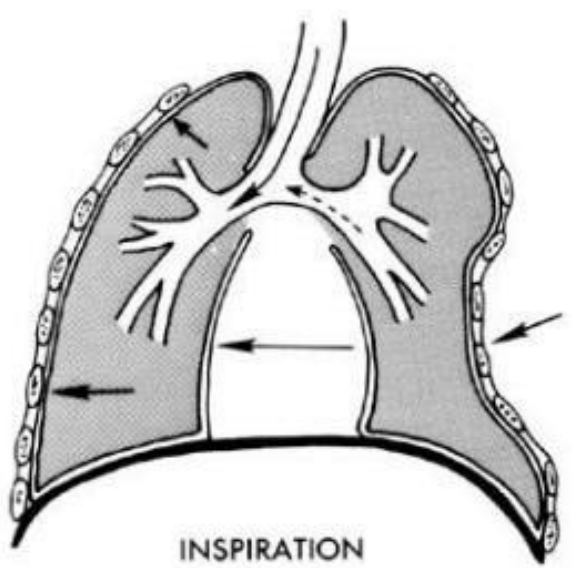
"FLAIL CHEST"

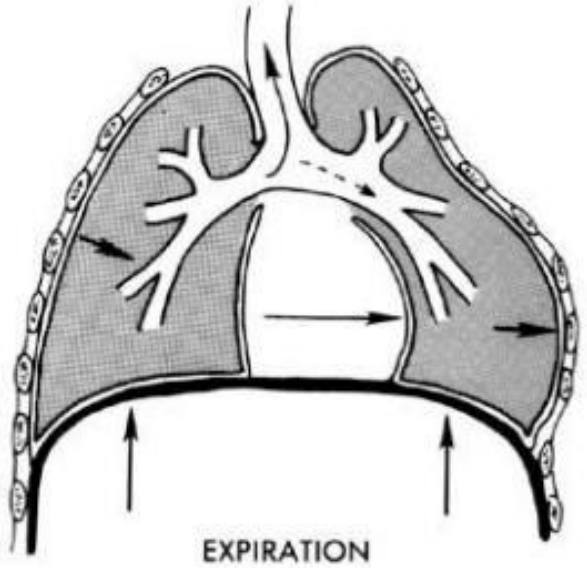
- 3 or more adjacent ribs in two different places
- Paradoxical respirations
- Associated pulmonary contusion

"FLAIL CHEST"

- *Prehospital stabilization*
- Conservative treatment may work
- Consider intubation if:
  - Age >65
  - Other major injuries
  - Hypoxia/hypercarbia
  - Debility from chronic disease


Inspiration
Expiration
Flail segment

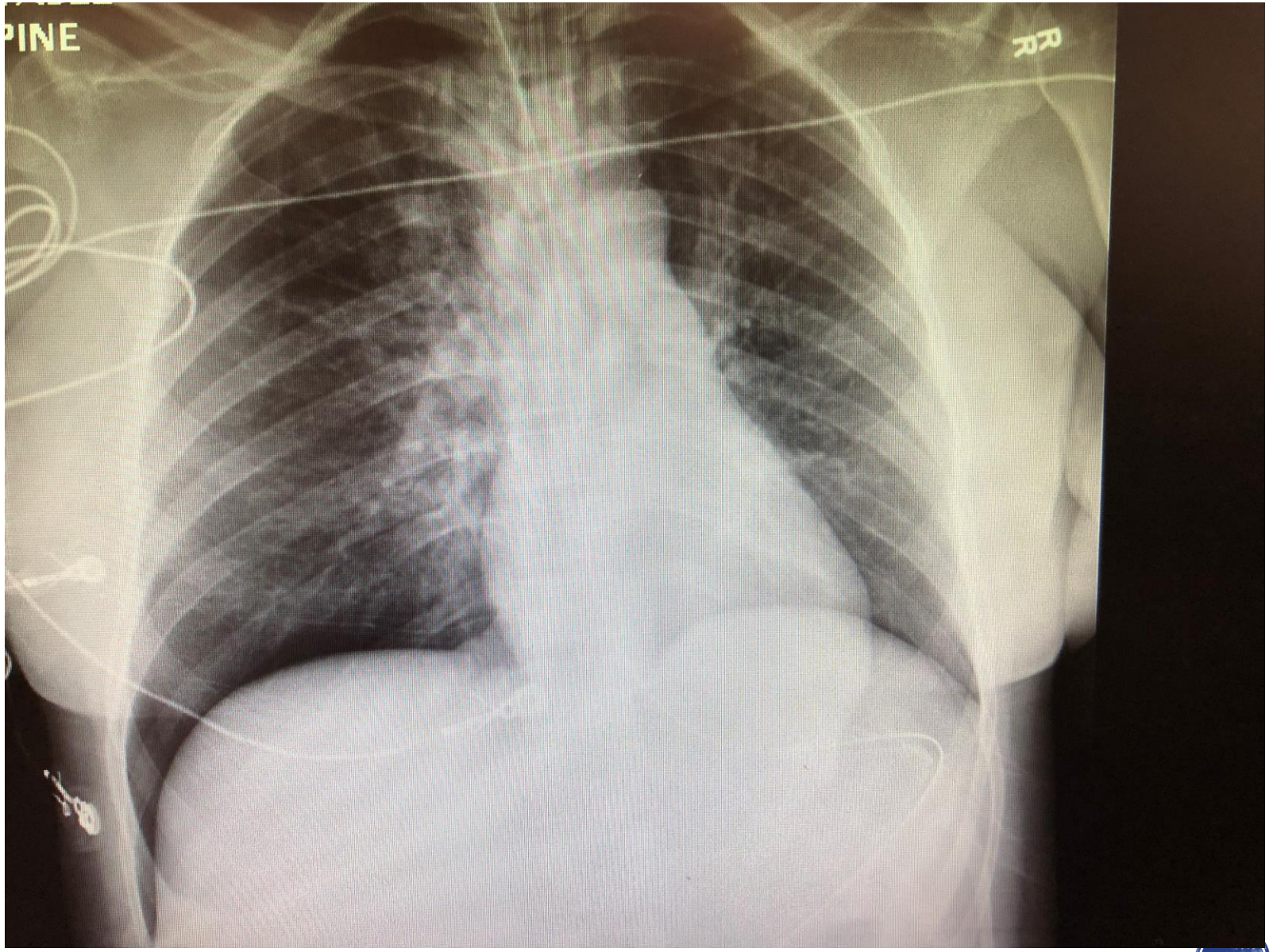




FEMC
Florida Emergency Medicine Clerkship

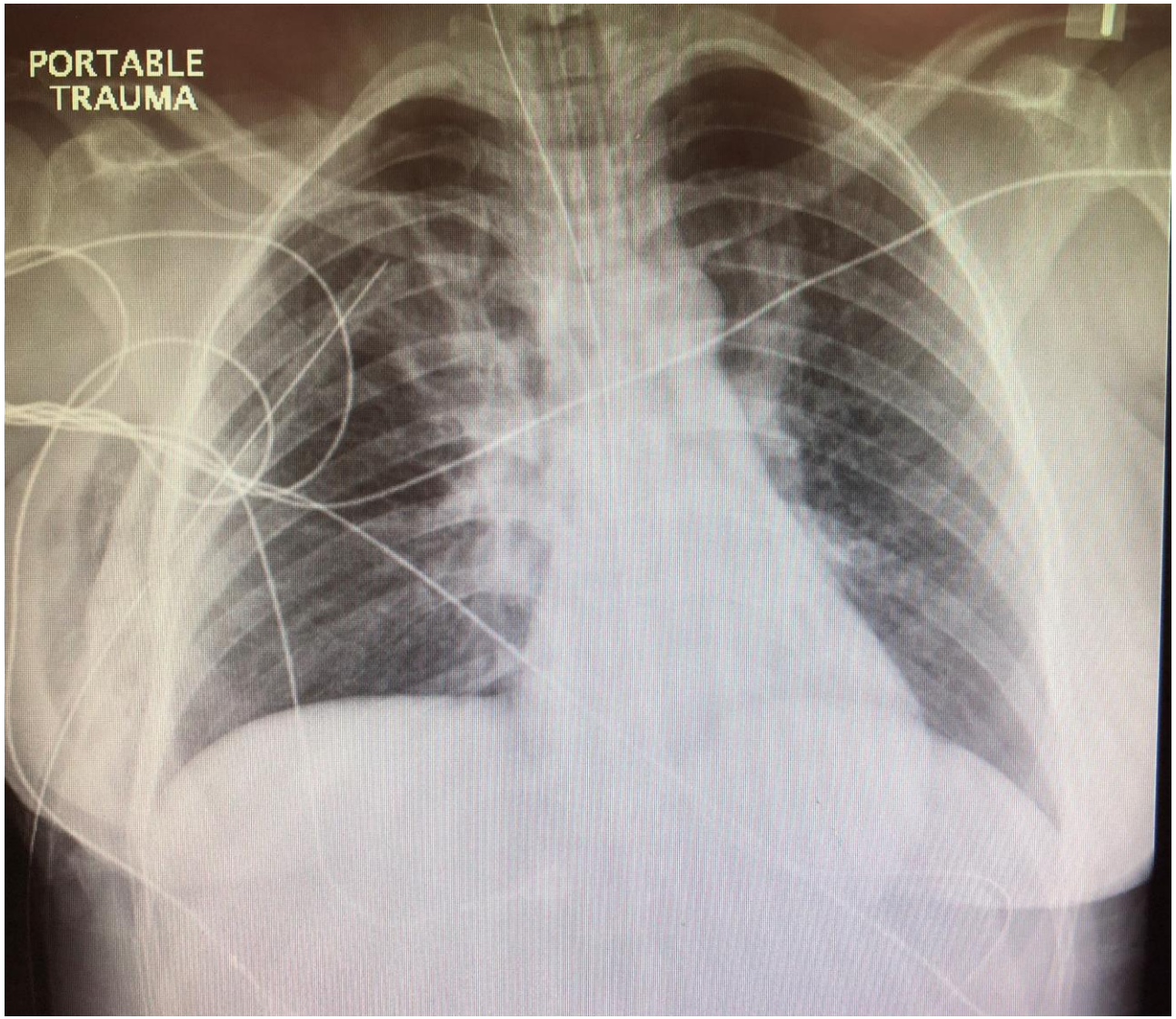
FEMC
Florida Emergency Medicine Clerkship

DEEP SULCUS

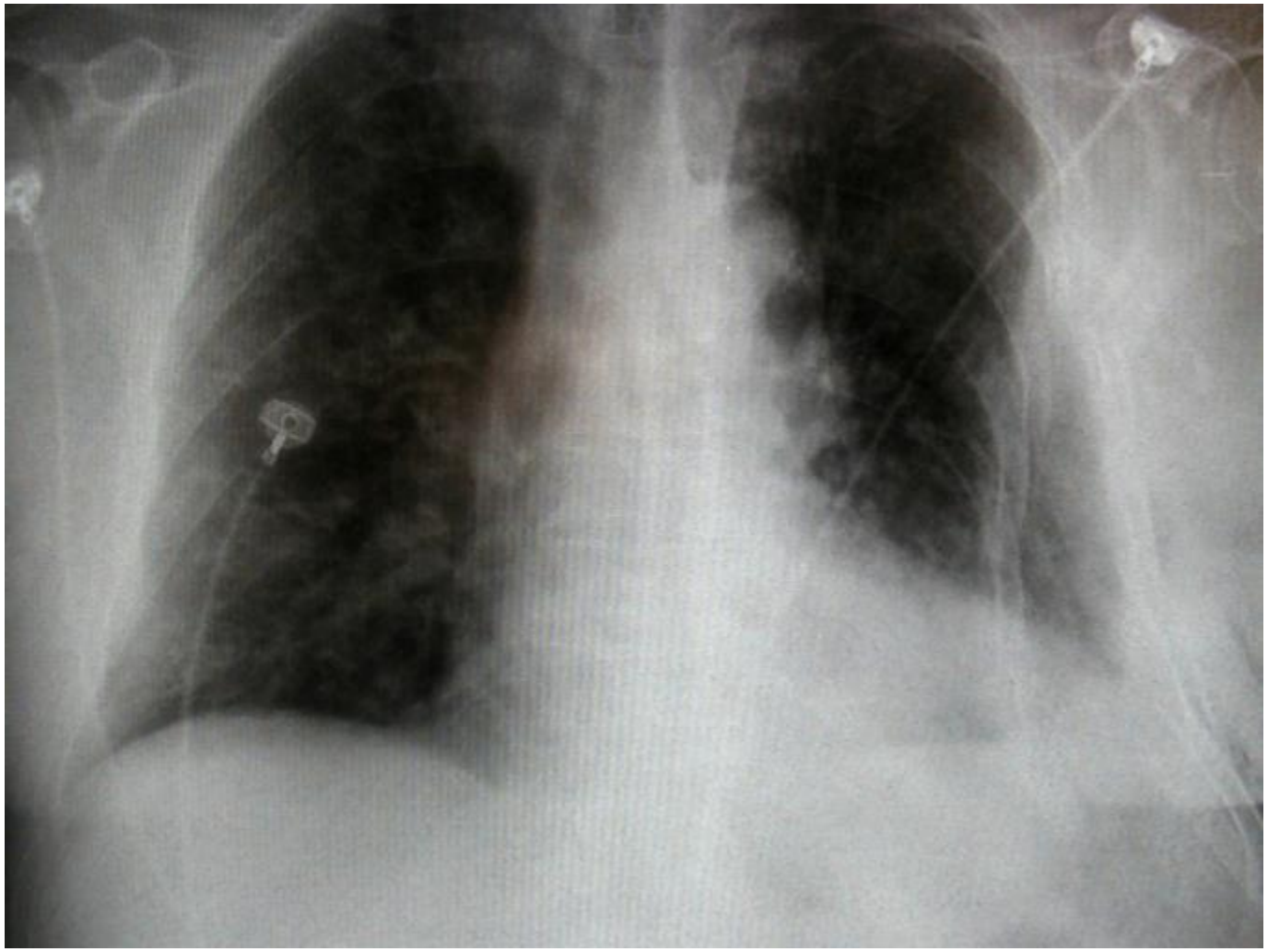


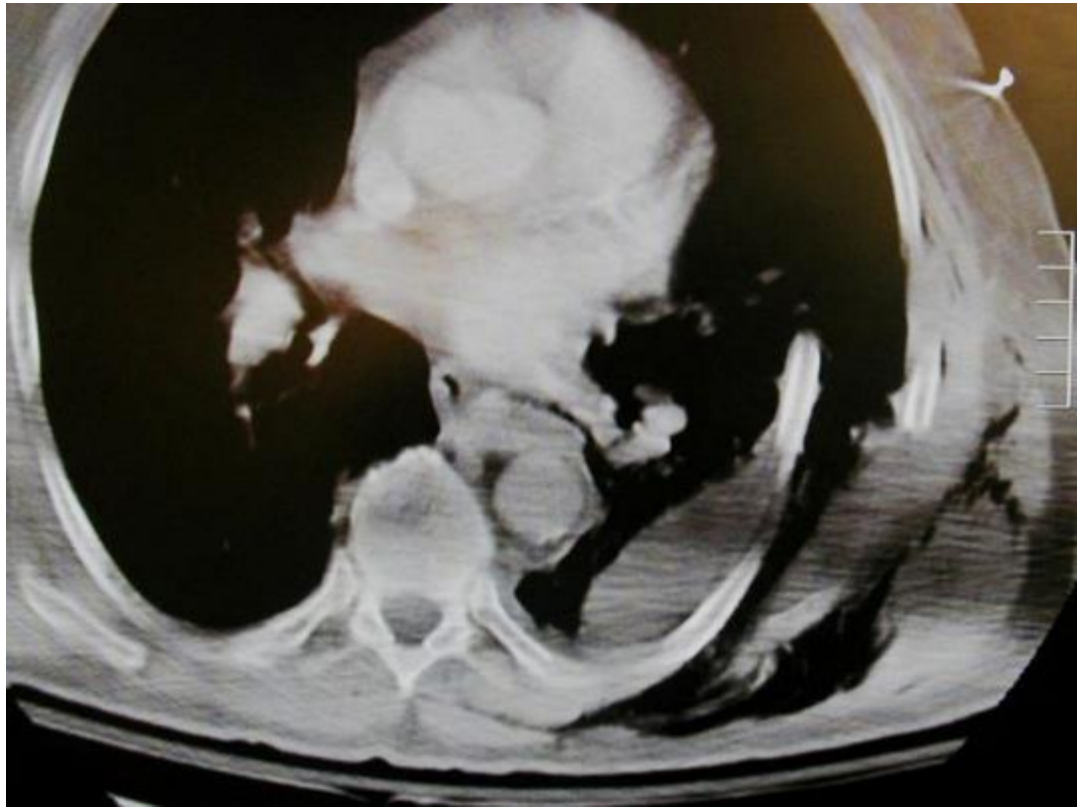
FEMC
Florida Emergency Medicine Clerkship

S/P CHEST TUBE



FEMC
Florida Emergency Medicine Clerkship





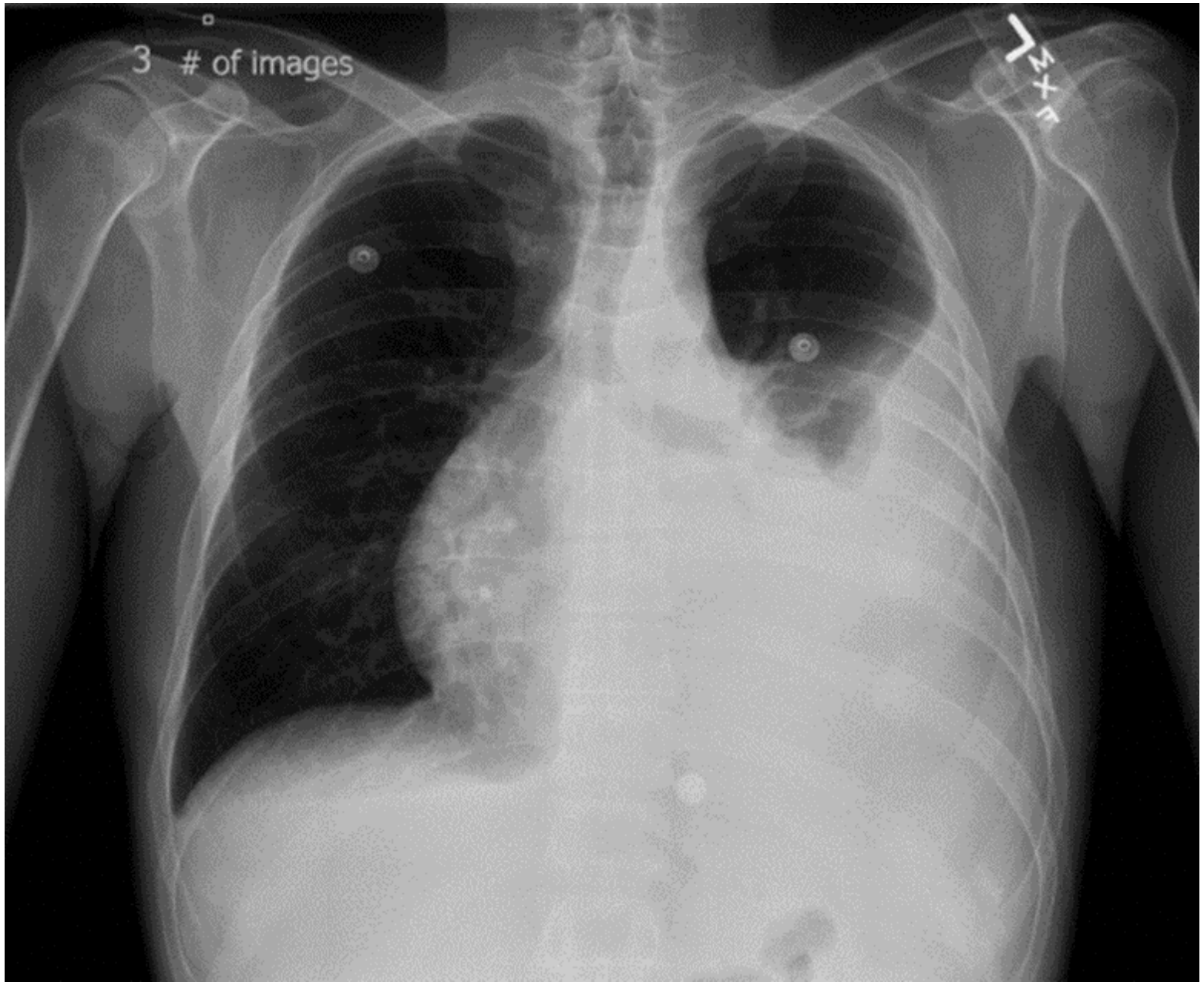
FEMC
Florida Emergency Medicine Clerkship

CARDIAC TAMPONADE

- Beck's triad:
  - Hypotension
  - Diminished heart tones
  - Distended neck veins (JVD)
  - Usually not seen

CARDIAC TAMPONADE

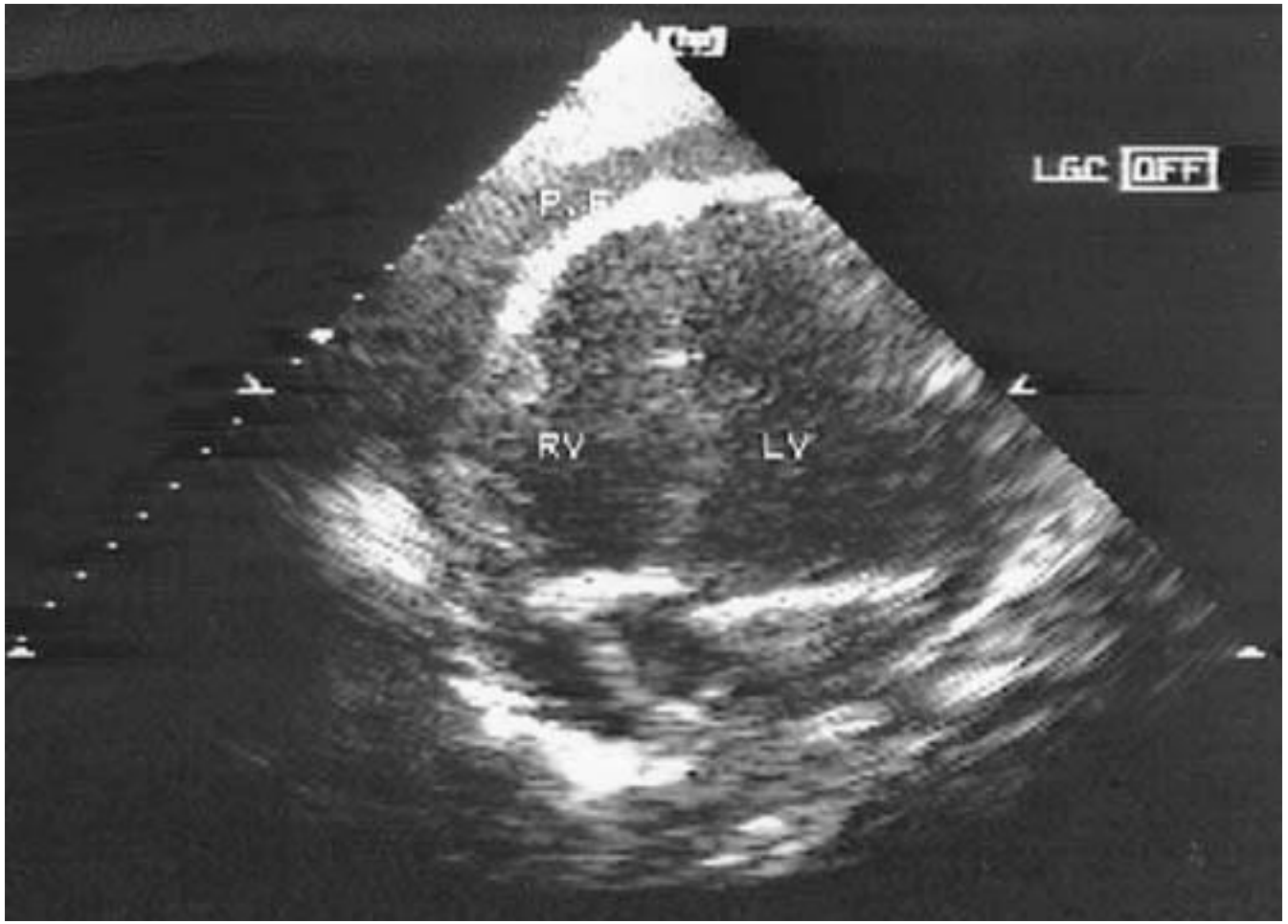
- Treatment
  - IVF's
  - Vasopressors
  - Pericardiocentesis
  - Pericardiac window
  - Thoracotomy



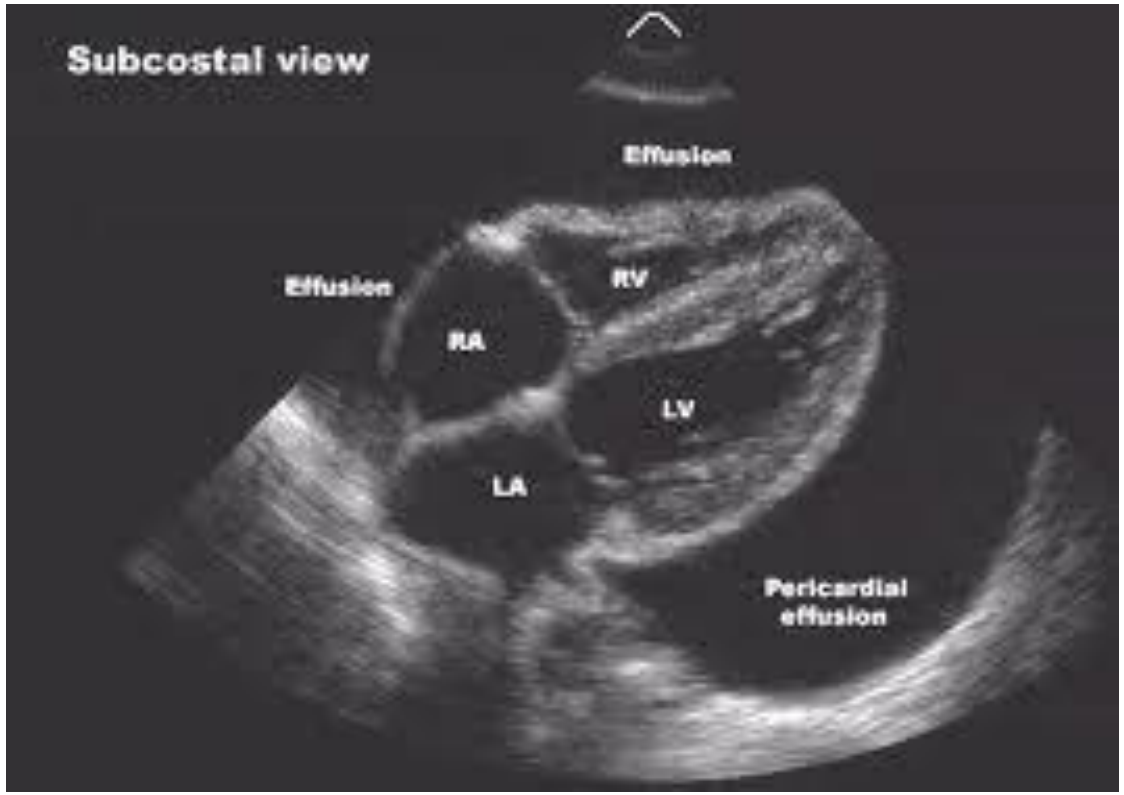
FEMC
Florida Emergency Medicine Clerkship

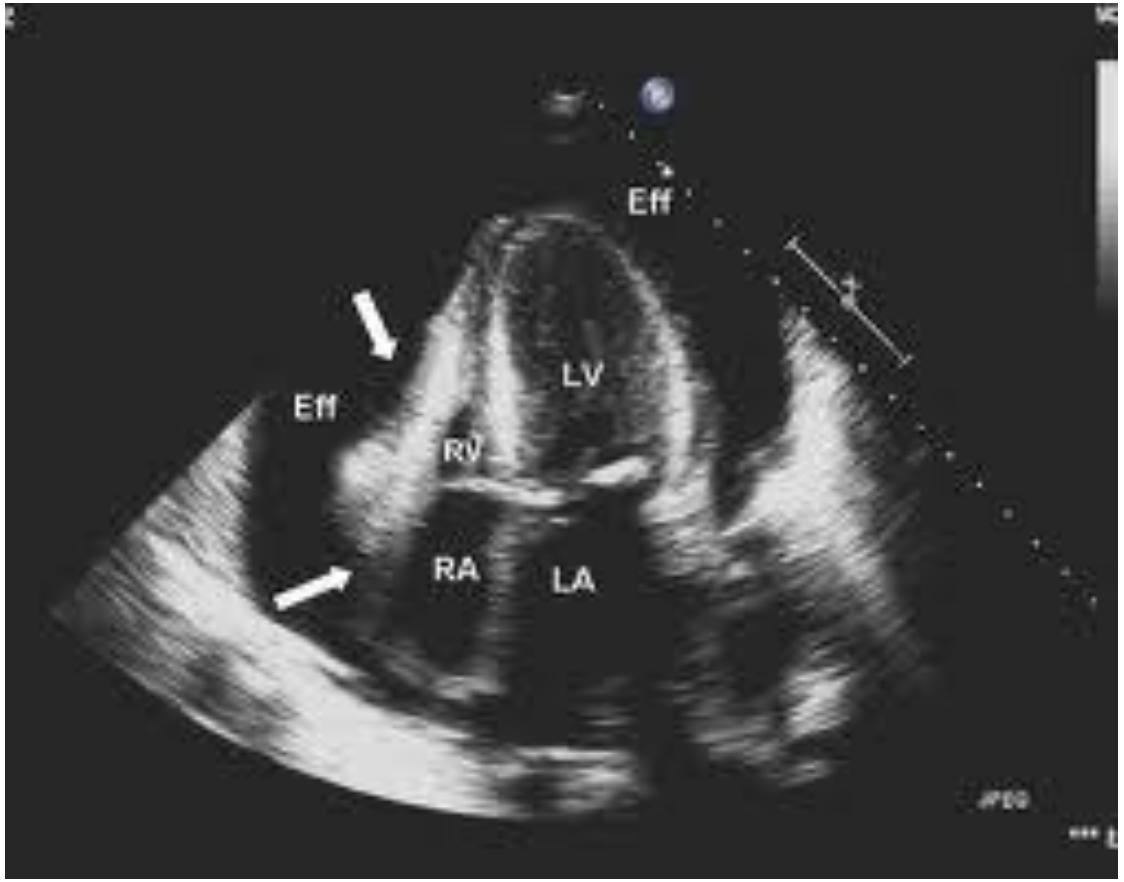
FEMC
Florida Emergency Medicine Clerkship

PERICARDIAL EFFUSION



FEMC
Florida Emergency Medicine Clerkship





FEMC
Florida Emergency Medicine Clerkship

AORTIC RUPTURE

- Main cause of death in falls and car accidents
- Signs:
  - Pulse differences
  - Paraplegia
  - Lower extremities hypotension
  - Acute severe back/chest pain

AORTIC RUPTURE

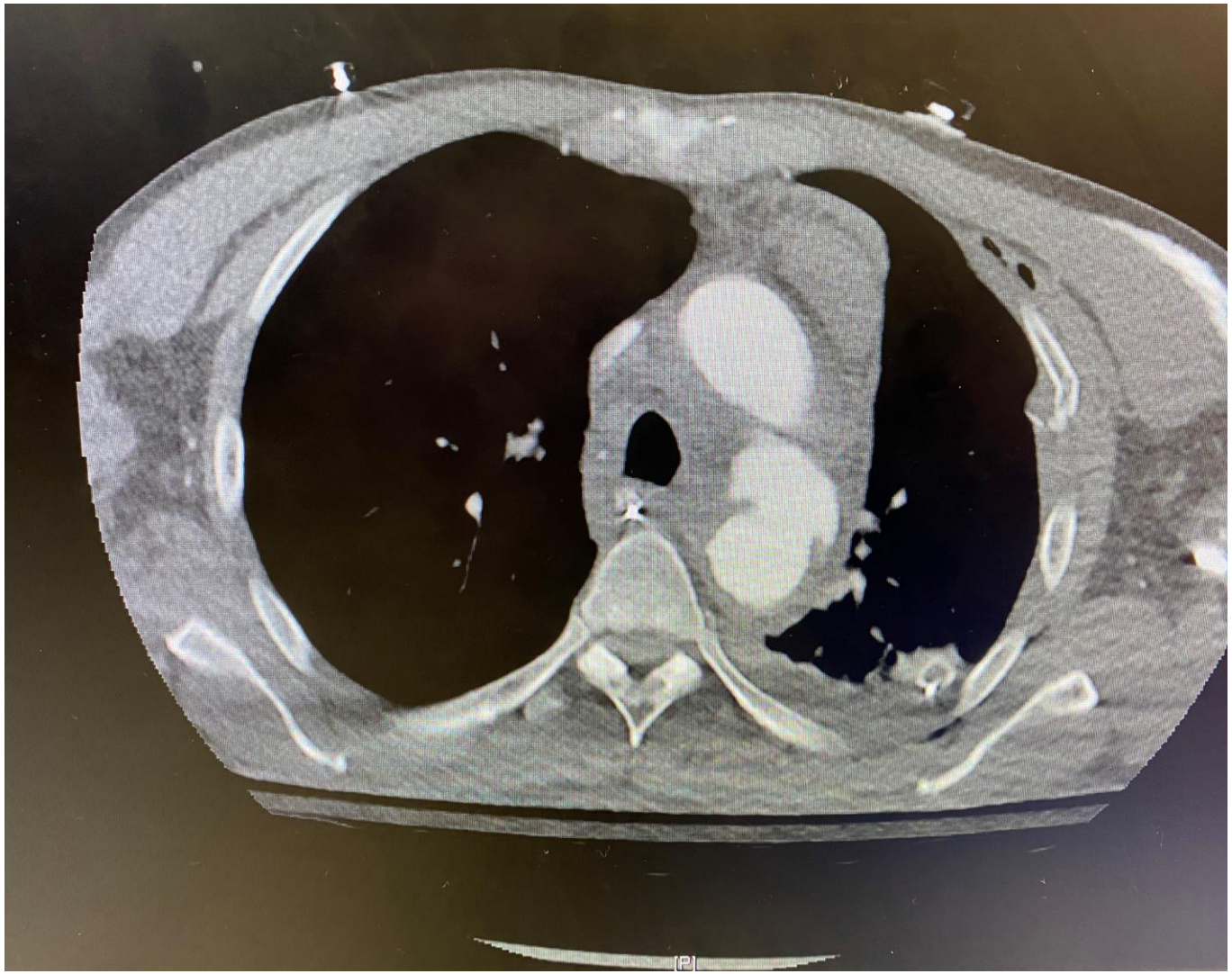
- Chest X-ray findings
  - Wide mediastinum
  - Loss aortic knob
  - Left pleural effusion
  - Deviated trachea or NG tube

AORTIC RUPTURE

- Is usually a tearing injury near the ligamentous artery
- Diagnostic studies:
  - Angiography is the hallmark study
  - TEE
  - CT Scan

AORTIC RUPTURE

- Treatment:
  - Be careful to overload on fluids
  - Control hypertension
  - T+C
  - Surgery



FEMC
Florida Emergency Medicine Clerkship

PULMONARY CONTUSION

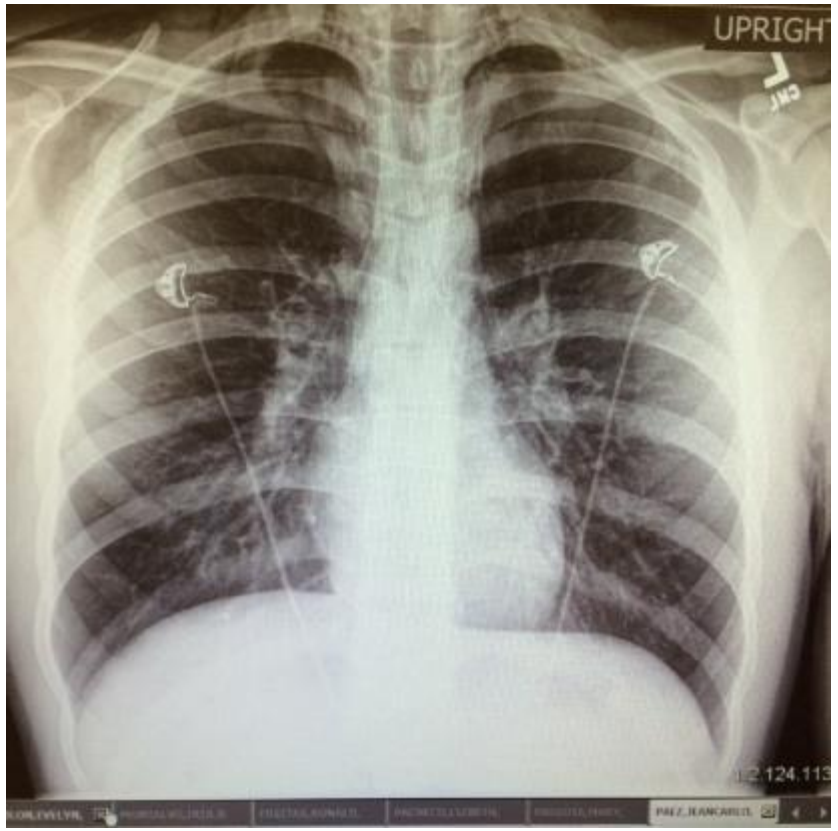
- In adults usually seen with rib fractures
- Signs:
  - Hemoptysis
  - Diminished breath sounds
  - Dullness to percussion
  - Shortness of breath
  - Hypoxia
  - Infiltrates on chest film

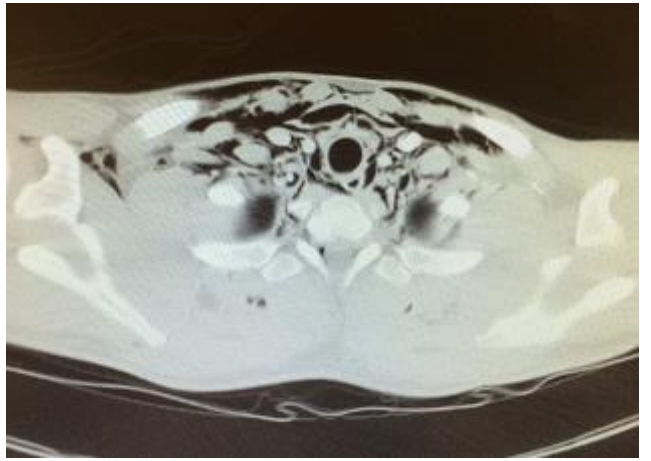
PULMONARY CONTUSION

- Steroid contraindicated
- Antibiotics are no of help
- Treatment
  - Oxygen
  - Incentive spirometry
  - Fluids restriction
  - Bronchodilators
  - Supportive care

PULMONARY CONTUSION

PNEUMOPERICARDIUM/PNEUMOMEDIASTINUM

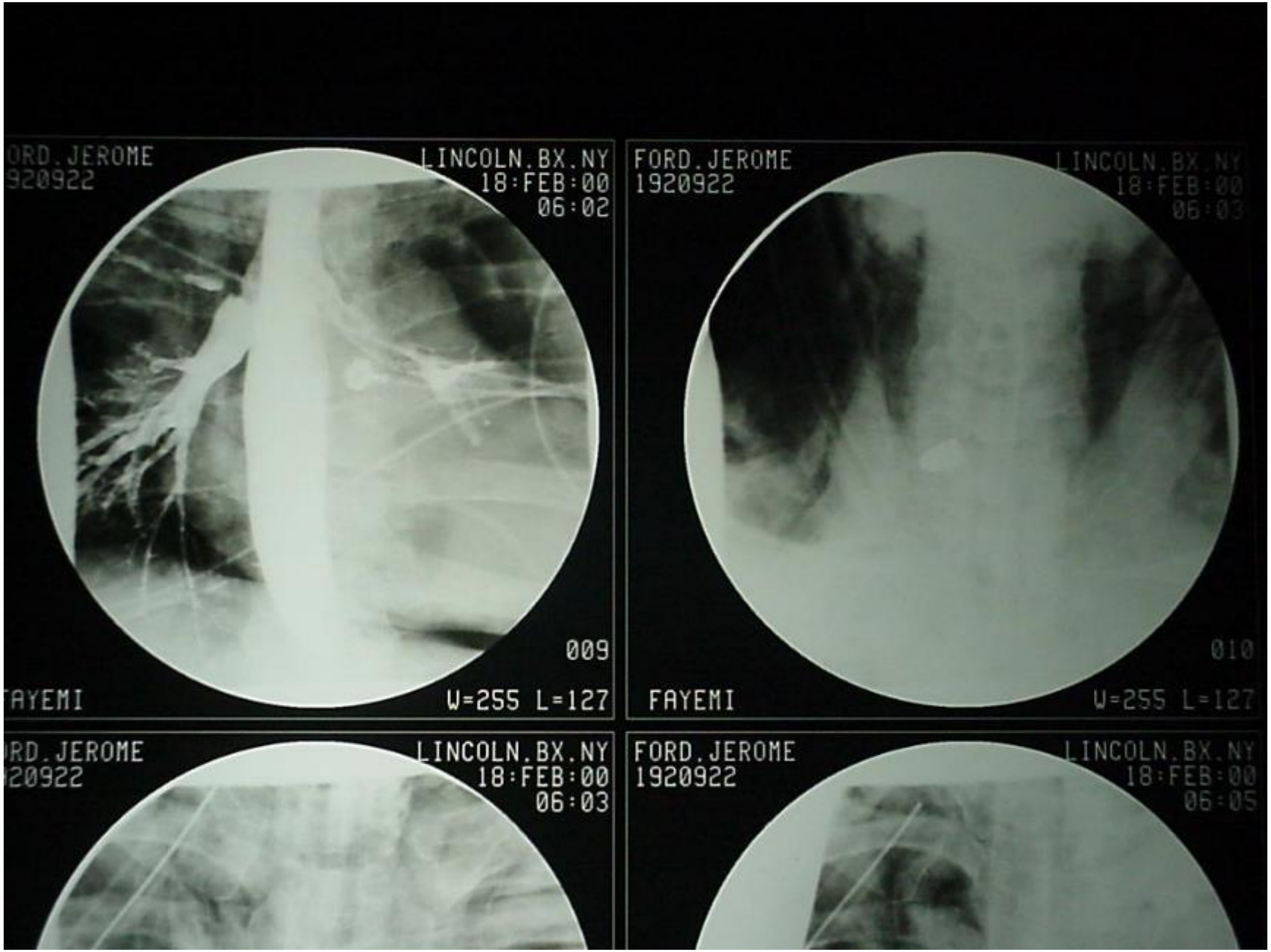




FEMC
Florida Emergency Medicine Clerkship

TRACHEOBRONCHIAL RUPTURE

- Due to tracheal/bronchial major laceration
- Usually diagnosed by a persistent air leak from chest tube
- Treatment
  - 2nd chest tube
  - Selective intubation
  - Bronchoscopy, thoracotomy or surgery

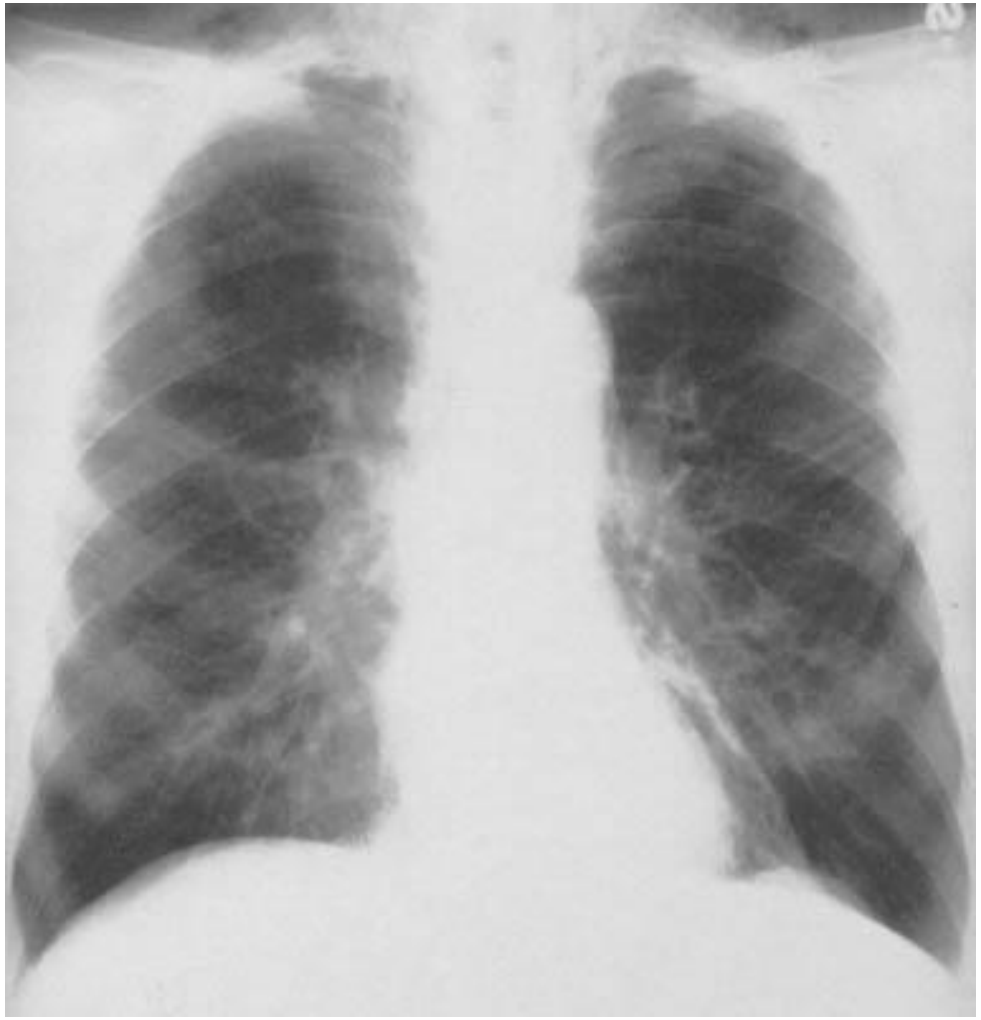


FEMC
Florida Emergency Medicine Clerkship

ESOPHAGEAL RUPTURE

- Usually results from penetrating injury; sometimes blunt
- Signs
  - Dysphagia
  - Chest pain
  - Air under skin/mediastinum
  - Pneumothorax
  - Amylase or cloudy fluid in chest tube

SUBCUTANEOUS EMPHYSEMA



FEMC
Florida Emergency Medicine Clerkship

ESOPHAGEAL RUPTURE

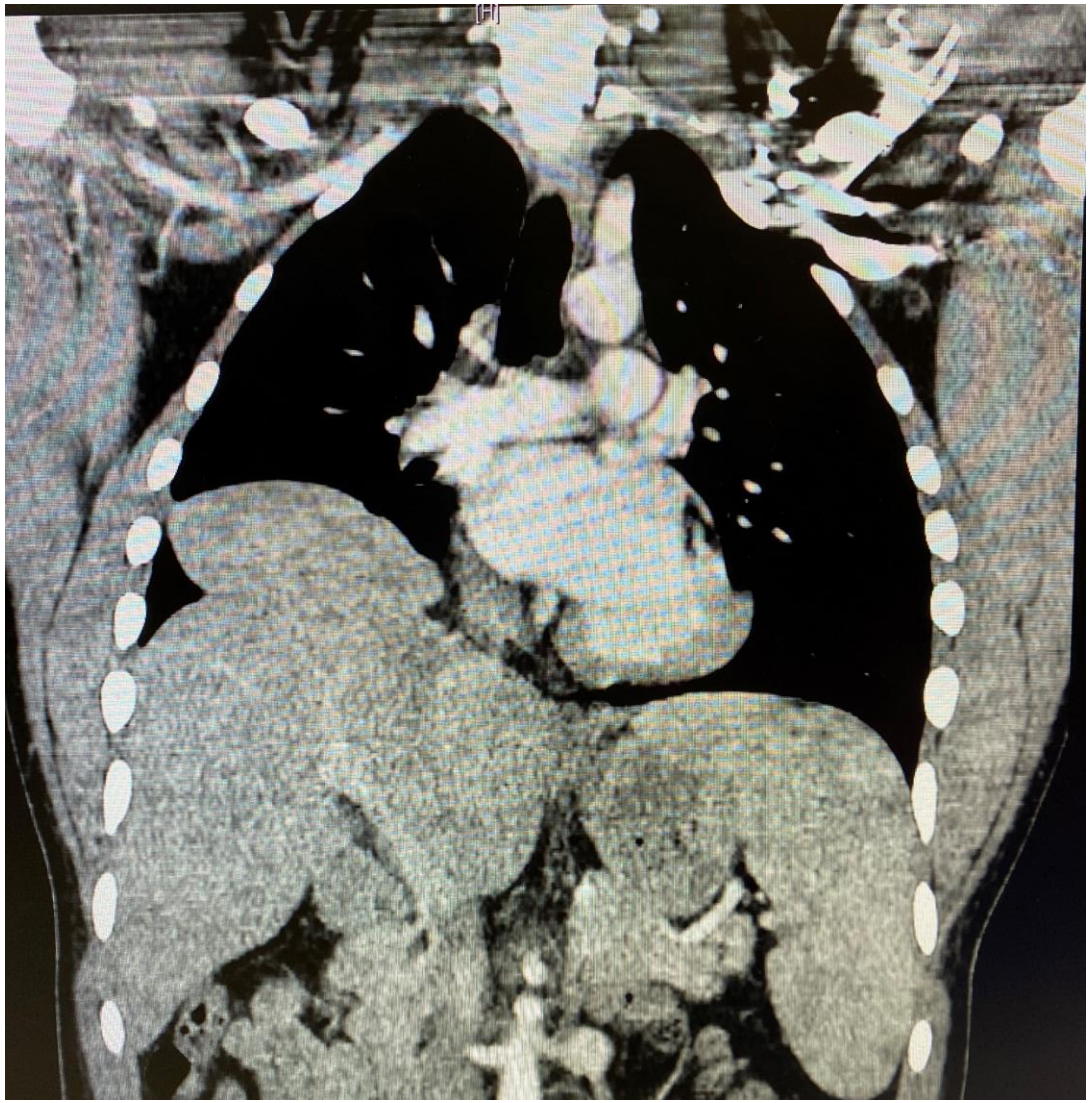
- Suspect:
  - esophagoscopy or esophagogram
- Treatment:
  - Chest tube
  - Broad spectrum antibiotics

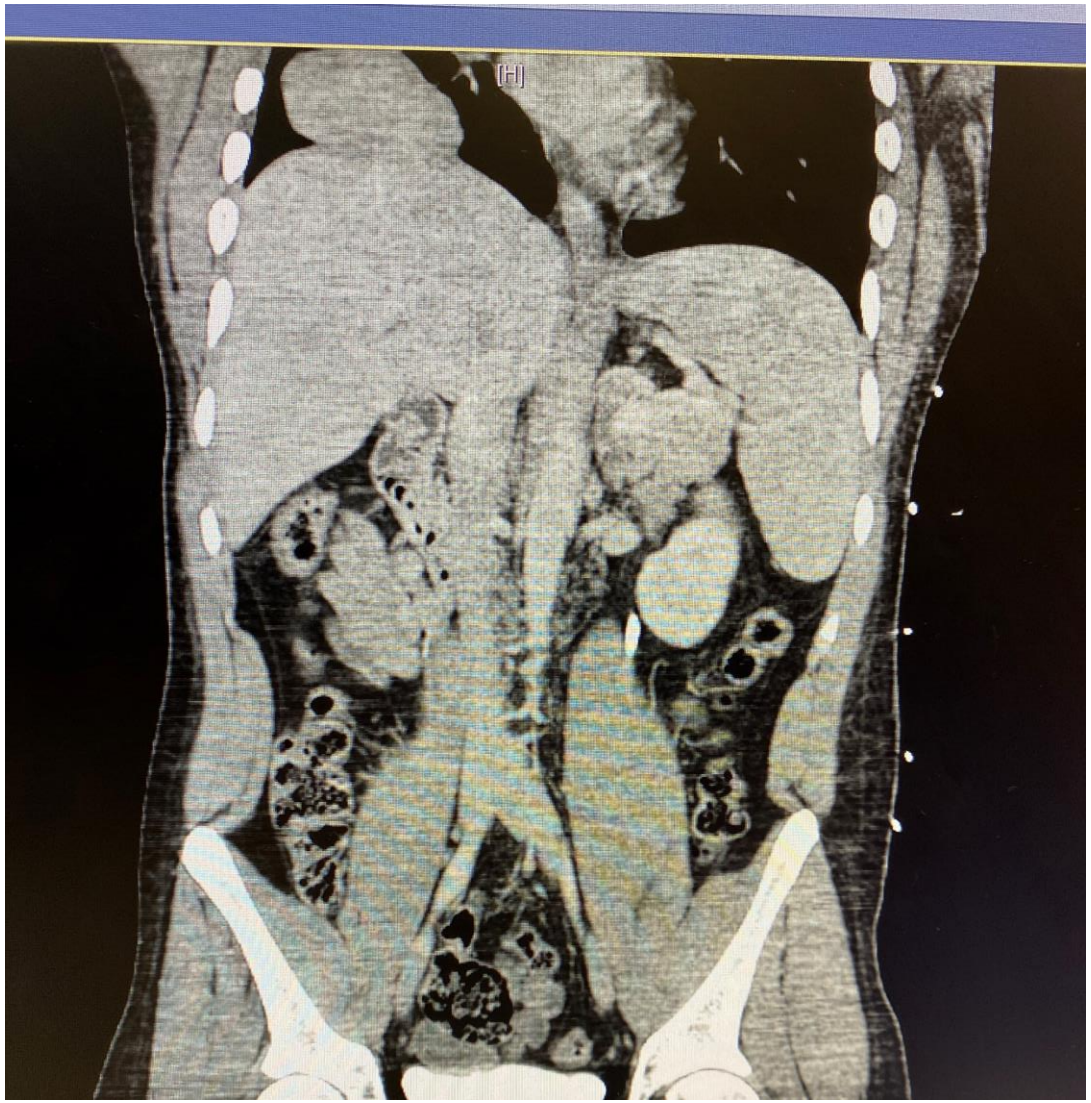
DIAPHRAGMATIC RUPTURE

- Herniation of abdominal content to the chest with possible strangulation
- More often diagnosed on the left side
- Respiratory insufficiency
- Small penetrating injuries often missed

DIAPHRAGMATIC RUPTURE

- Suspect diagnosis if:
  - Elevated hemidiaphragm on chest film
  - Dense infiltrate over diaphragm
- Confirms diagnosis:
  - Intestines/NG tube in thorax
  - Peritoneal fluid draining from chest tube
  - CT





FEMC
Florida Emergency Medicine Clerkship

DIAPHRAGMATIC RUPTURE

- Treatment:
  - Surgery
  - NGT

INTESTINE IN CHEST

FEMC
Florida Emergency Medicine Clerkship

STOMACH IN CHEST

FEMC
Florida Emergency Medicine Clerkship

DIAPHRAGMATIC RUPTURE

FEMC
Florida Emergency Medicine Clerkship

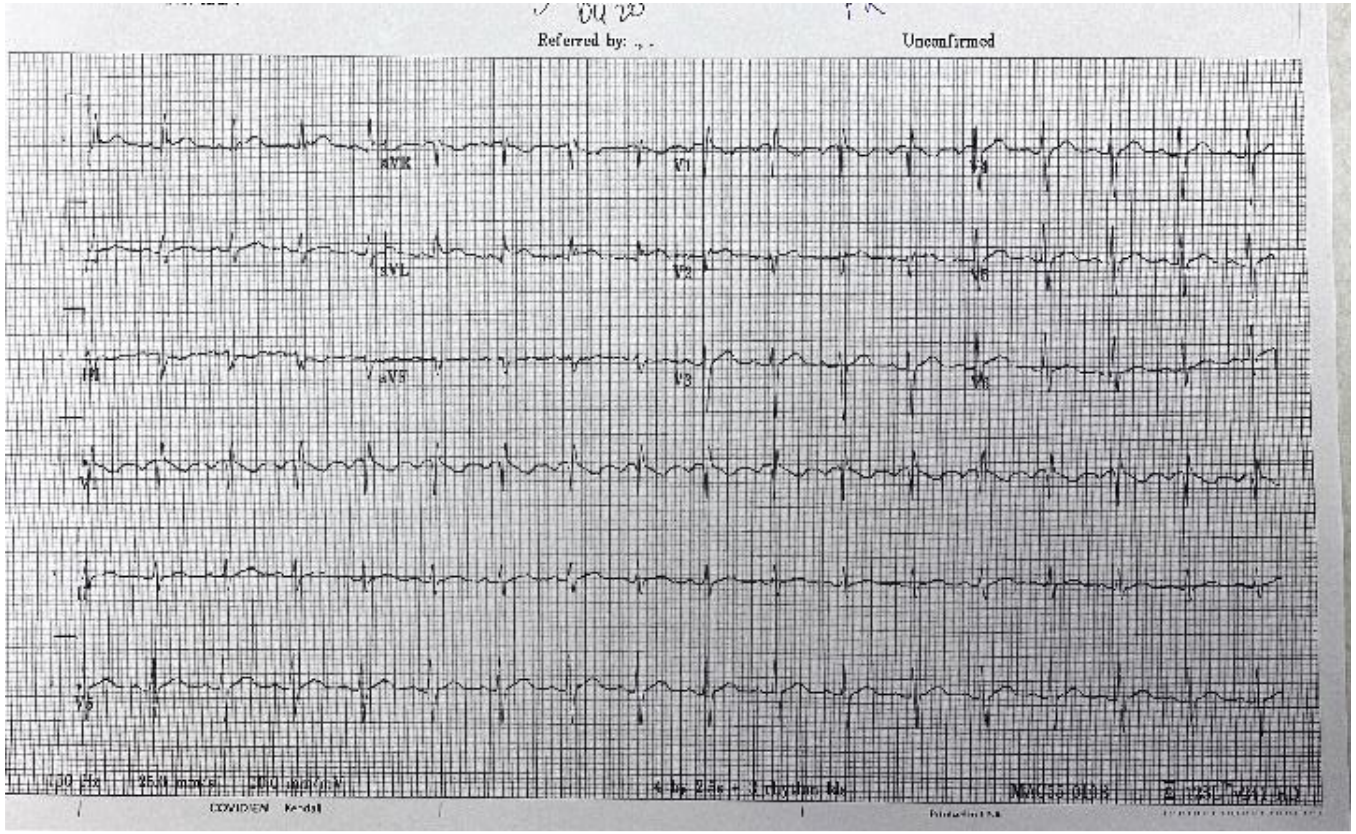
MYOCARDIAL CONTUSION

- True or not
- Not common
- Diagnosis:
  - EKG - CVP's; CAP's; "T" waves inverted; "ST" segments elevated; A Fib or BBB
  - Echocardiogram – abnormal wall movements; pericardial fluid
  - Cardiac enzymes- CPK-MB; CK's; Troponin I

MYOCARDIAL CONTUSION

- Treatment:
  - Cardiac monitor
- Prognosis:
  - Complete resolution if no fatal arrhythmias occur < 24 hours

FEMC
Florida Emergency Medicine Clerkship



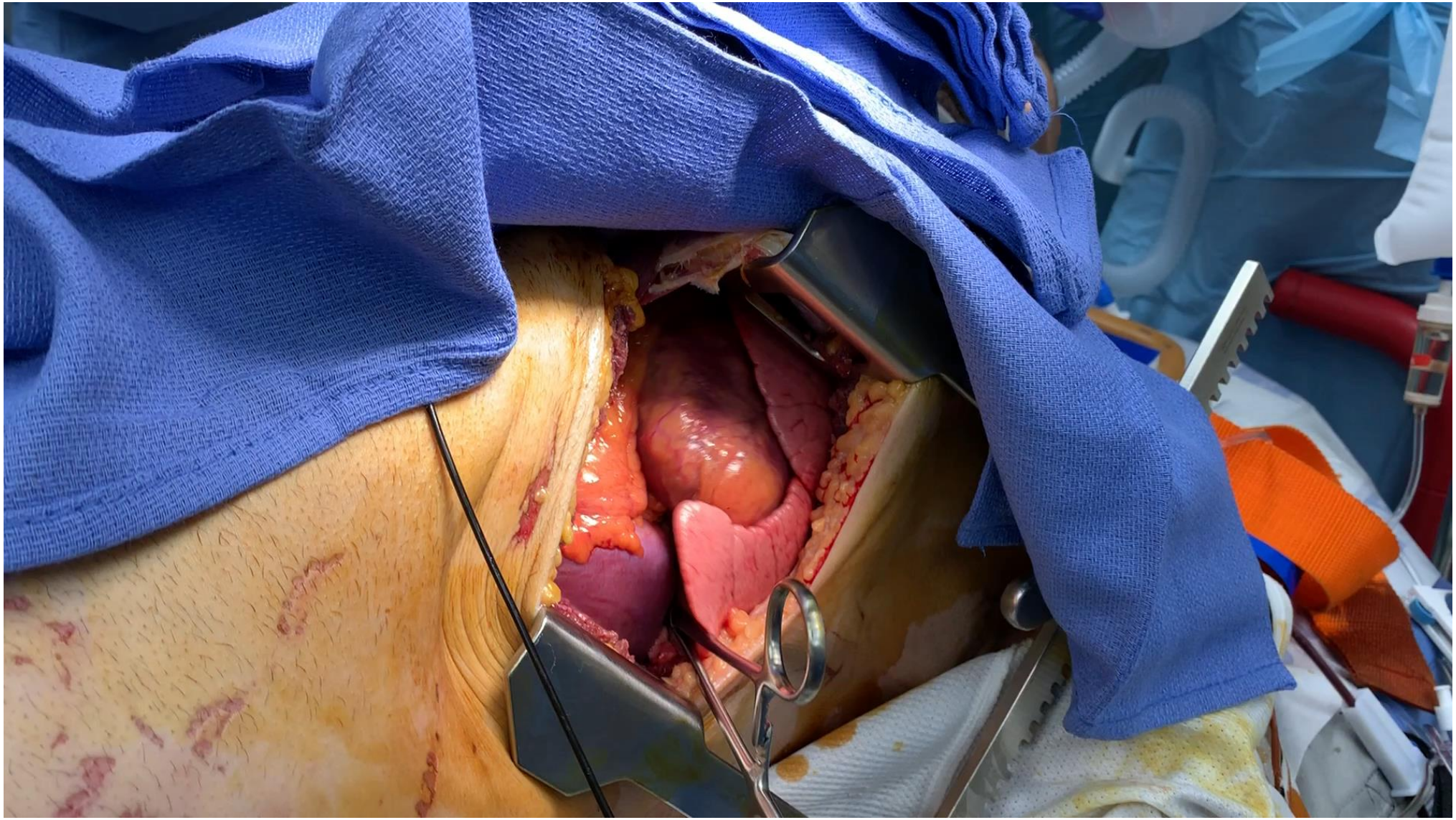
FEMC
Florida Emergency Medicine Clerkship

INDICATIONS FOR ED THORACOTOMY

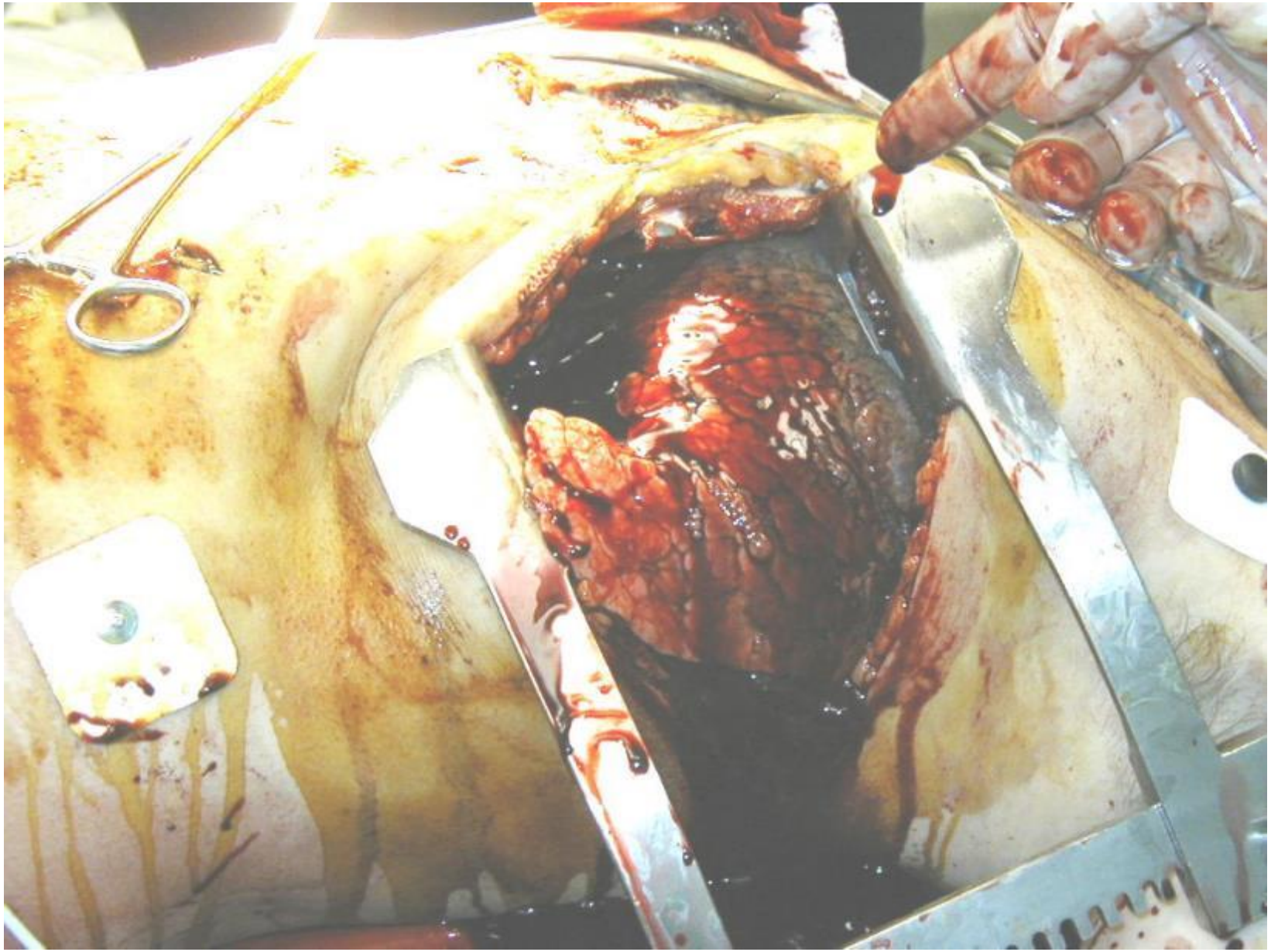
- Penetrating trauma to trunk with some sign of life in the field
- Impending cardiovascular collapse as a result of trauma to trunk
- Suspicion cardiac tamponade
- More than 1500 mL of blood in chest or more than 200 mL/hour for > 2 hours in selected patients??

ED-THORACOTOMY

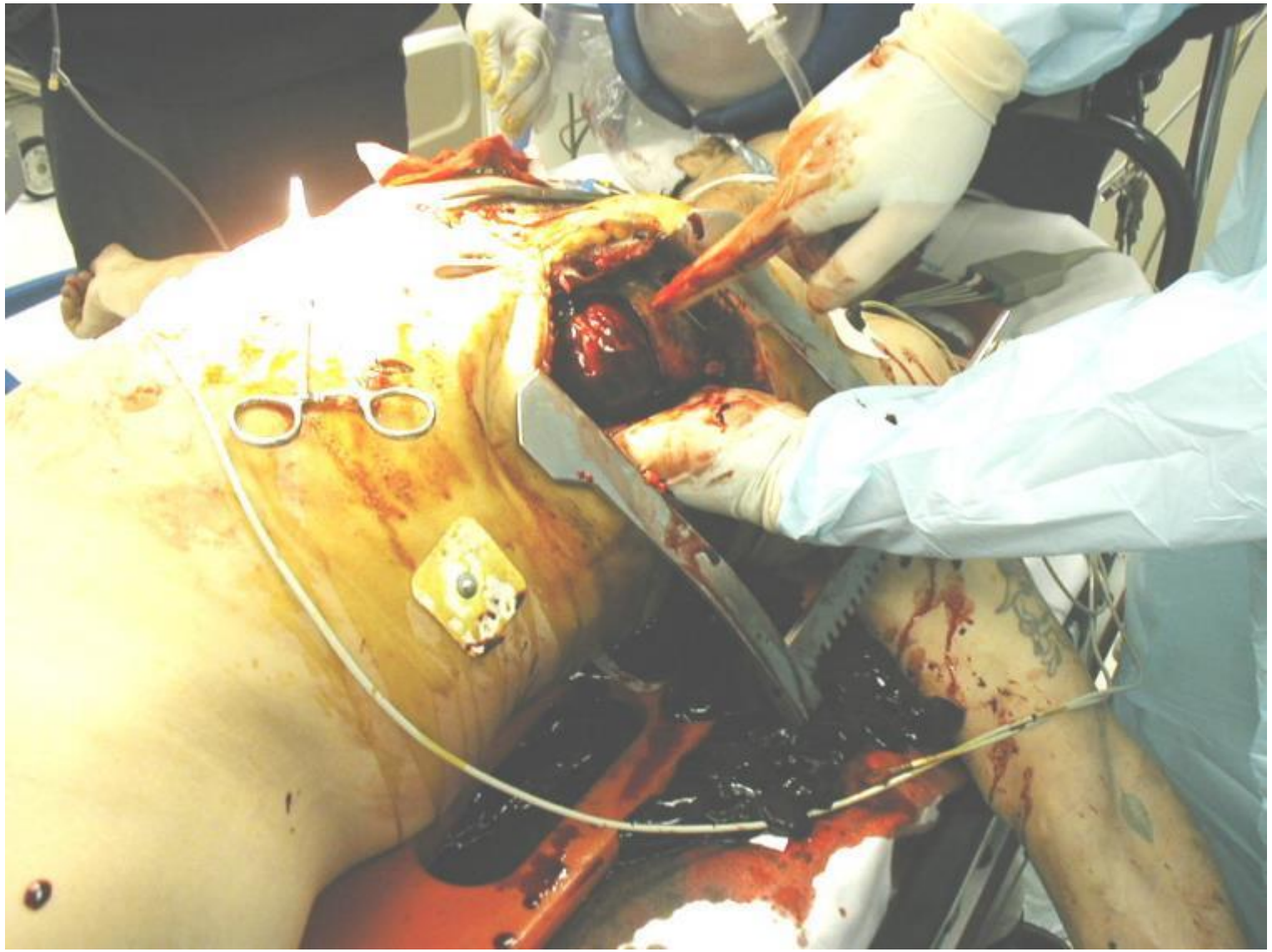
FEMC
Florida Emergency Medicine Clerkship



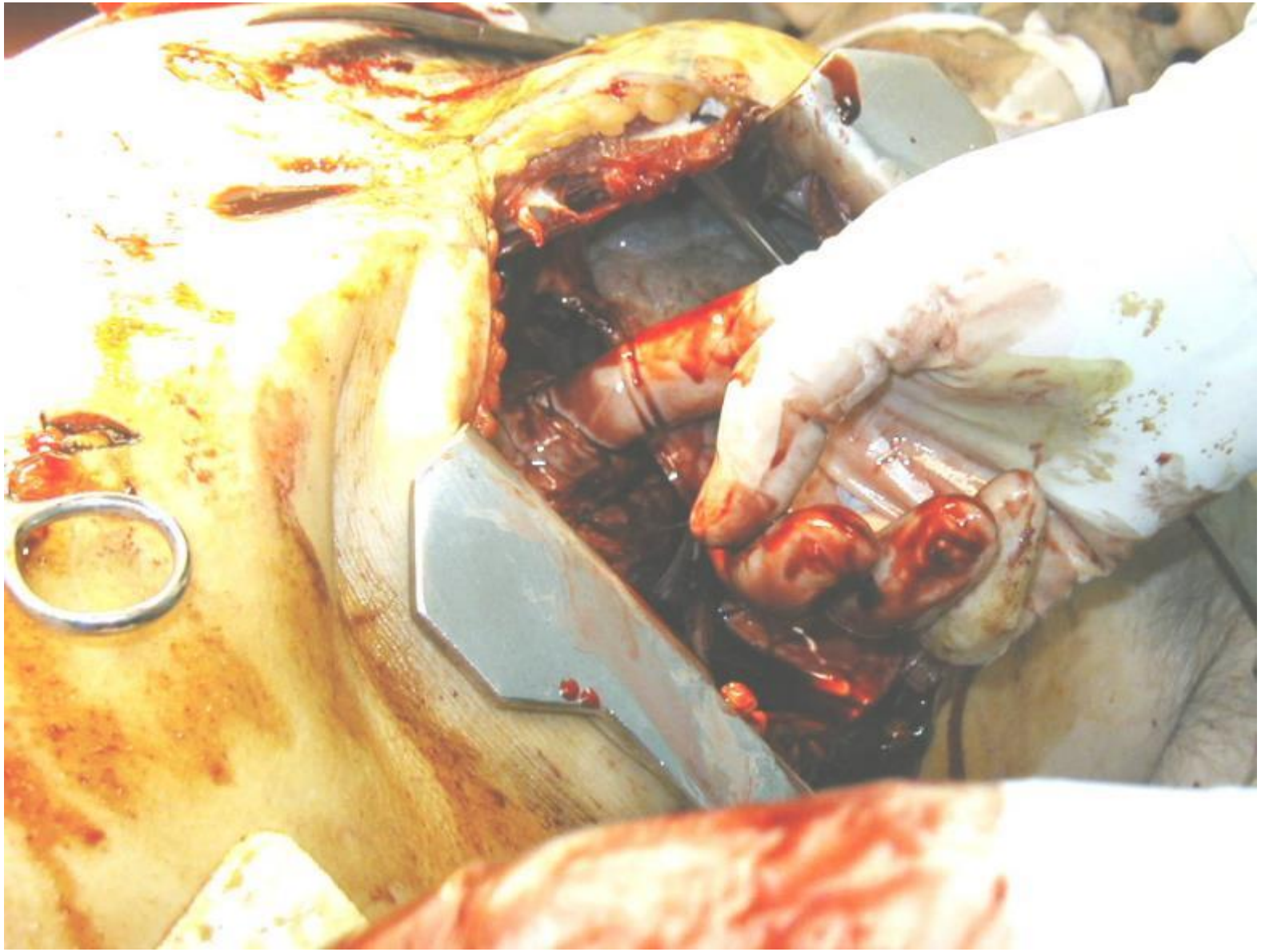
FEMC
Florida Emergency Medicine Clerkship



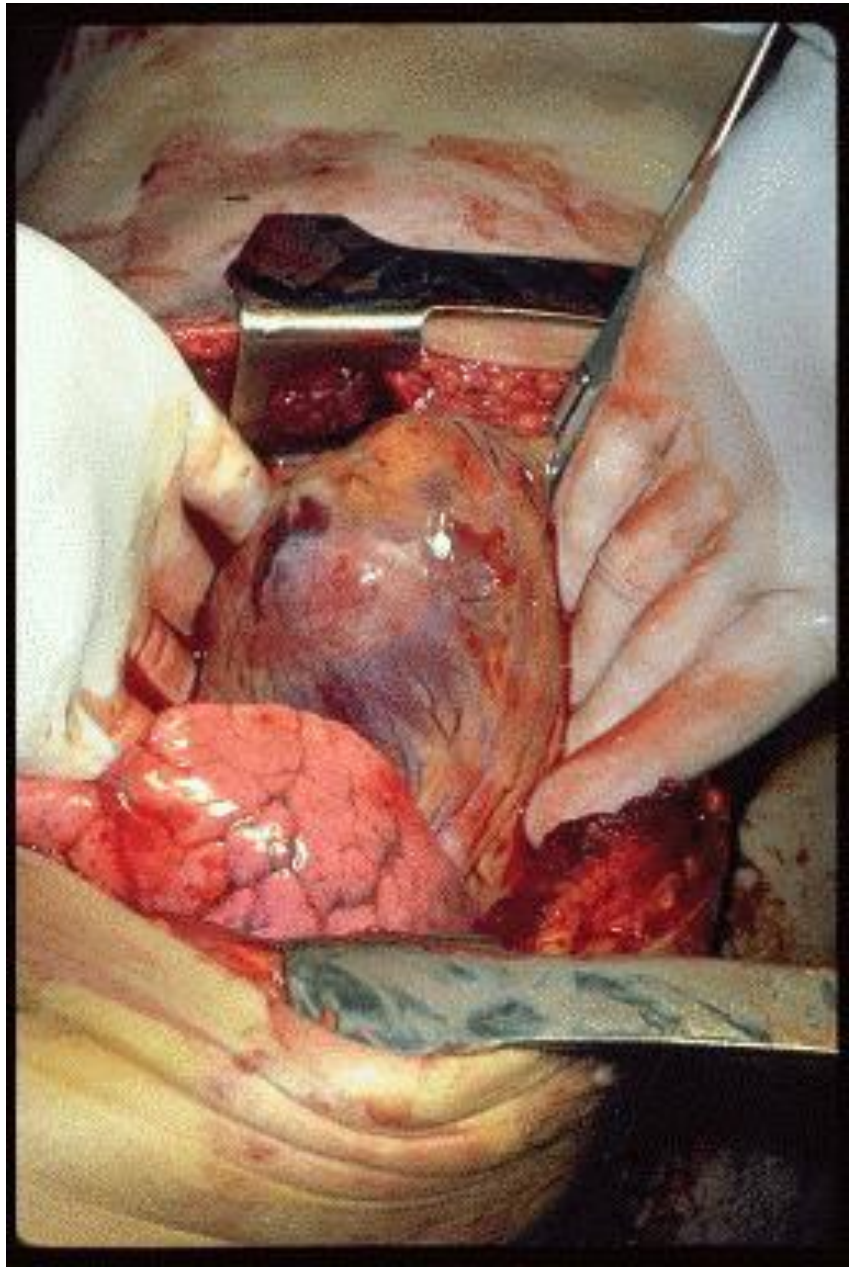
FEMC
Florida Emergency Medicine Clerkship



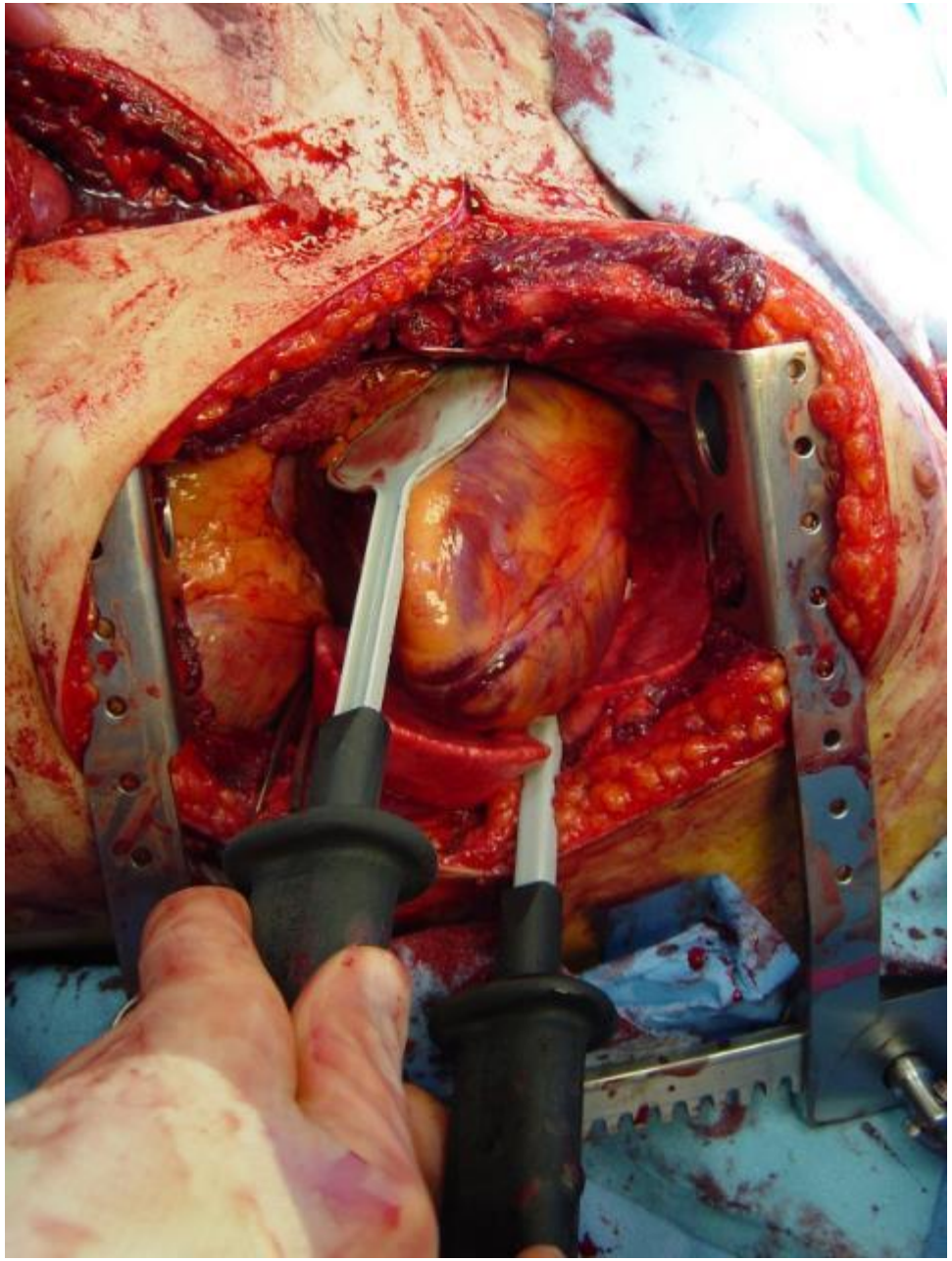
FEMC
Florida Emergency Medicine Clerkship

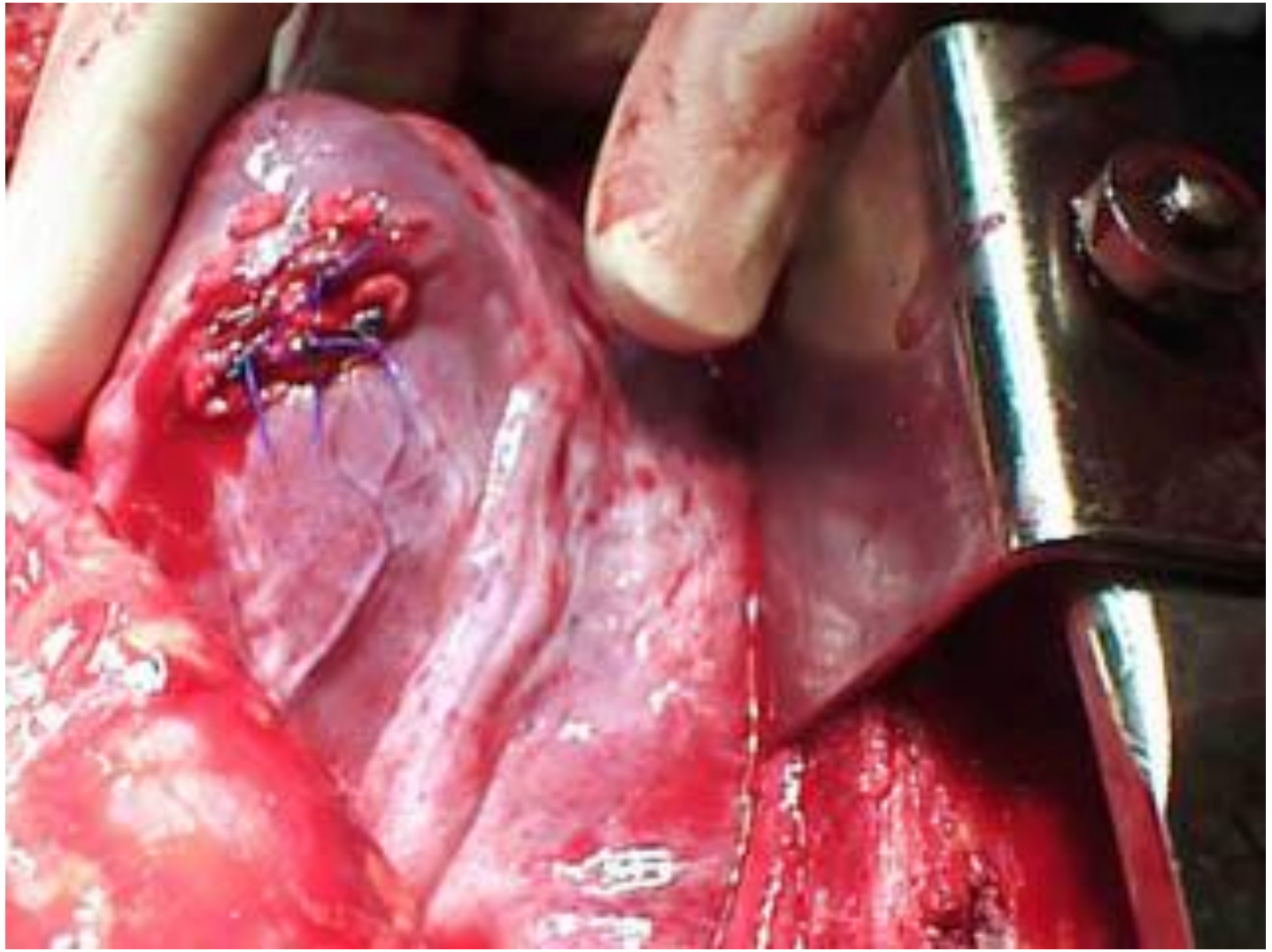


FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship





INDICATIONS FOR THORACOTOMY IN THE OR

- >1500 mL/hr of bleeding when inserting chest tube
- Continues bleeding of > 200 mL/hr thru the chest tube
- Air leak despite of two chest tube
- Suspected cardiac tamponade

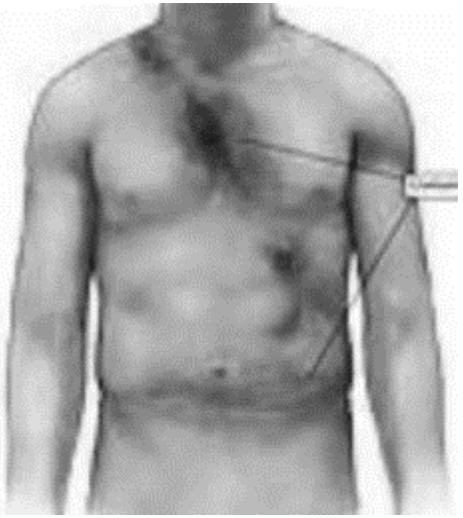
CHEST TUBE PLACEMENT

- Always indicated
  - Tension pneumothorax
  - Massive hemothorax
  - Suspected tracheobronchial laceration
  - Esophageal rupture
  - Intubated patients with chest trauma in those being air transport
  - OR for other reasons
- Not always indicated
  - Small pneumo/hemothorax
  - "Flail chest"

DPL IN CHEST TRAUMA

- Indicated for:
  - Penetrating trauma below 4th intercostal space
  - Suspected diaphragmatic rupture
- RBC 5,000 - 10,000 in penetrating and >100,000 in blunt trauma require exploratory laparotomy

ABDOMINAL AND PELVIC TRAUMA



- 35-year-old male passenger in high-speed motor vehicle collision
- BP: 105/80; Pulse: 110; RR: 18
- GCS score: 15
- Complaining of pain in chest, abdomen, and pelvis

ABDOMINAL TRAUMA:
INCIDENCE AND MORTALITY

- Incidence
  - MVA's: 7-20%
  - Falls: 5-15%
- Mortality
  - Major trauma: 4-30%
  - GSW: 5-15%
  - Stab wounds: 1-2%

FEMC
Florida Emergency Medicine Clerkship

ABDOMINAL TRAUMA:
DIAGNOSIS AND TREATMENT PRIORITY

- Recognize shock or intra-abdominal bleeding
- Start resuscitative measurements
- Determine if the abdomen is the source of the shock
- Determine if OR is needed

FEMC
Florida Emergency Medicine Clerkship

ABDOMINAL TRAUMA:
DIAGNOSIS AND TREATMENT PRIORITY

- Complete secondary survey; review all the diagnostics studies
- Re-evaluate

ABDOMINAL AND PELVIC TRAUMA

- The signs of bladder injury have historically included blood at the urethral meatus, perineal ecchymosis, and a high-riding prostate on physical examination. Today, the high-riding prostate indicator is considered unreliable and not useful in determining which patients should undergo further investigation.
- Given the successful use of preperitoneal pelvic packing to control pelvic hemorrhage from pelvic fractures, this section was updated to include this option.

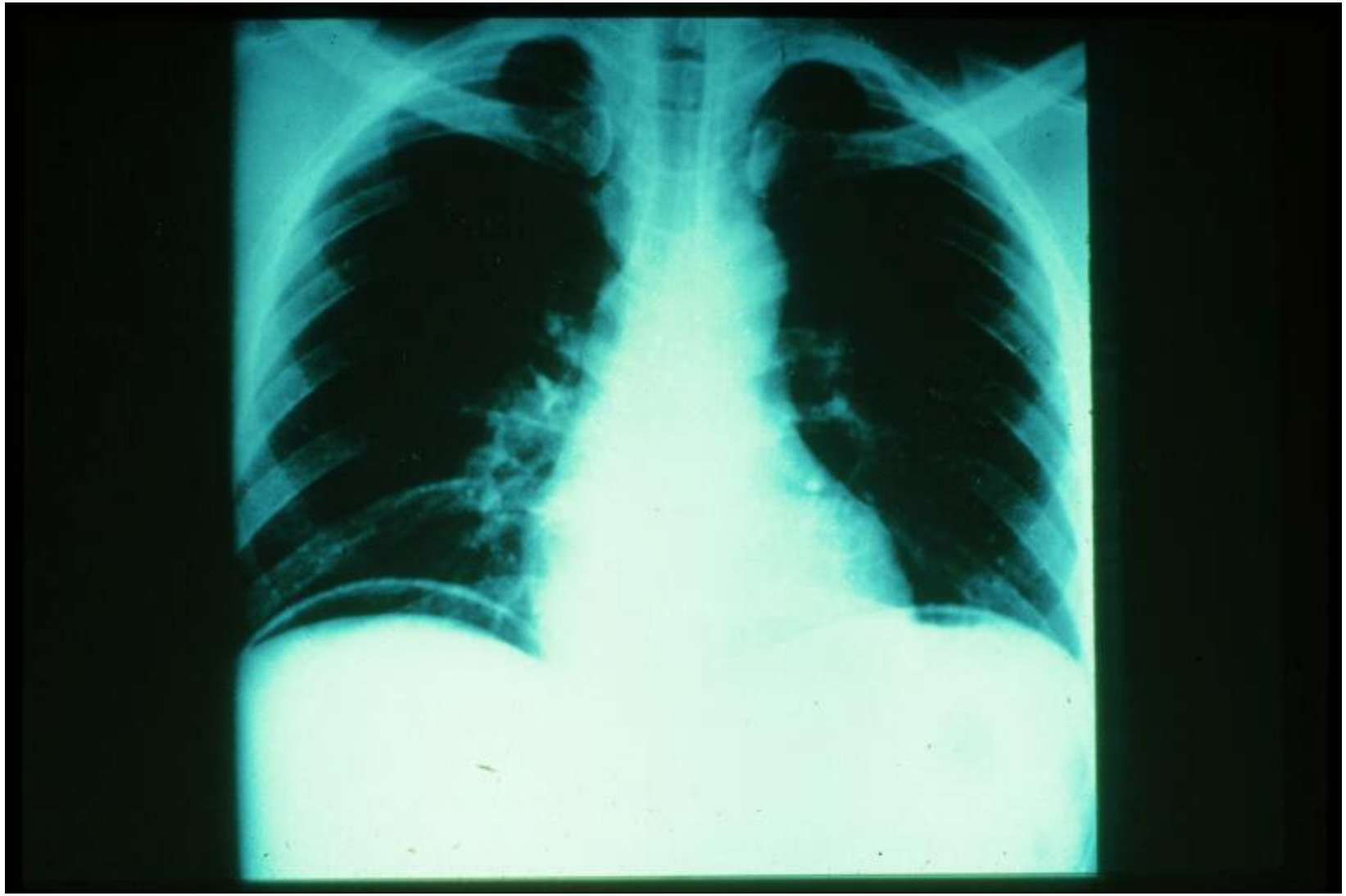
ABDOMINAL TRAUMA: PHYSICAL EXAM

- Inspection
- Auscultation
- Percussion
- Palpation
- Genital exam
- Rectal exam

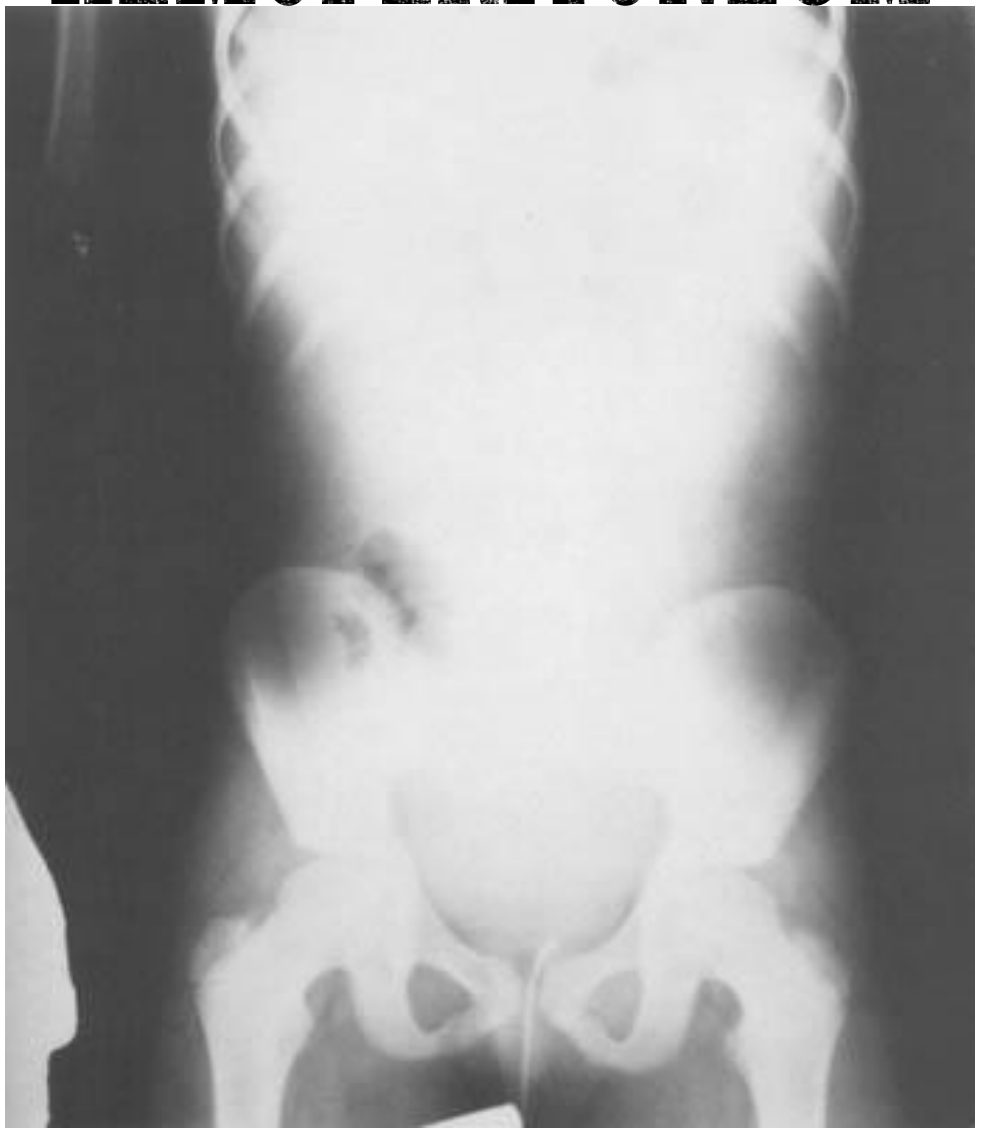
FEMC
Florida Emergency Medicine Clerkship

ABDOMINAL TRAUMA

- EKG
- Laboratories
- Radiography



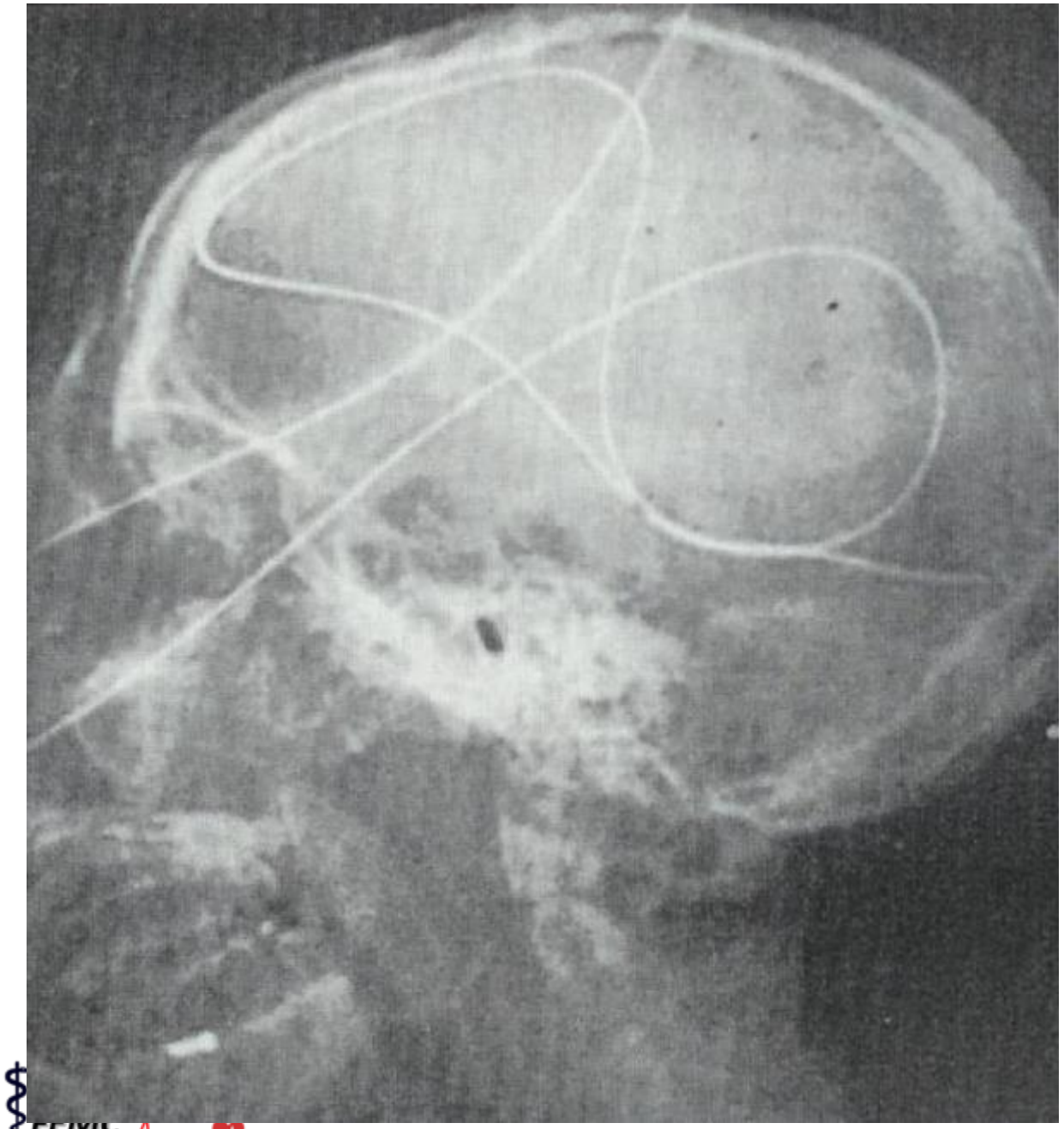
HEMOPERITONEUM

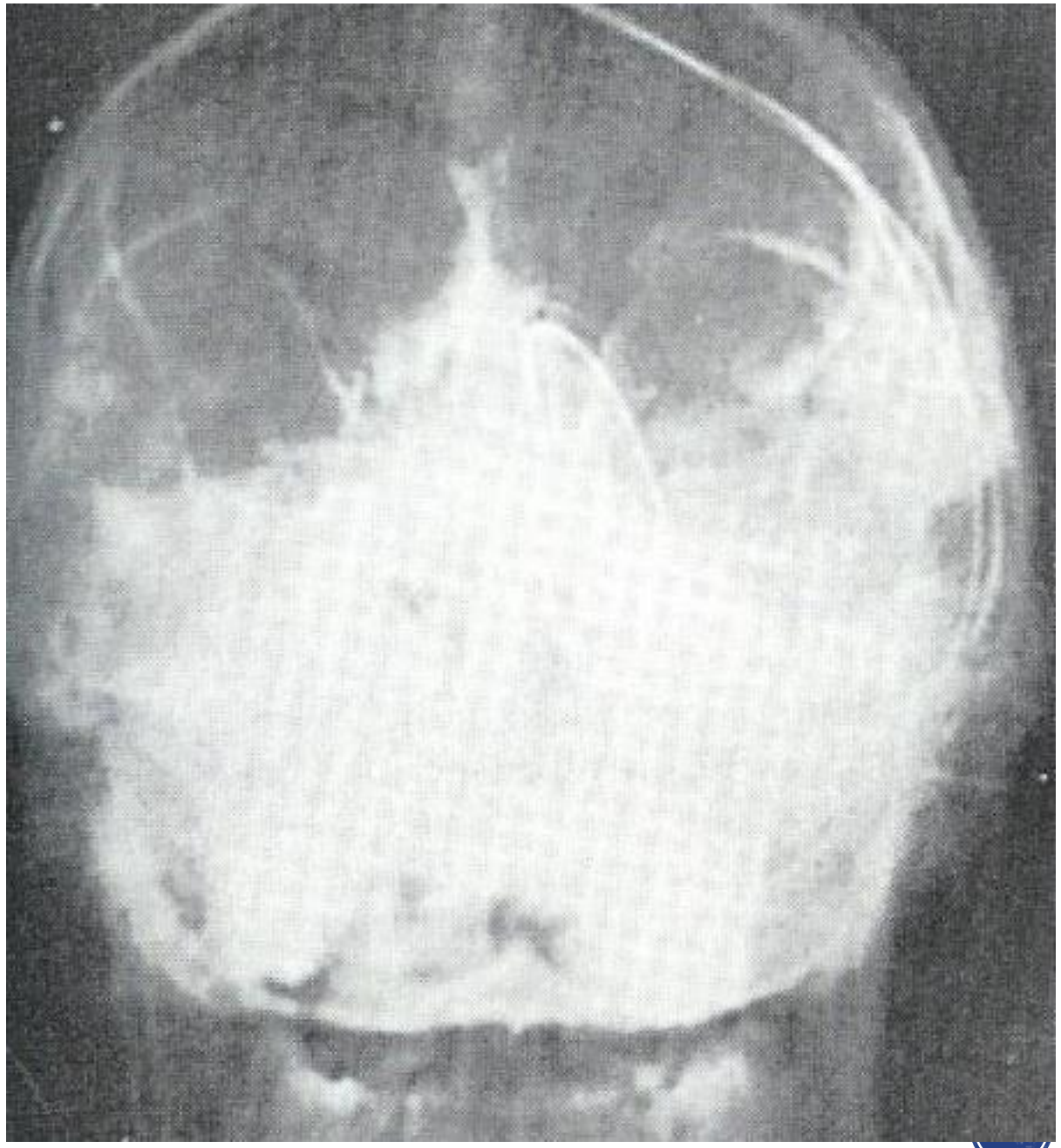


FEMC
Florida Emergency Medicine Clerkship

ABDOMINAL TRAUMA:
NGT

- Decompress stomach
- Decrease risk for aspiration
- Reveal UGI bleed
- Required prior to DPL
- Remove toxins
- Contraindicated in cribiform plate fracture, nasal fracture, or facial bleeding (use OGT)





ABDOMINAL TRAUMA: FOLEY CATHETER

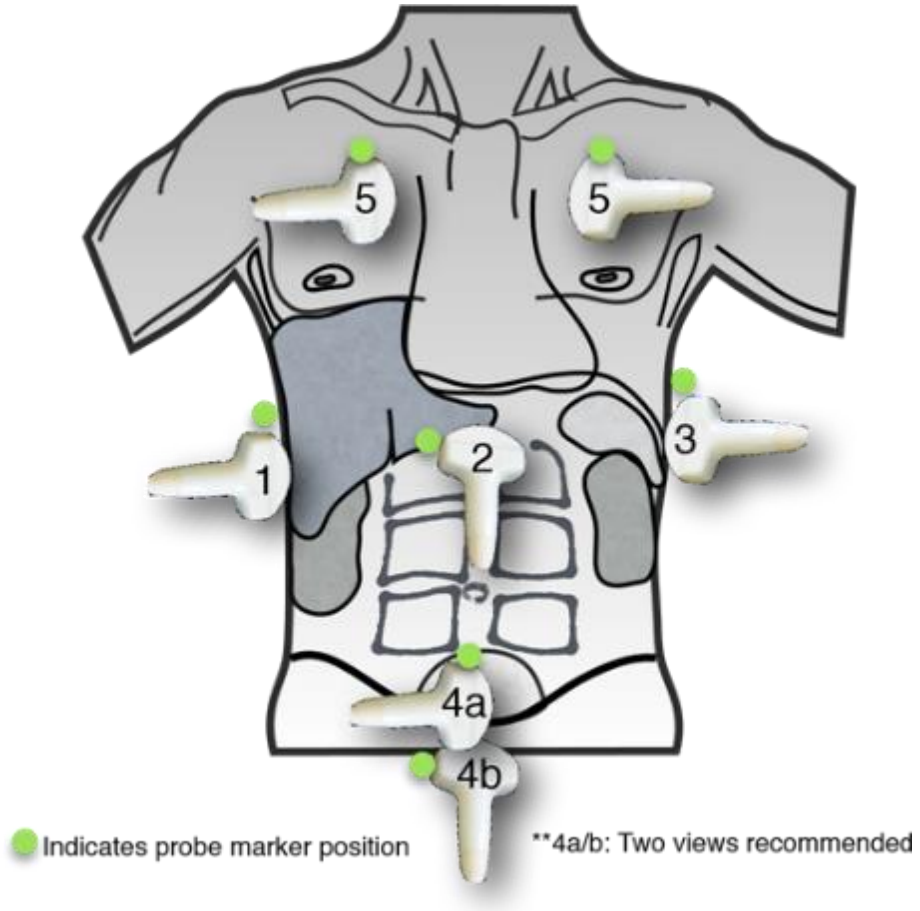
- Check prostate and urethral meatus prior to insertion
- Insert prior DPL

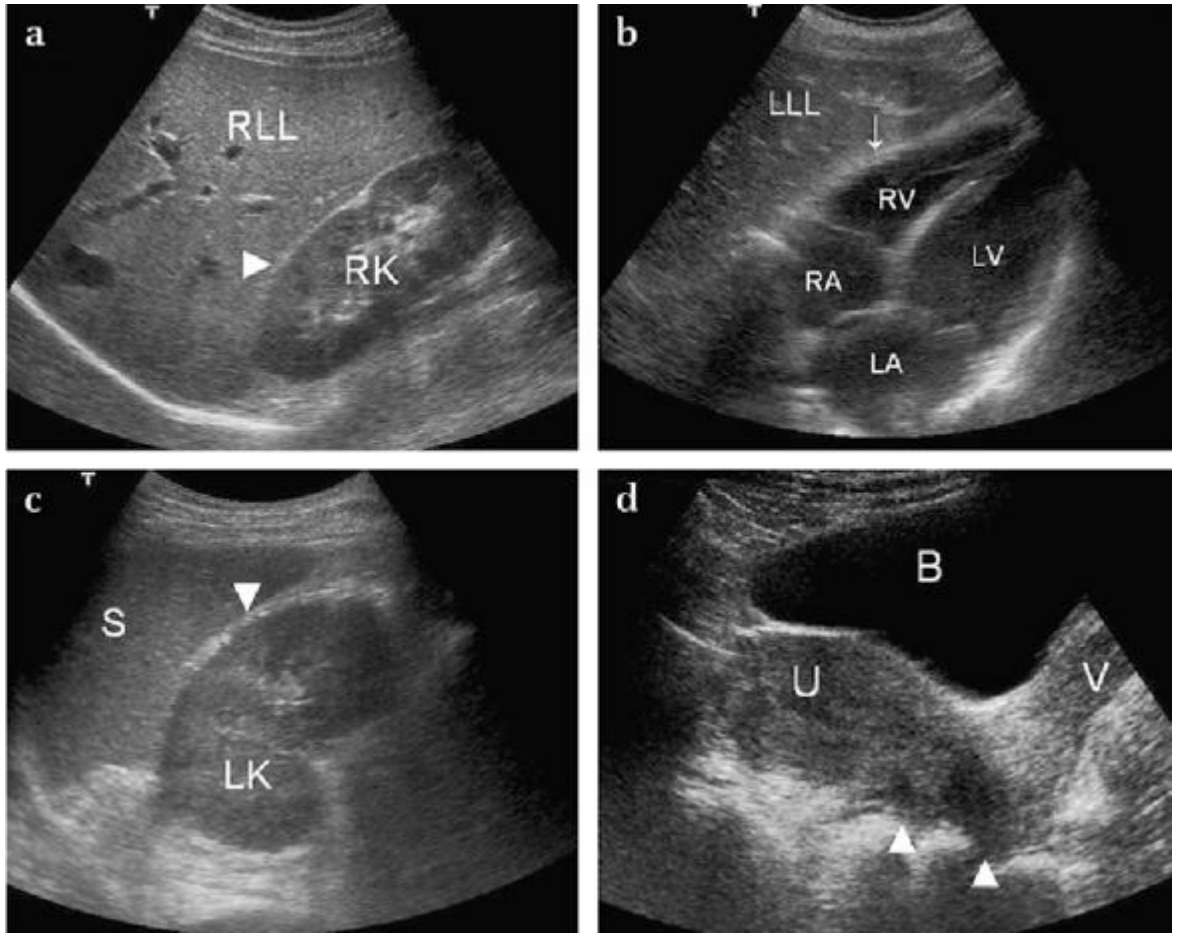
FEMC
Florida Emergency Medicine Clerkship

SONOGRAPHY / ULTRASOUND

- No invasive
- Fast
- Painless

E-FAST: EXTENDED FOCUSED ASSESSMENT SONOGRAPHY IN TRAUMA

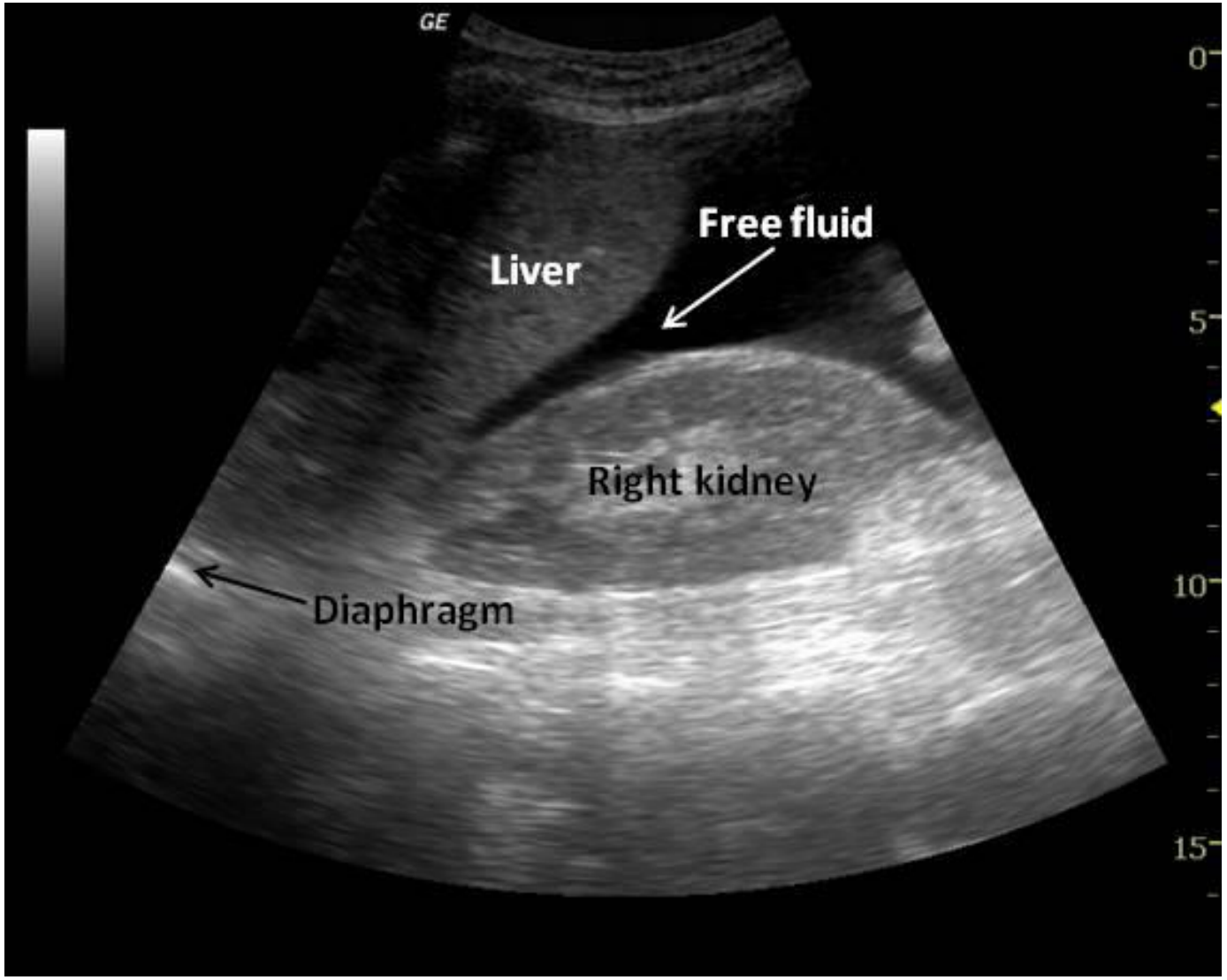




FEMC
Florida Emergency Medicine Clerkship

PERICARDIAL FLUID

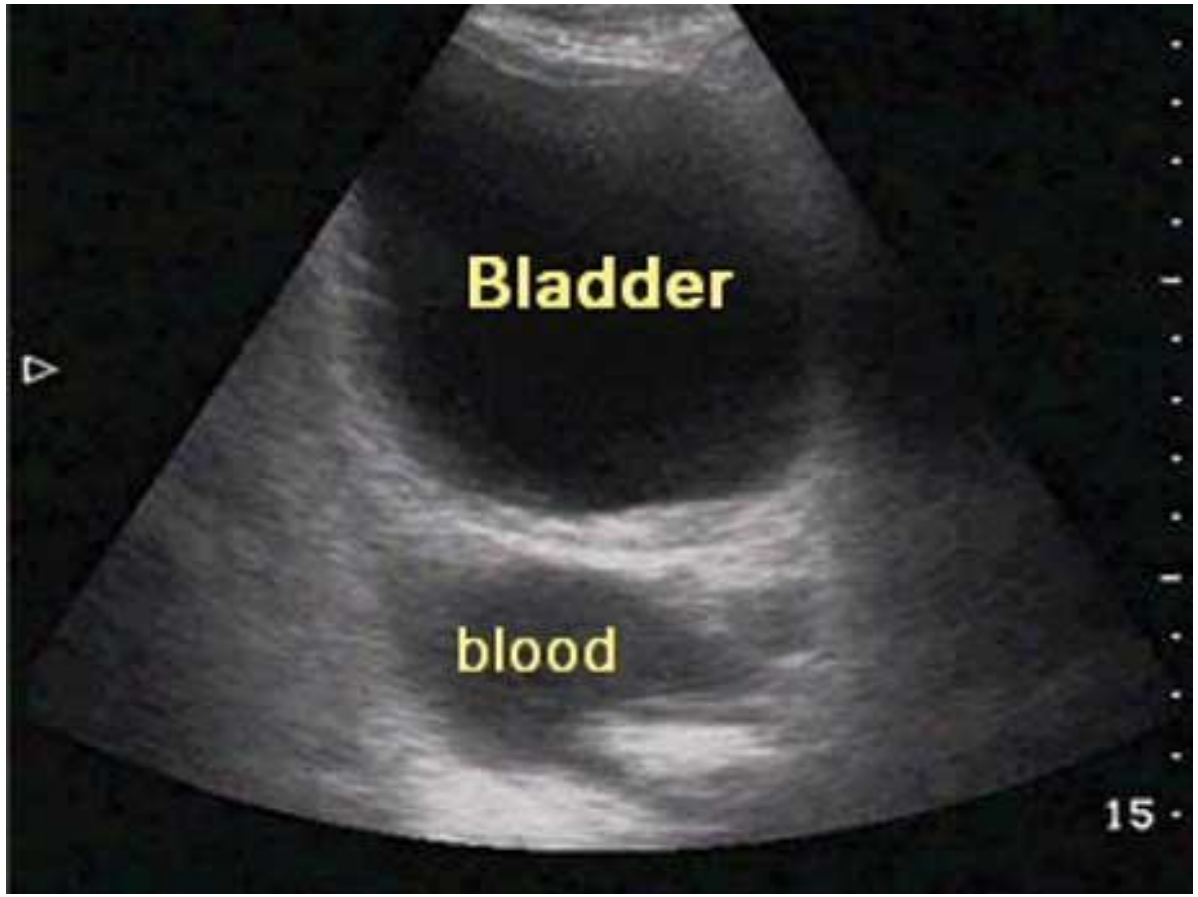
FEMC
Florida Emergency Medicine Clerkship



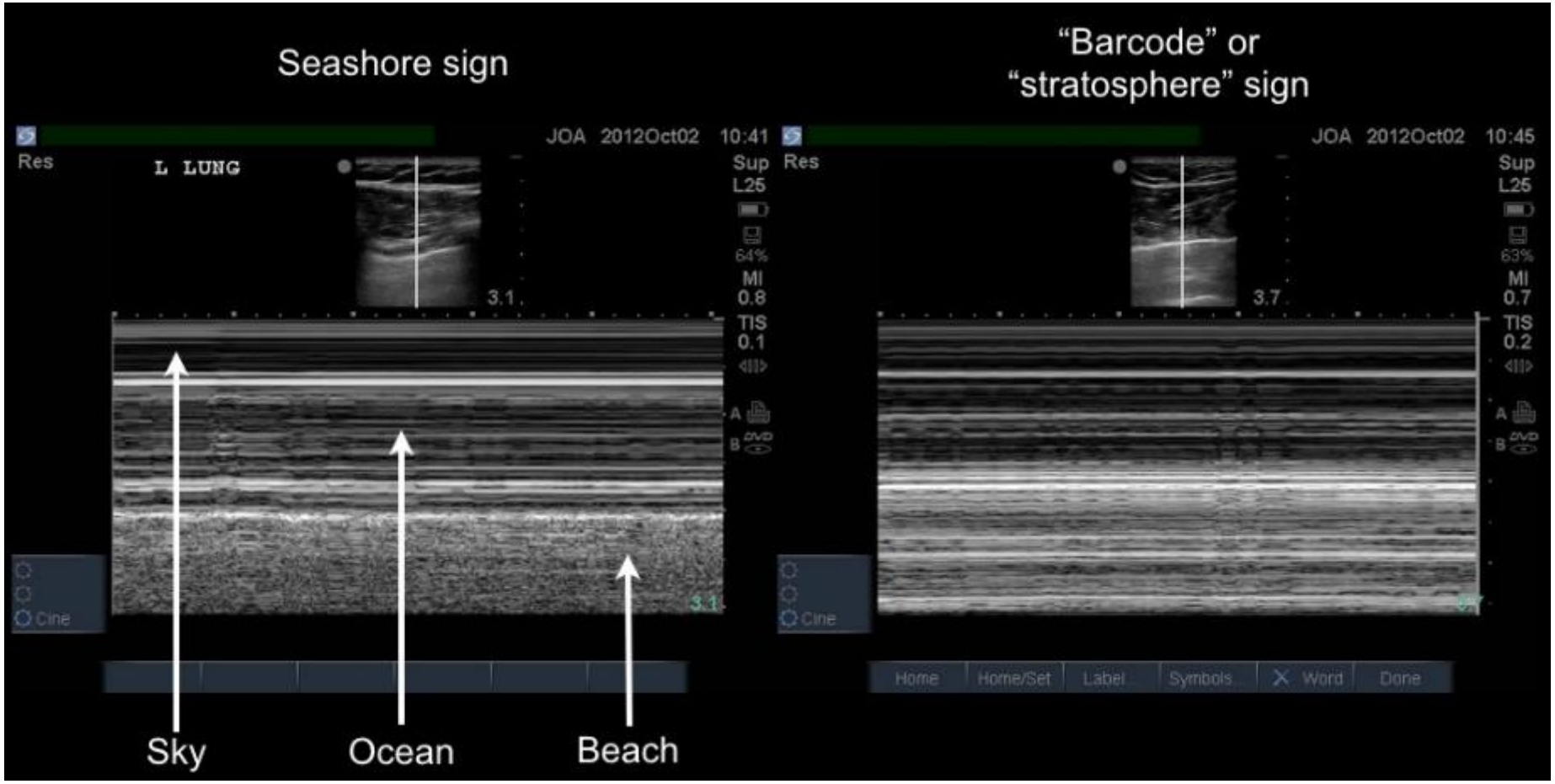
FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

DOUGLAS POUCH



FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

INDICATIONS FOR EMERGENT LAPARATOMY

- Hypotension / "shock"
- Penetrating peritoneal / retroperitoneal injury
- Positive DPL
- Unstable
- Fast abdominal distention

INDICATIONS FOR URGENT LAPARATOMY

- GSW
- Evisceration
- Penetrating FB
- Signs of peritoneal irritation
- GI/GU bleeding

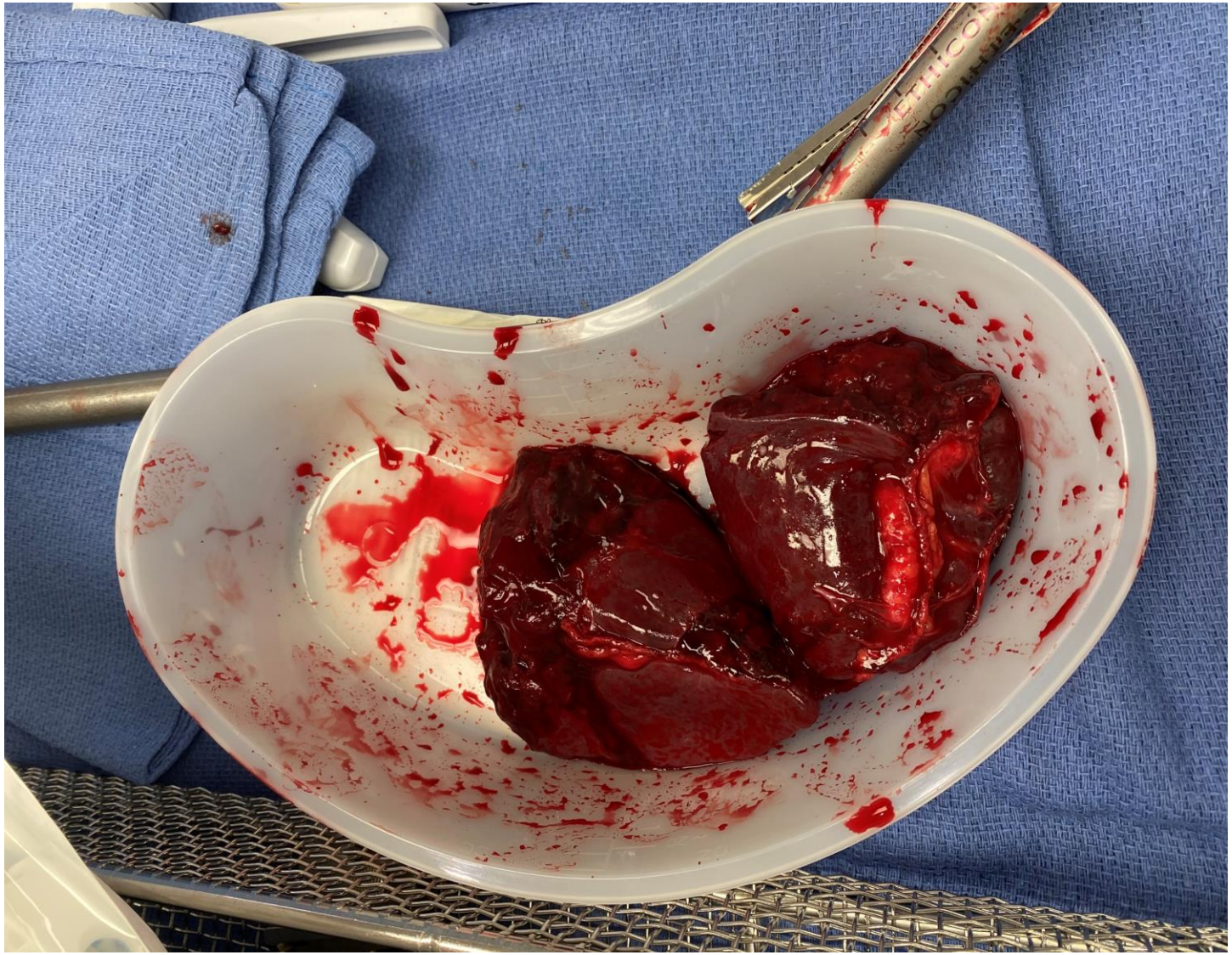
INDICATIONS FOR LAPARATOMY

- Due to secondary survey
  - X-rays
    - Free air, intraperitoneal or retroperitoneal
    - SBO
    - signs of diaphragmatic rupture
  - Elevated amylase
  - CT
  - Extravasation of contrast from GI/GU study
  - Angiography with intra-abdominal vascular injury

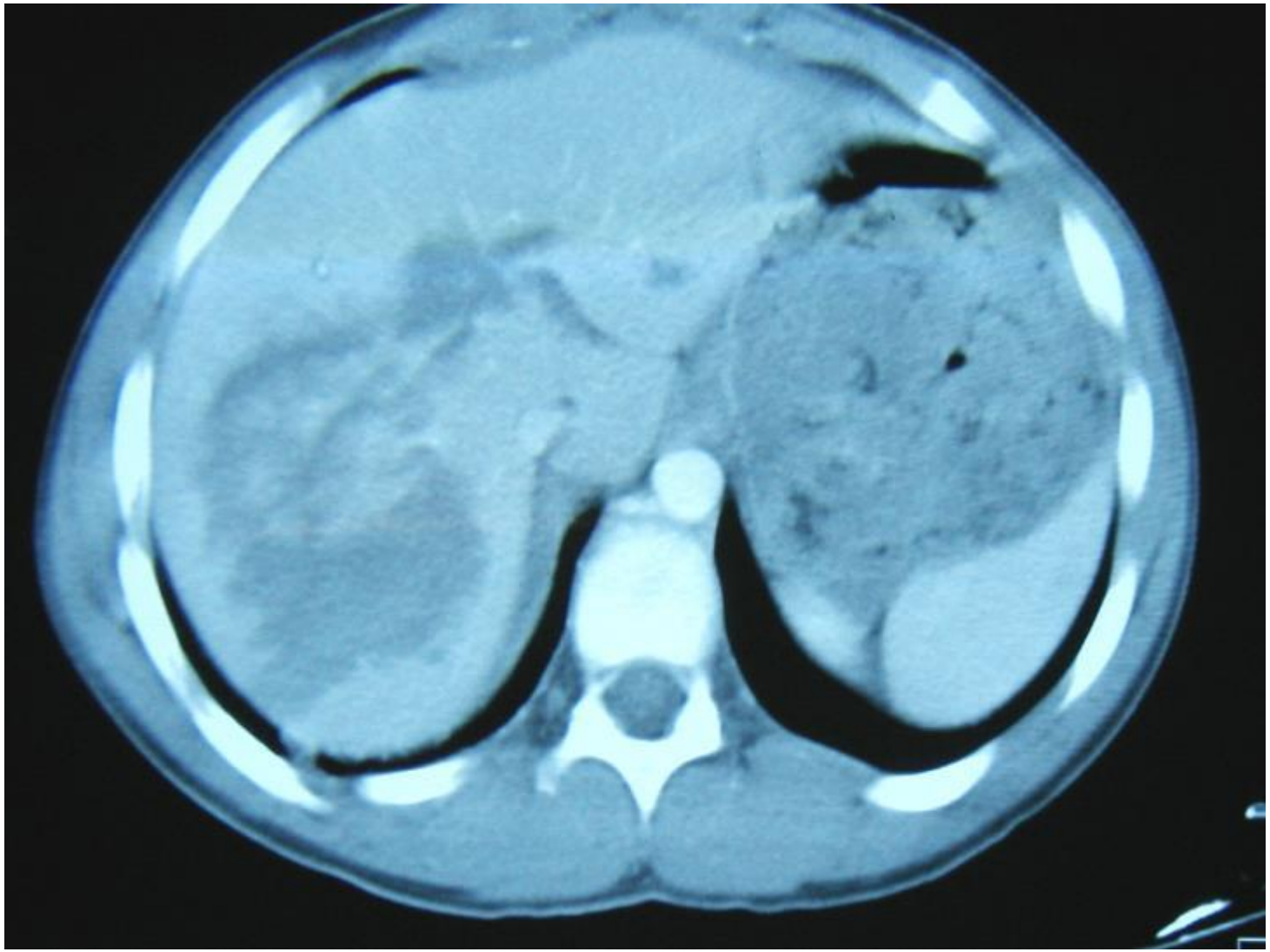
NON-SURGICAL ABDOMINAL TRAUMA

- Some of the liver or spleenic lacerations
  - Stable BP
  - <50 y/o
  - Monitoring setting
  - Available blood transfusion
  - Serial exams and CBC's

FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

BOWEL TRAUMA

- Handlebar injury → duodenum
- Seatbelt injury → small bowel

FINAL CONSIDERATIONS

- Antibiotics
  - Penetrating injury
  - Suspected viscous injury
  - Emergent surgery
- Td
- Analgesia

PELVIC TRAUMA

- Falls, MVA, blunt trauma
- Mortality of 6-19%
- If hypotension, mortality increased to 40-50%
- 60% due to MVA
- 30% due to falls
- 65% of the death due to hemorrhage

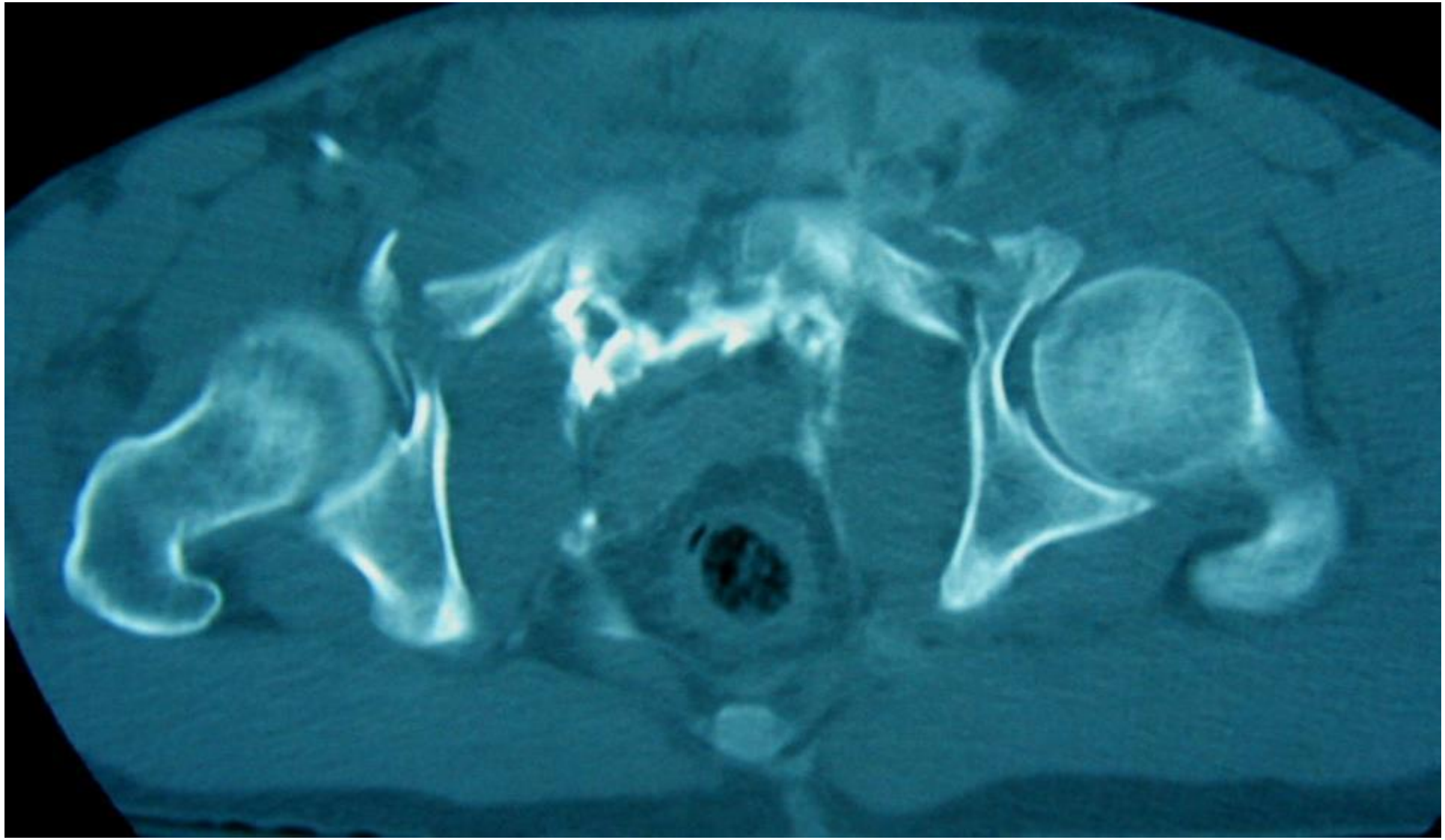
POSSIBLE ASSOCIATED INJURIES

- Massive hemorrhage
- Boney destruction
- Vascular injuries
- Urologic injuries
- Neurologic injuries
- GI or vaginal perforation

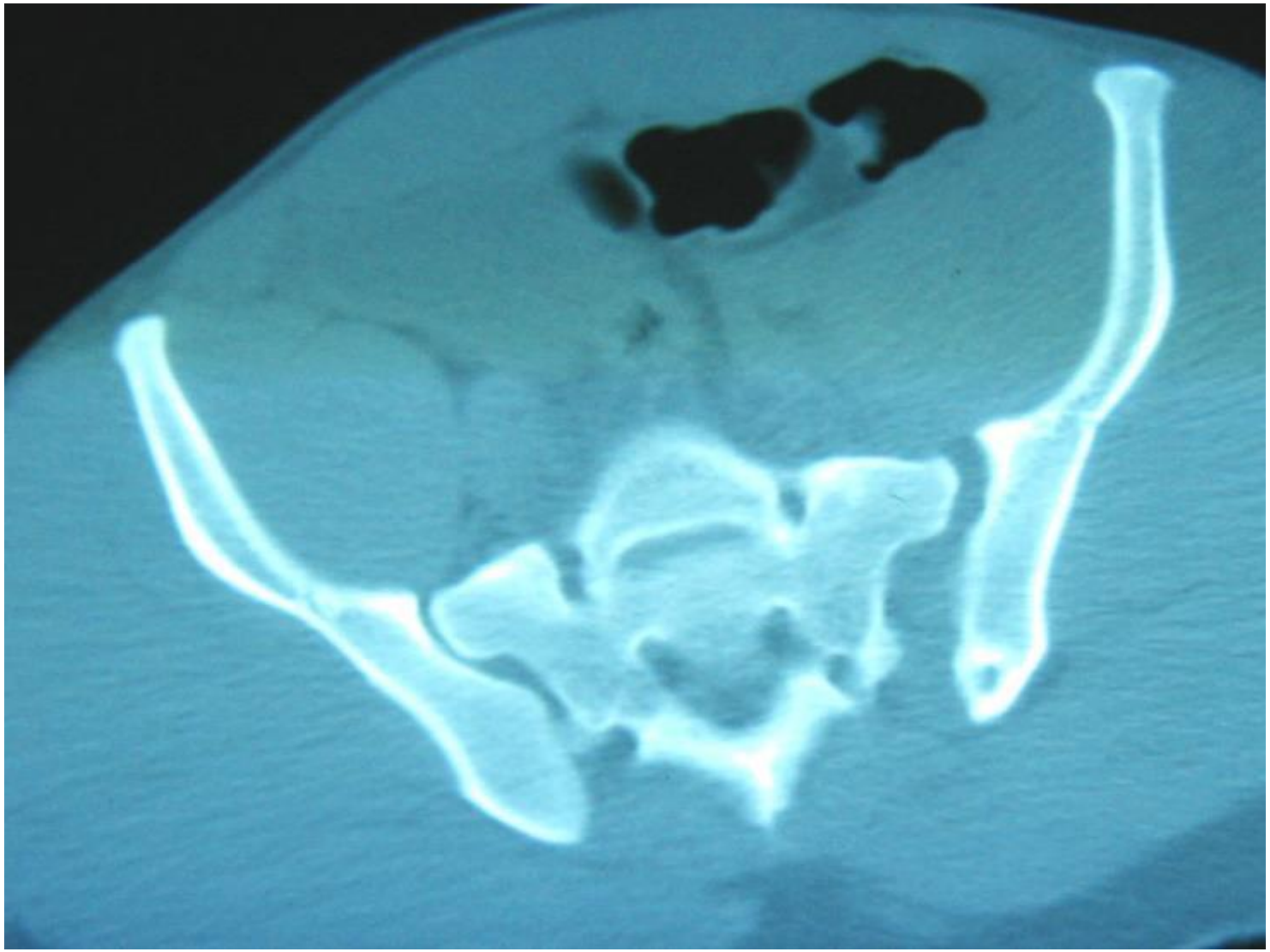
X-RAYS

- Single AP view shows most fractures
- Inlet view may show inward ring disruption
- Outlet view for disruptions from vertical shearing
- Oblique view for sacral fx or sacroiliac separation
- CT is best for significant ring fx

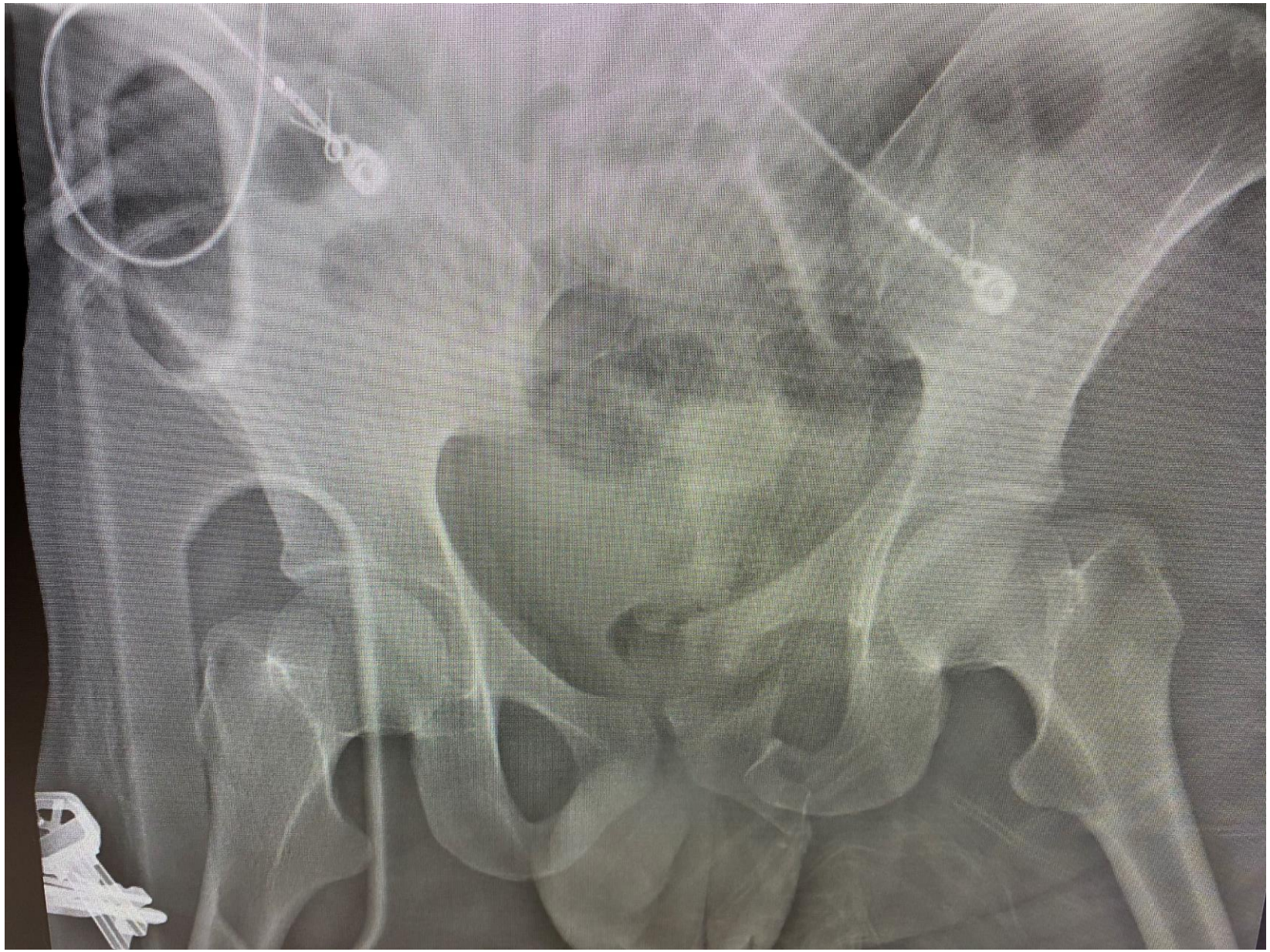
FEMC
Florida Emergency Medicine Clerkship



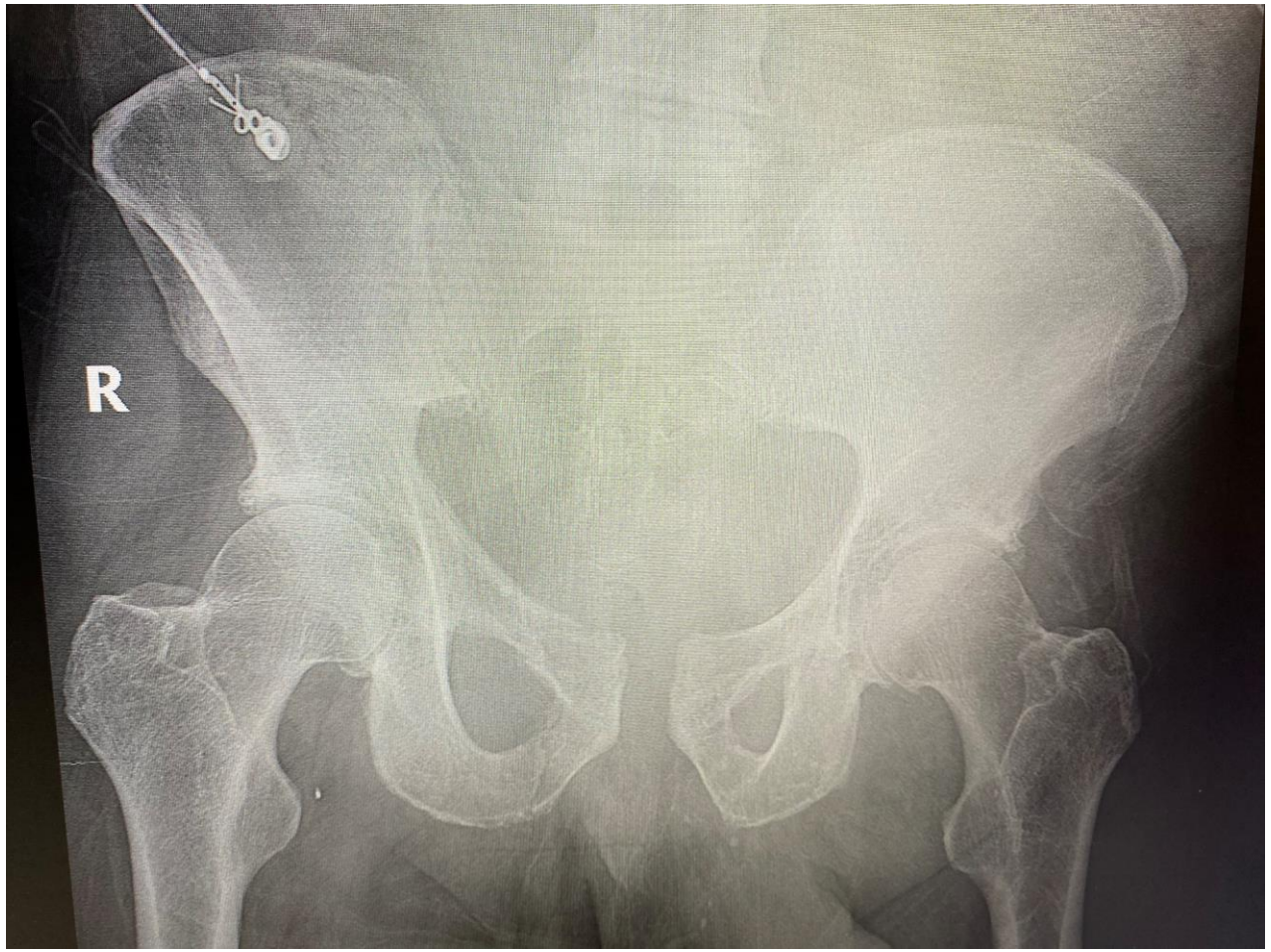
FEMC
Florida Emergency Medicine Clerkship

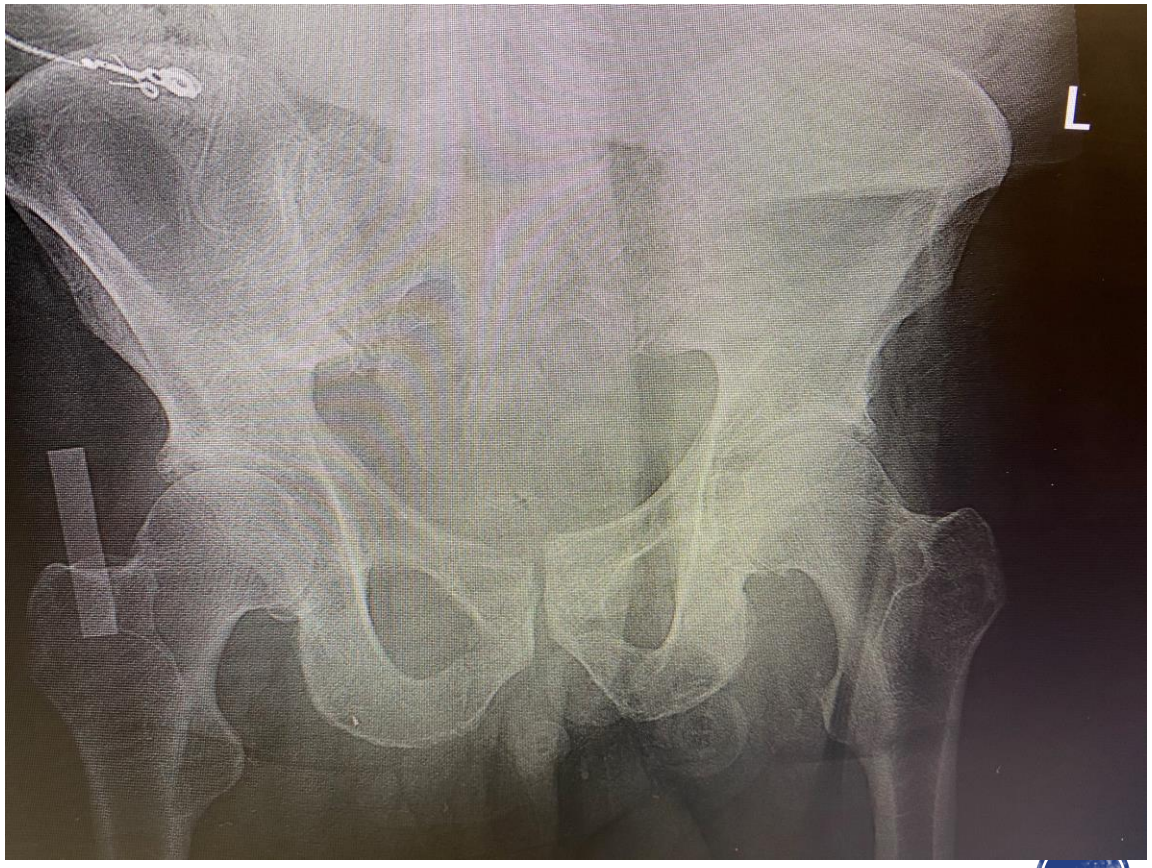


FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship





FEMC
Florida Emergency Medicine Clerkship

MASSIVE HEMORRHAGE

- Major cause of mortality are pelvic Fx (60-80%)
- 50-60% of the death from pelvic fractures occurred in the first 9 hours
- Bleeding depends of the type of fracture (major posterior Fx)
- Retro peritoneum can hold large amount of blood in an open Fx
- Immediate surgery if there is a vascular lesion after angiography

ANGIOGRAPHY

- Persistent hypovolemia not due to intra-abdominal bleeding
- Posterior pelvic fractures
- Permit embolization of bleeding vessels

GENITOURINARY TRAUMA

- External genitalia to kidneys
- Hematuria is not indicative of location or severity of injury

SIGNS AND SYMPTOMS OF GU TRAUMA

- Hematuria
- Decreased urination
- Abdominal mass
- Appropriate mechanism of injury
- Associated injuries

PHYSICAL EXAM

- Inspect perineum
- Rectal, meatus, vaginal exam
- Flank/back ecchymosis & tenderness
- Evidence pelvic fracture

SEQUENCE FOR EVALUATION

- PE
- Decide if Foley catheter should be inserted
  - If none, insert
  - If there is, do retrograde ureterogram
- Consider if cystogram is needed, IVP or CT
- Consider if suprapubic catheter is needed

CONTRAINDICATIONS FOR FOLEY

- Blood at meatus
- Boggy or high riding prostate
- Perineal ecchymosis
- Pelvic fracture

FEMC
Florida Emergency Medicine Clerkship

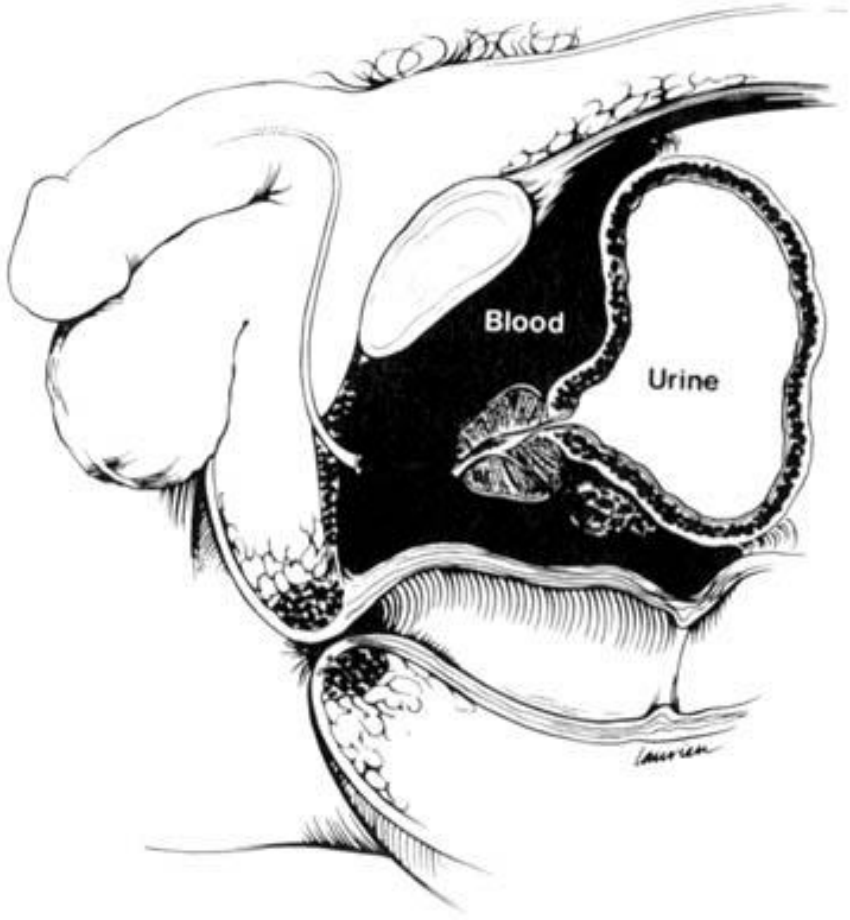
INDICATIONS FOR CT

- Low velocity penetrating injury
- Blunt injury with flank tenderness / mass / ecchymosis
- Micro hematuria in children
- Resolved hypotension + micro - hematuria
- Gross hematuria with negative urethrogram and cystogram in adults

IVP VS. CT

- CT is more precise for kidney trauma, but less precise for ureter trauma
- CT with sagittal reconstruction you will be able to see ureters

PERINEAL HEMATOMA



FEMC
Florida Emergency Medicine Clerkship

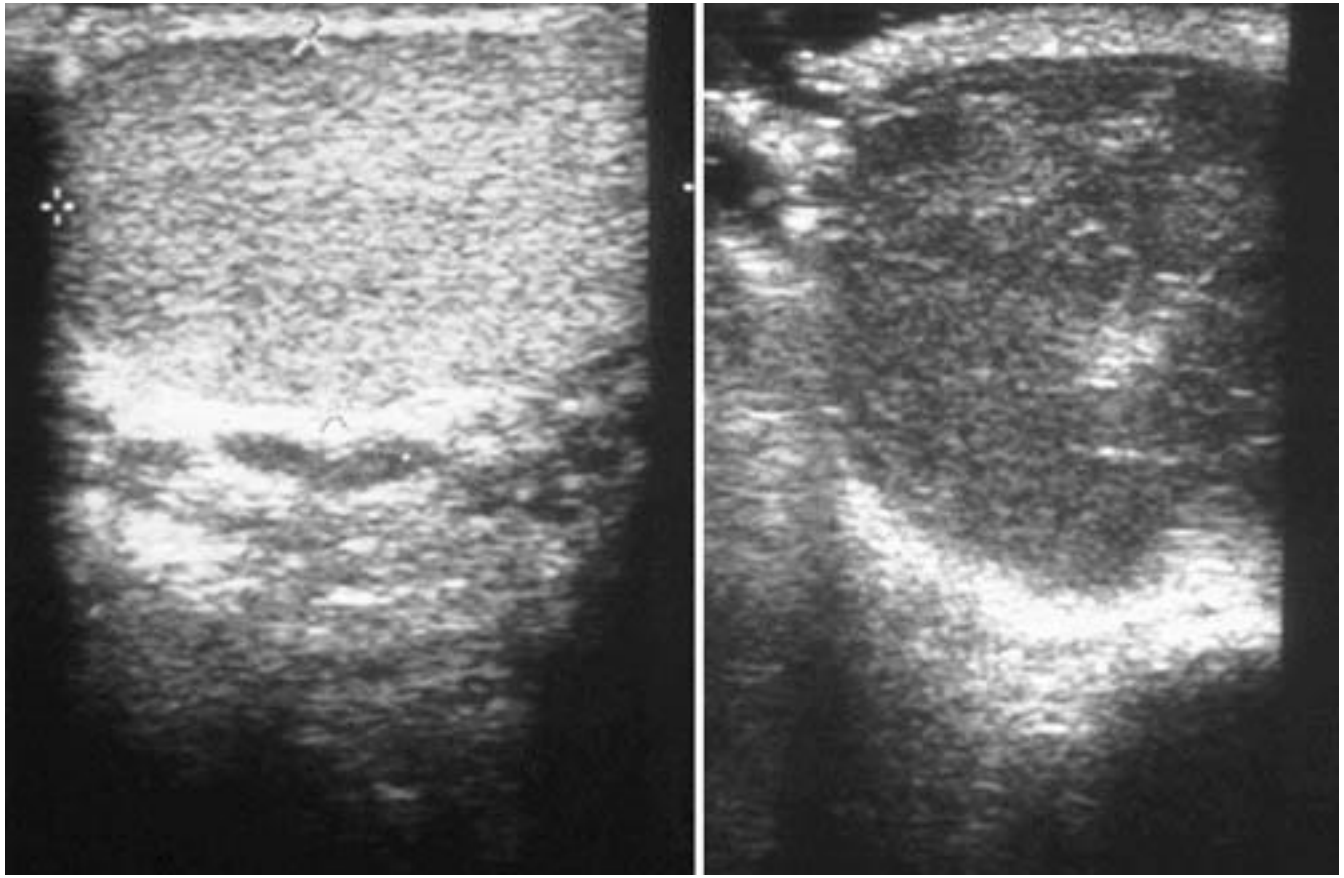
SCROTUM TRAUMA

- Look for torsion
- Order testicular sonogram
- Use antibiotics if penetrating

SCROTAL HEMATOMA

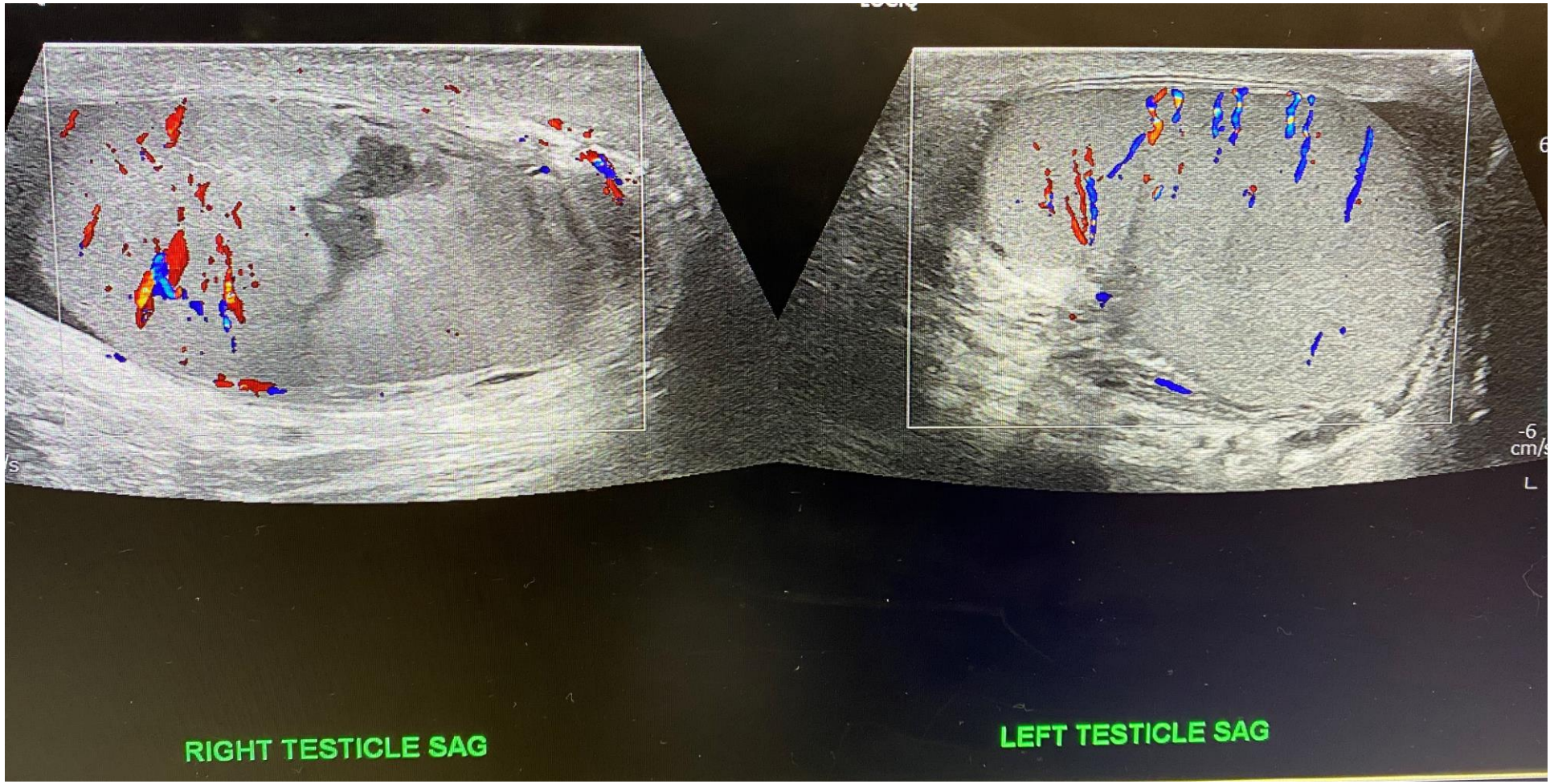
FEMC
Florida Emergency Medicine Clerkship

SCROTAL HEMATOMA

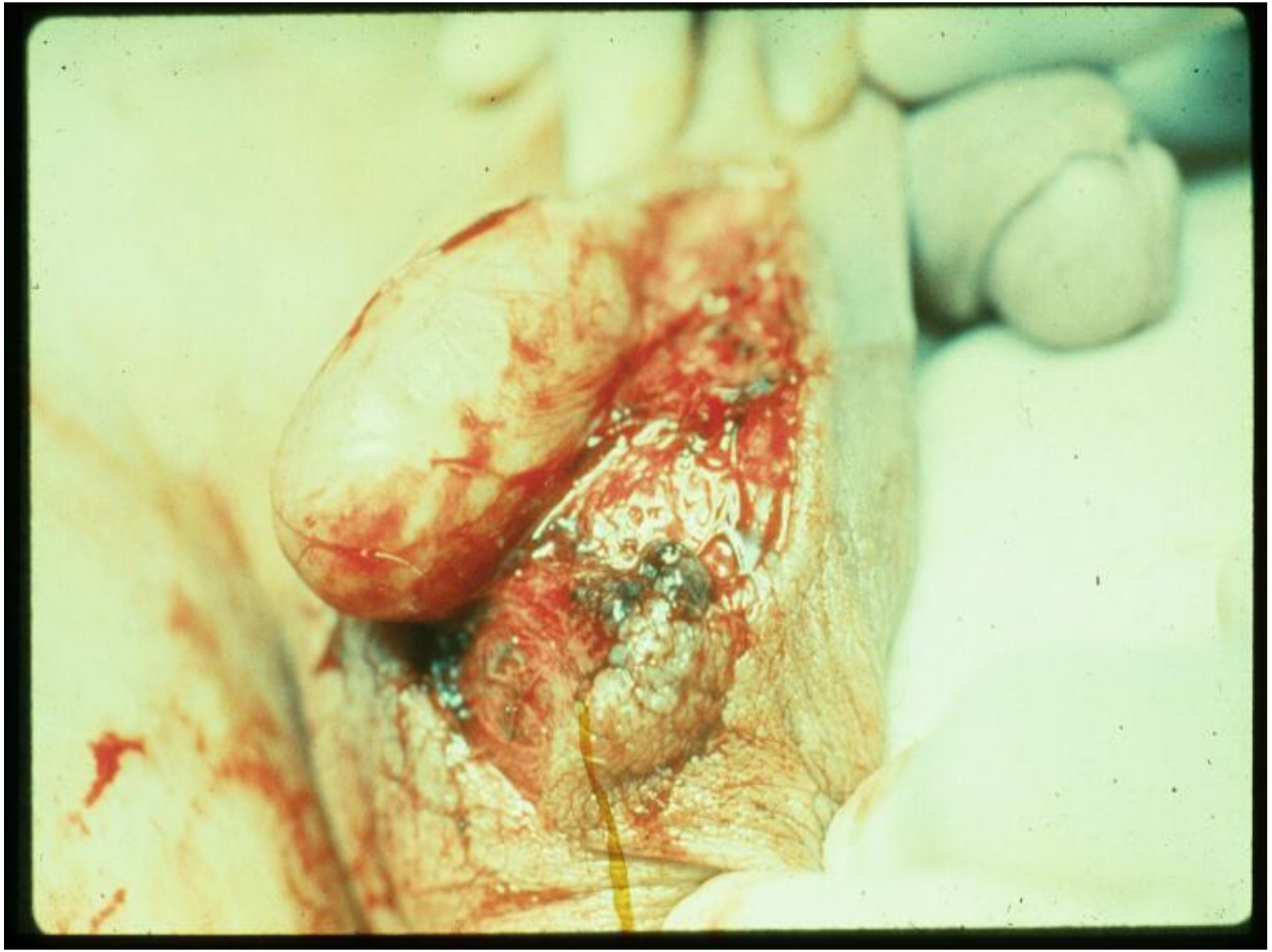


FEMC
Florida Emergency Medicine Clerkship

SCROTAL FRACTURE



FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

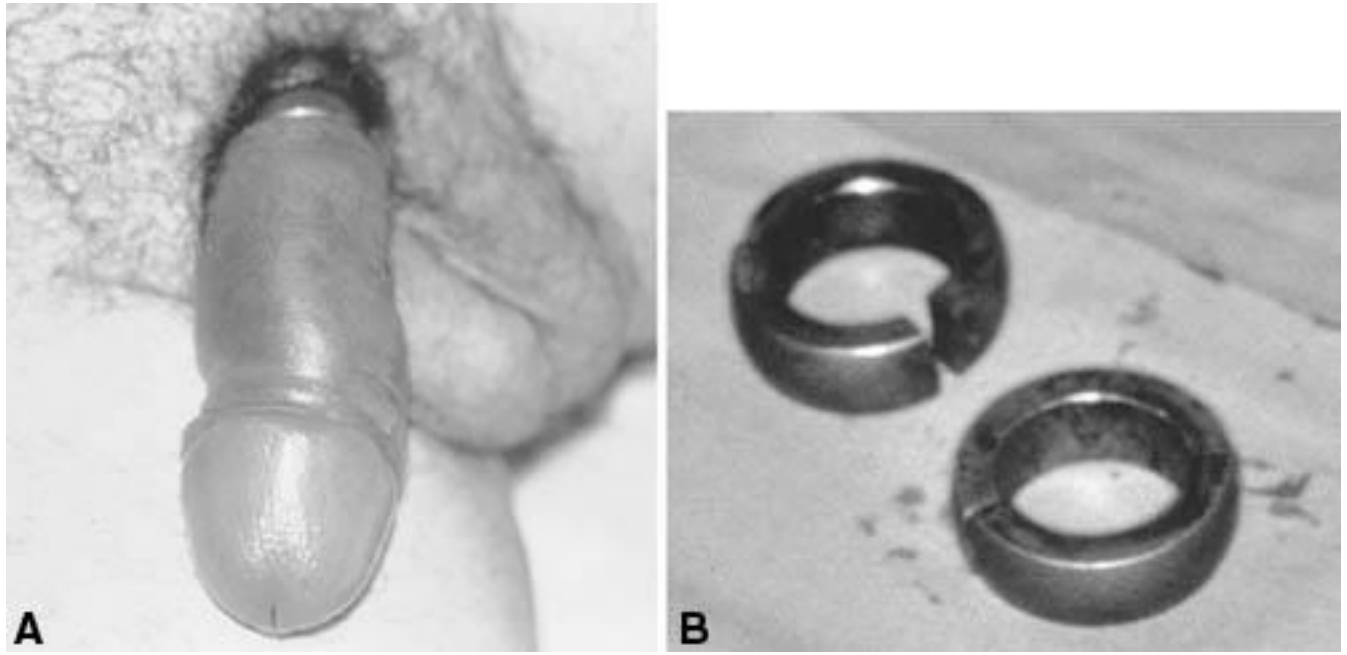
PENIS TRAUMA

- Retrograde urethrogram
- Surgical repair of rupture or laceration of corpus cavernosum
- Contusions treated conservatively—may need Foley catheter
- Analgesia
- Antibiotics

PENILE FRACTURE

FEMC
Florida Emergency Medicine Clerkship

PENILE STRANGULATION



FEMC
Florida Emergency Medicine Clerkship

VAGINAL TRAUMA

- Superficial lacerations may not need repair
- Use absorbable sutures
- Antibiotics?

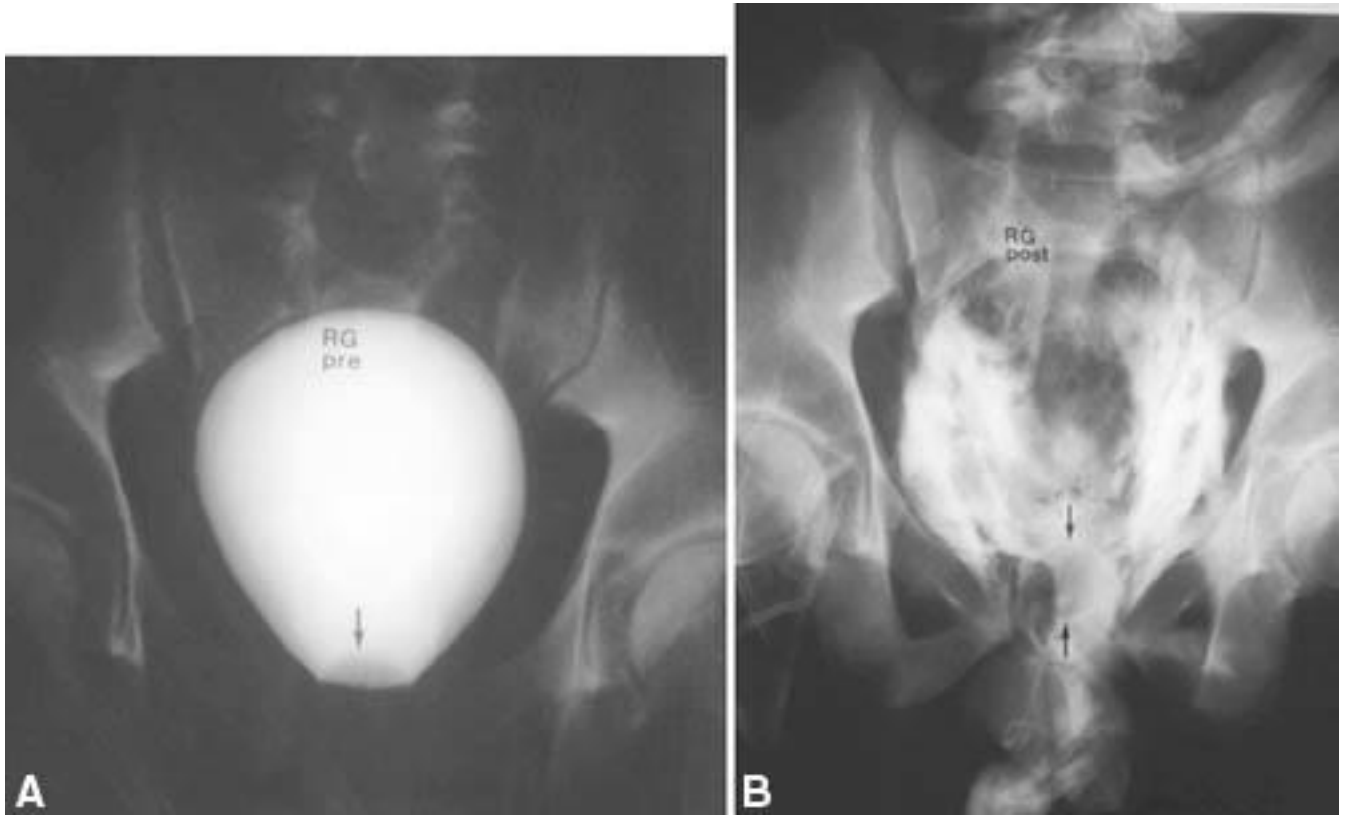
URETHRAL TRAUMA

- Diagnosis by urethrogram
- If posterior to the urogenital diaphragm
  - Use suprapubic catheter
- If anterior to the urogenital diaphragm
  - Partial, use urinary catheter
  - Complete, use surgery or stent

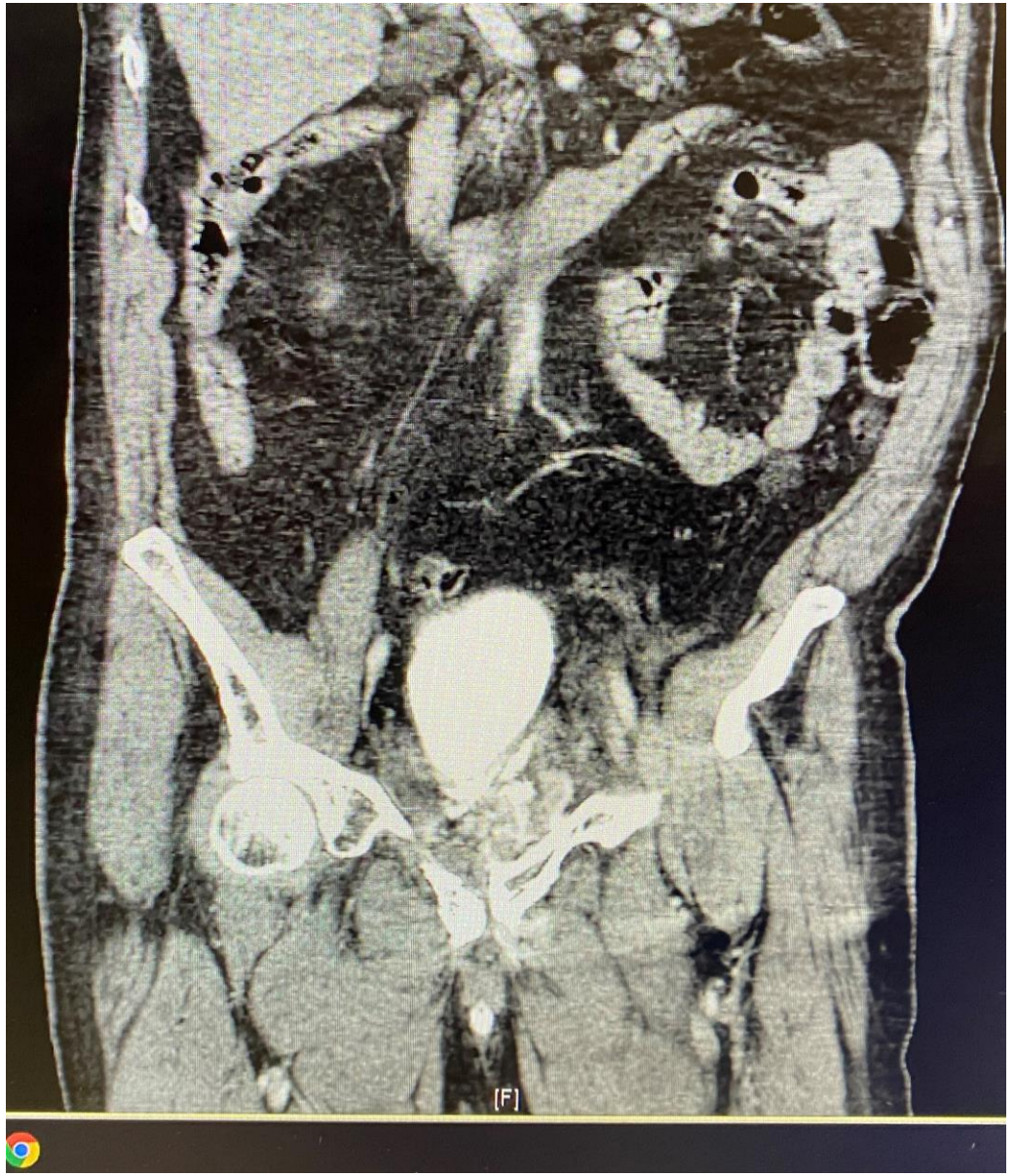
BLADDER TRAUMA

- 2 types
  - Extra peritoneal rupture
    - If small, it will heal with catheter
    - Sometimes, may need suprapubic catheter and antibiotics
  - Intraperitoneal rupture
    - Surgery and suprapubic catheter

EXTRAVASATION



FEMC
Florida Emergency Medicine Clerkship

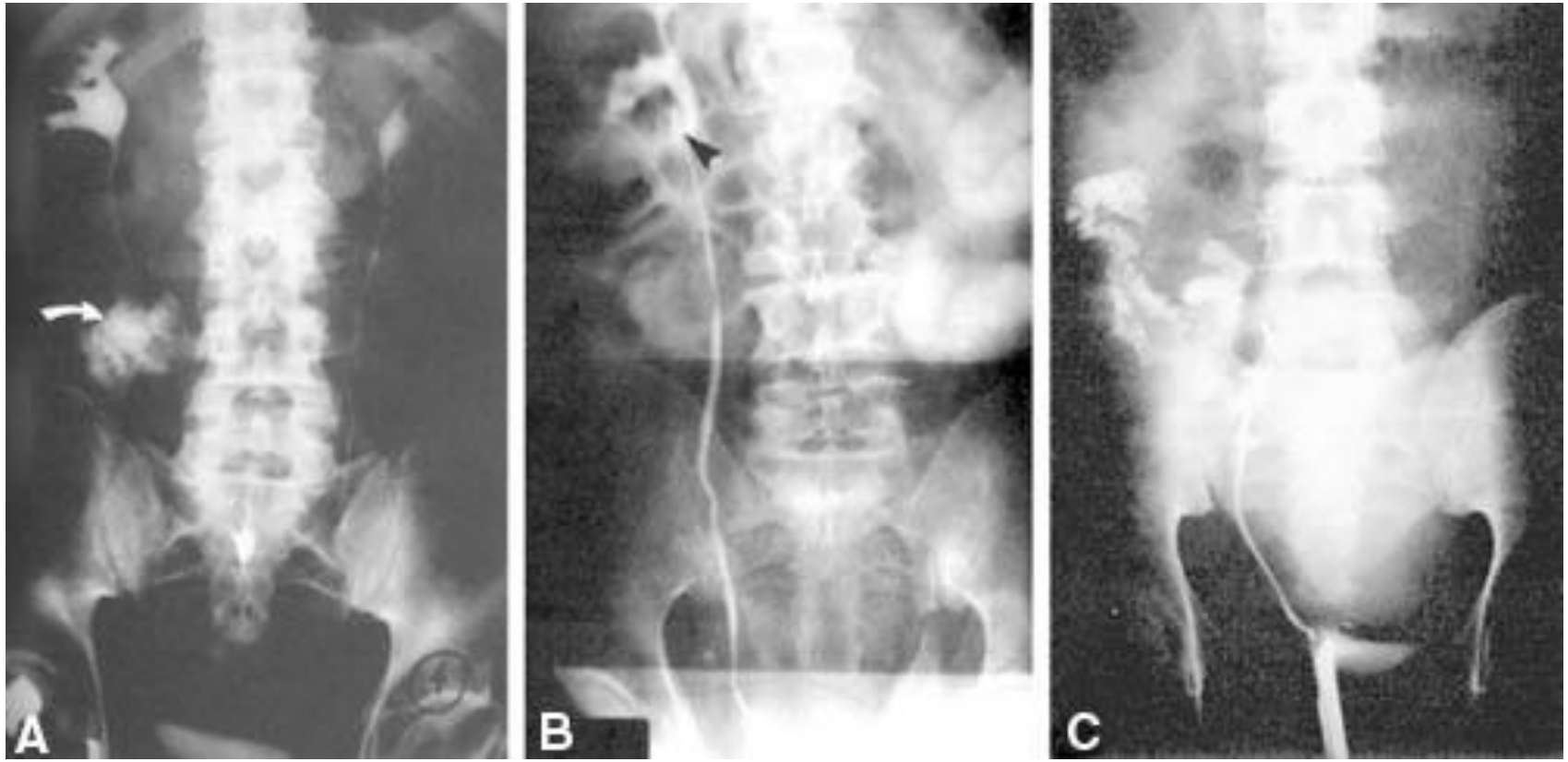


FEMC
Florida Emergency Medicine Clerkship

URETER TRAUMA

- Most common if penetrating retroperitoneal trauma
- Not common in blunt trauma
- May need surgery

EXTRAVASATION



FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

RENAL TRAUMA:
CLASSIFICATION

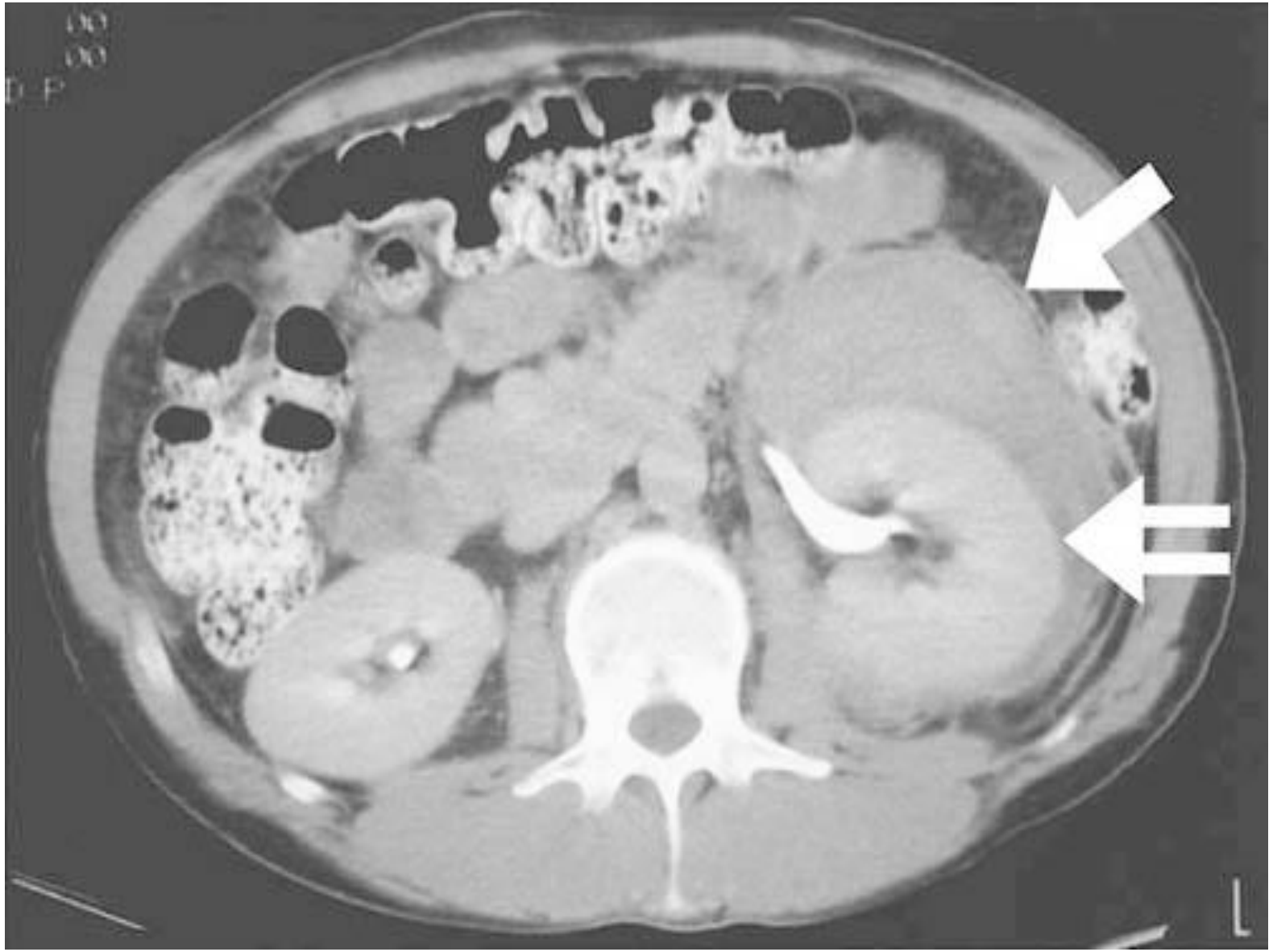
- Class I
  - Cortical contusion
- Class II
  - Cortical laceration
- Class III
  - Calyx laceration

} No surgery

FEMC
Florida Emergency Medicine Clerkship

Renal Trauma: Classification

- Class IV
  - Complete renal fracture
    - May need nephrectomy
- Class V
  - Vascular pedicle trauma
    - Loss of kidney



FEMC
Florida Emergency Medicine Clerkship

KIDNEY TRAUMA

FEMC
Florida Emergency Medicine Clerkship

TRAUMA TO THE EXTREMITIES

MUSCULOSKELETAL TRAUMA

- Bilateral femur fractures are markers of significant energy mechanism and are risk factors for complications and death in blunt trauma.
- Antibiotics used to treat open fractures should be dosed based on the patient's weight to ensure adequate tissue levels are achieved.
  - Ancef
  - Clindamycin
  - Gentamycin
  - Zosyn

DISLOCATIONS THAT CAN RESULT IN VASCULAR INJURY

- Knee – popliteal
- Elbow - brachial
- Ankle – dorsalis pedis, posterior tibialis
- Hip – femur head ischemia
- Immediate reduction prior to X-ray if vascular insufficiency is present

SIGNS OF ARTERIAL INJURY

- Location of injury
- Type: stab, gsw, fx
- Presence or absence of pulse?
- Vascular injuries should be suspected:
  - Distal ischemia
  - Pulsatile bleeding
  - Pallor
  - Large, expanding, or pulsatile hematoma
  - Bruit or palpable thrill

COMPARTMENT SYNDROME

- Suspect with:
  - Crush injuries
  - Compound fractures
  - GSW
  - Circumferential burns
- Pathologic increase in compartment pressure resulting in limb ischemia

COMPARTMENT SYNDROME

- Need to distinguish early from late
  - Pain
  - Paresthesia
  - Pallor
  - Paralysis
  - Pulse loose later
- Diagnosis
  - Direct pressure measurement of compartment
- 30-40 mmHg usually means fasciotomy


stryker

Signs and symptoms of compartment syndrome

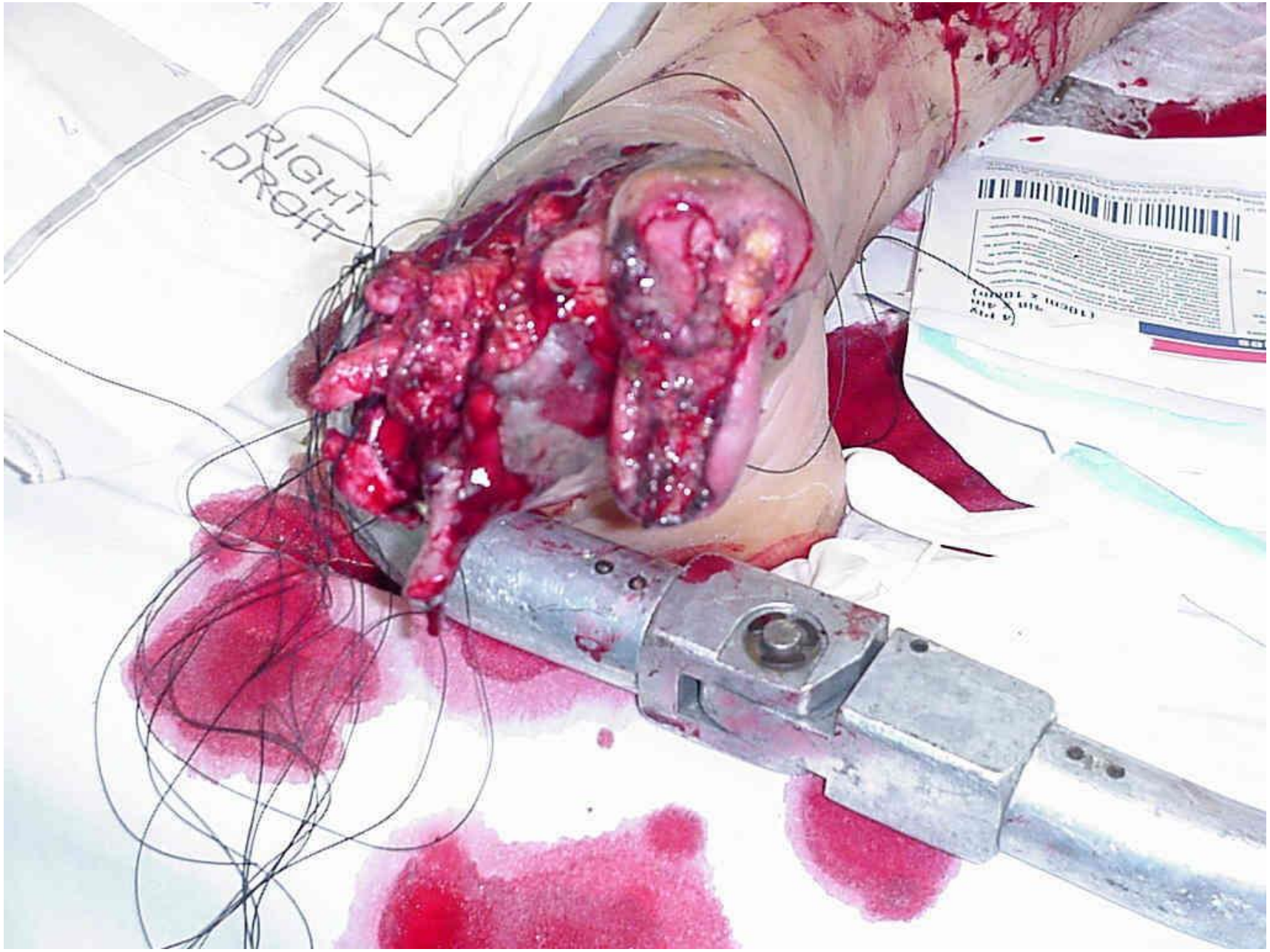
- Pain greater than expected and out of proportion to the stimulus or injury
- Pain on passive stretch of the affected muscle
- Tense swelling of the affected compartment
- Paresthesias or altered sensation distal to the affected compartment

RHABDOMYOLYSIS

- Muscle breakdown
- Deposition of proteins in renal parenchyma
- Diagnosis
  - + blood and no RBC in UA
- Treatment
  - IVF of NS with Bicarb to at least 50cc/hour urine

TRAUMATIC AMPUTATION

- Direct pressure to site - never clamp blindly
- Amputated part in cool saline
- Incision *vs.* crush or tear
- Antibiotics and hemorrhage control in ED
- Proximal has better prognosis
- Re-attachment decision by surgeon



FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

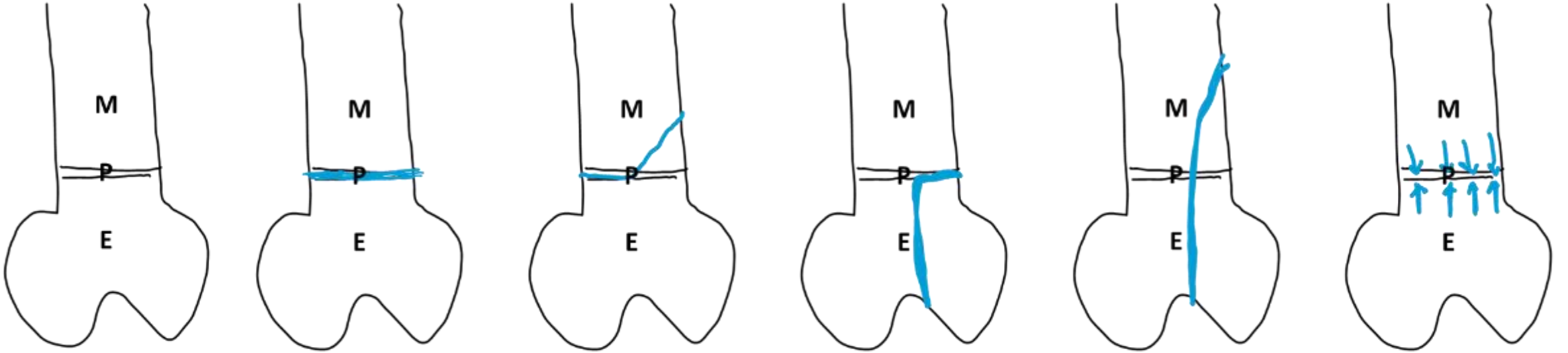
CONTRAINDICATIONS FOR REIMPLANTATION

- Medical conditions that can cause inability to tolerate general anesthesia
- Distal phalanx amputation
- TibiaI ischemia for more than 4 hours
- Crushed injuries

FRACTURES DESCRIPTION

- Salter-Harris: pediatric classification
  - Type 1: thru epiphysial plate
    - Not seen in X-ray; clinical suspect
  - Type 2: thru epiphysial plate and fracture of metaphysis
    - Most common
  - Type 3: thru epiphysial plate and fracture of epiphysis
  - Type 4: fracture thru the epiphysis and metaphysis
  - Type 5 :crushed epiphysial plate

SALTeR – Harris Fractures



NORMAL	TYPE I (5%)	TYPE II (75%)	TYPE III (10%)	TYPE IV (10%)	TYPE V (uncommon)
	S	A	L	T	ER
	Slipped (P involvement)	Above (M involvement)	Lower (E involvement)	Through (M+P+E involvement)	Erasure (P Crush injury)

M = metaphysis
P = physis
E = epiphysis

FEMC Florida Emergency Medicine Clerkship

Salter-Harris Classification

OPEN FRACTURES

- Risk for infection
- IV antibiotics
- Irrigation and debridement usually in the OR

FEMC
Florida Emergency Medicine Clerkship

IMMOBILIZATION

- Part of the secondary survey
- Decrease pain and bleeding
- Evaluate circulation after splint
- Maintain fingers free to evaluate circulation

INJURIES INVOLVING JOINTS

- Potential joint involvement
- Irrigation
- Antibiotics
- Methylene blue
- Careful exam :
  - Tendon
  - Neuro/vascular or bony abnormalities
  - Ligament injuries
- Delayed repair

HAND INJURIES

- Phalanx fracture
  - If phalanx rotation, will need surgery
- Skiing finger – ulnar collateral ligament of the thumb injury
  - Suspect if patient complaint of unable to do thumb abduction
  - Thumb spica splint or ligament repair

HAND INJURIES

- Proximal and distal phalanx dislocation
  - Reduced with simple traction
  - Obtain X-ray

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerks...

FEMC
Florida Emergency Medicine Clerkship

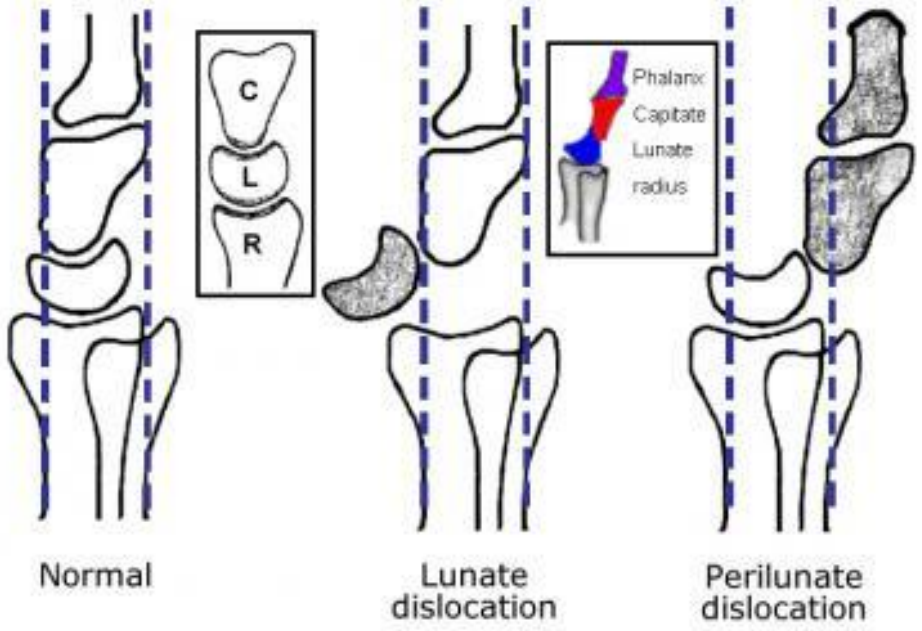
WRIST INJURIES

- Scaphoid tenderness (snuff box) should be treated as fracture
  - Thumb spica splint
  - Repeat X-rays in 7 – 10 days
- Increased separation of the scaphoid-lunate joint need to apply short posterior splint

PA view: no scaphoid Fx

Scaphoid view (same pte): + Fx

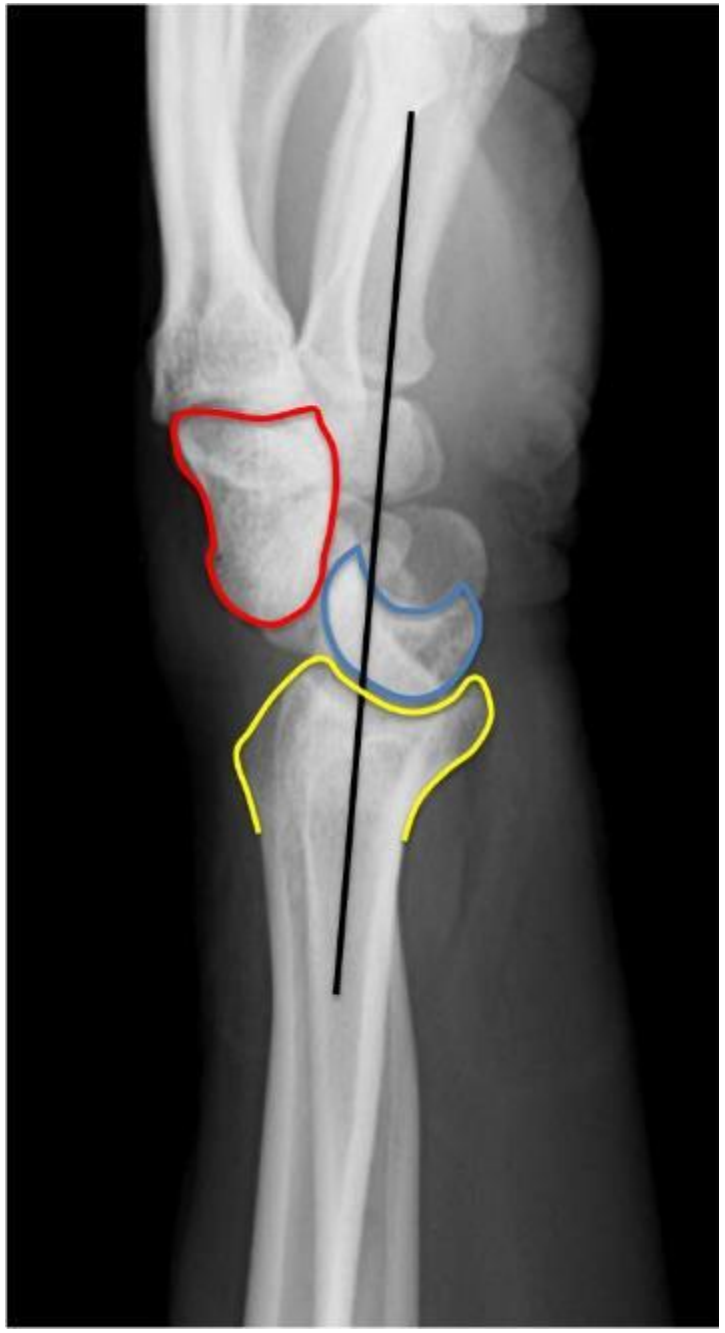
FEMC
Florida Emergency Medicine Clerkship



Bones most often injured

- Radius
- Ulna
- Lunate (dislocation)
- Scaphoid (fracture in anatomical snuffbox)
- Metacarpals
- Phalanges

FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

WRIST INJURIES

- If there is angulation, displacement, or fracture of the wrist of forearm, you need wrist and elbow X-rays
  - Galeazzi fracture – radial fracture with the displacement of the distal ulnar
  - Monteggia fracture – ulnar fracture with proximal radial bone dislocation
- Lateral X-rays to evaluate lunate an perilunate dislocation

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

Colle’s

FEMC
Florida Emergency Medicine Clerkship

Smith

FEMC
Florida Emergency Medicine Clerkship

Nightstick Fx

FEMC
Florida Emergency Medicine Clerkship

GALEAZZI VS MONTEGGIA

- Galeazzi
  - Fracture of the radius with dislocation of the distal radioulnar joint
- Monteggia
  - Fracture of the proximal third of the ulna with dislocation of the head of the radius
- GRUM
  - Galeazzi – radius
  - Monteggia – ulnar

Galeazzi

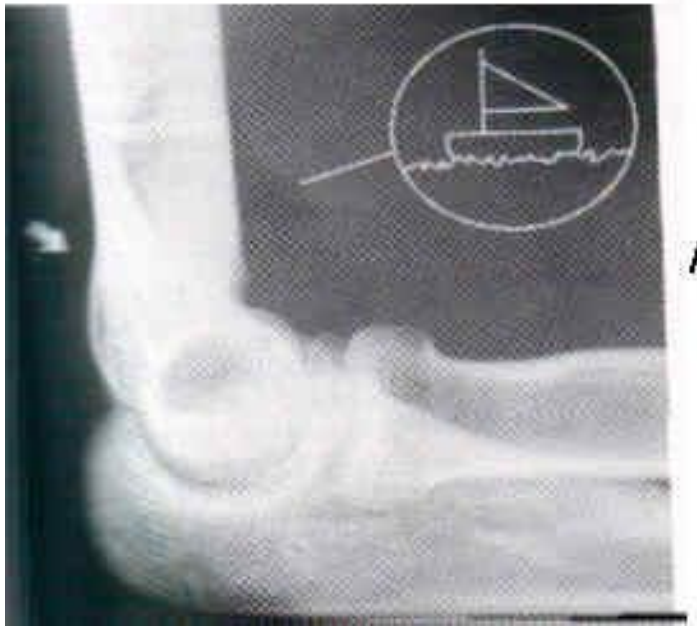
Monteggia

FEMC
Florida Emergency Medicine Clerkship

ELBOW EVALUATION

- Lateral X-rays to evaluate fat pad
  - Indicate intra-articular fracture
  - Most common intra-articular fracture is the head of the radius
- Evaluate alignment of the radius axis with the capitelum axis

Normal Ant Fat Pad



Abnormal Fat Pads

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

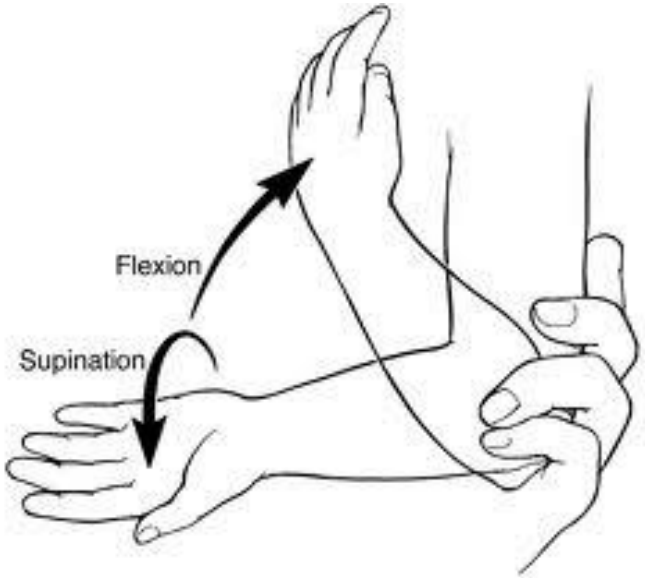
ELBOWS INJURIES

- Radial head subluxation in children < 4 y/o
  - Suspect if complaining of pain or decreased use
  - X-rays with normal
  - Reduction – manipulate elbow pressing against the radial head and forearm flexion
  - May hear a click post reduction
- Humerus-radius dislocation
  - Evaluate vascular injury

NURSEMAID ELBOW

- Dislocation of the elbow joint caused by a sudden pull on the extended pronated arm


Radial head
dislocation
Radius
Ulna
Humerus
ADAM.


Flexion
Supination

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

SHOULDER INJURY

- Rotator cuff injury
  - Decreased abduction strength against resistance with the arm abducted at 20 degree

SHOULDER INJURY

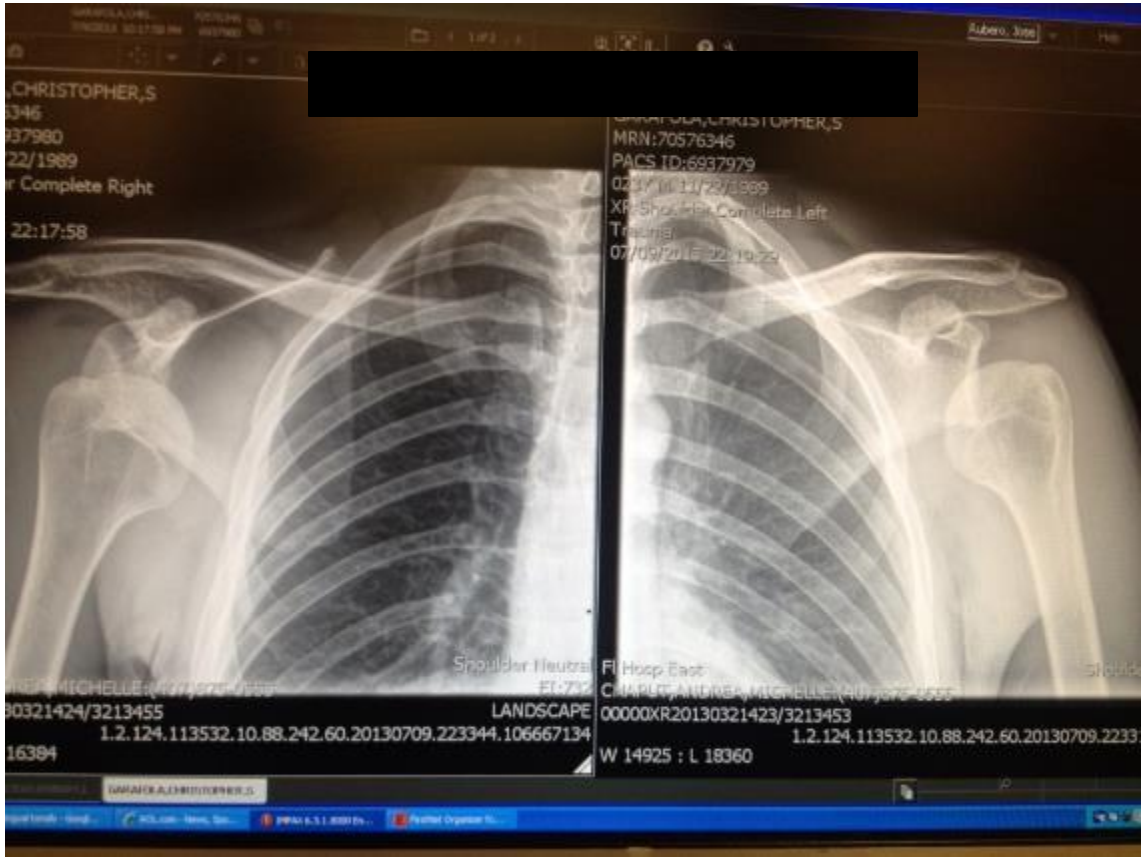
- Acromiun-clavicular separation
  - First grade – pain, joint swollen; normal X-rays
  - Second grade – X-rays indicate partial separation
  - Third grade – clavicle located above the acromiun
  - Treatment with shoulder immobilizer

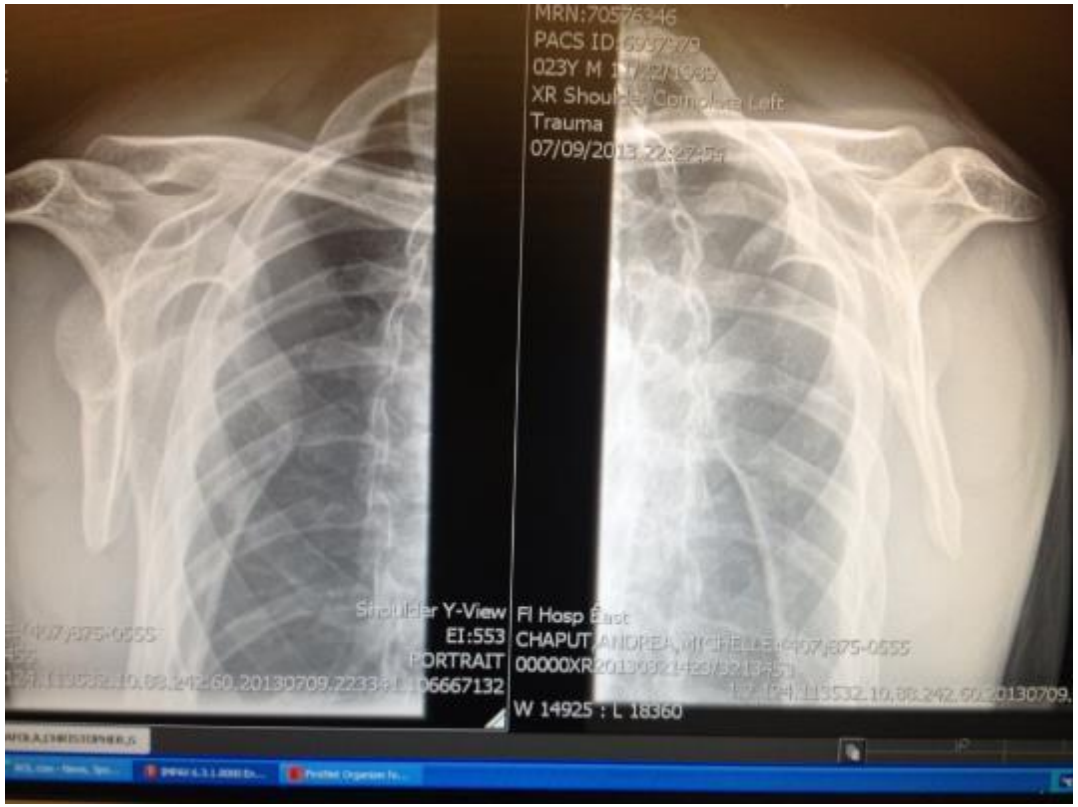
SHOULDER INJURY

- Clavicle fracture
  - Closed; shoulder immobilizer
  - ORIF in some cases
- Scapular fracture
  - Associated to chest trauma
  - Fracture alone to be treated with immobilizer
  - ORIF if displacement

SHOULDER DISLOCATIONS

- Y view
- Reduction with traction and counter-traction

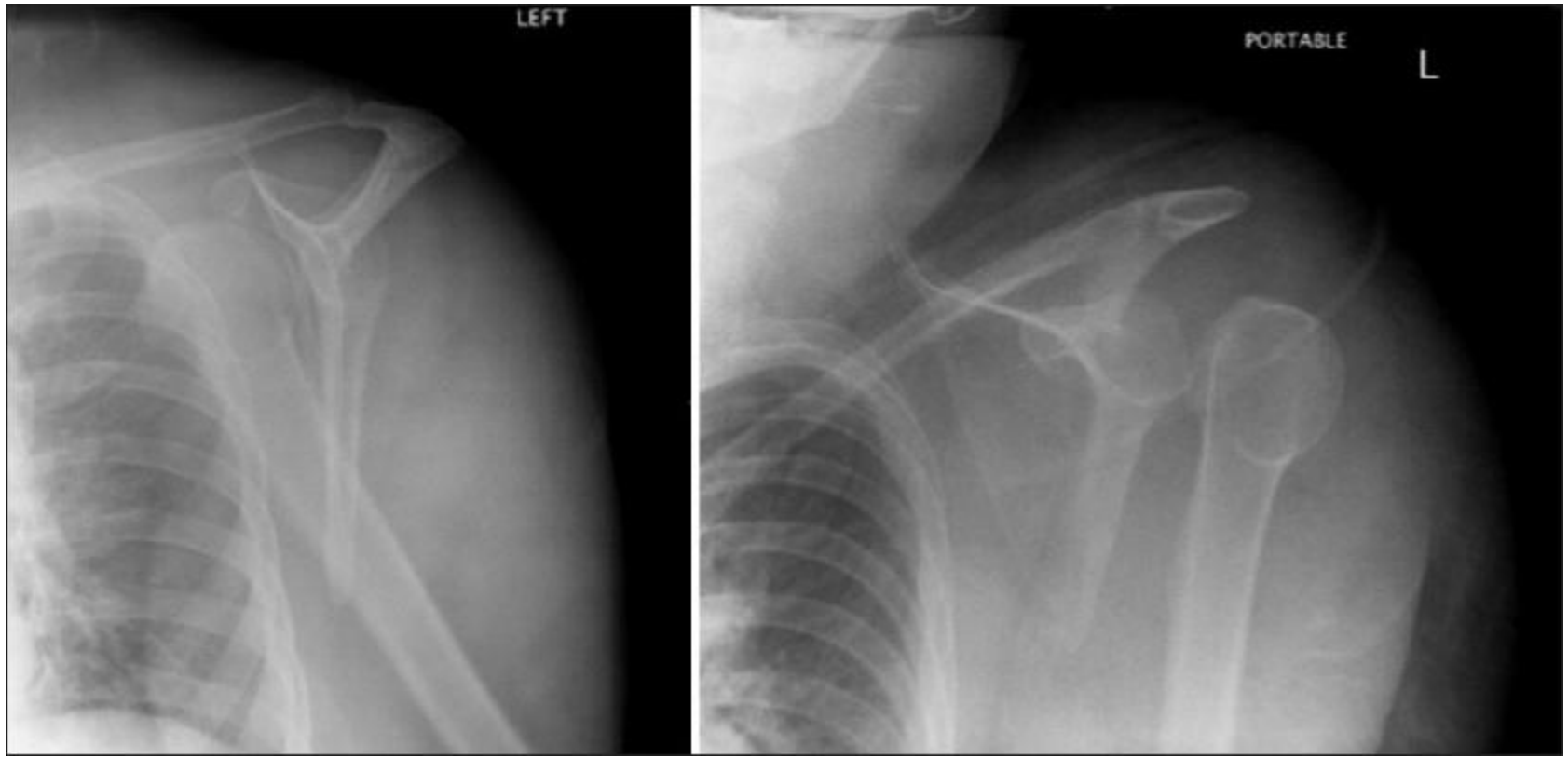


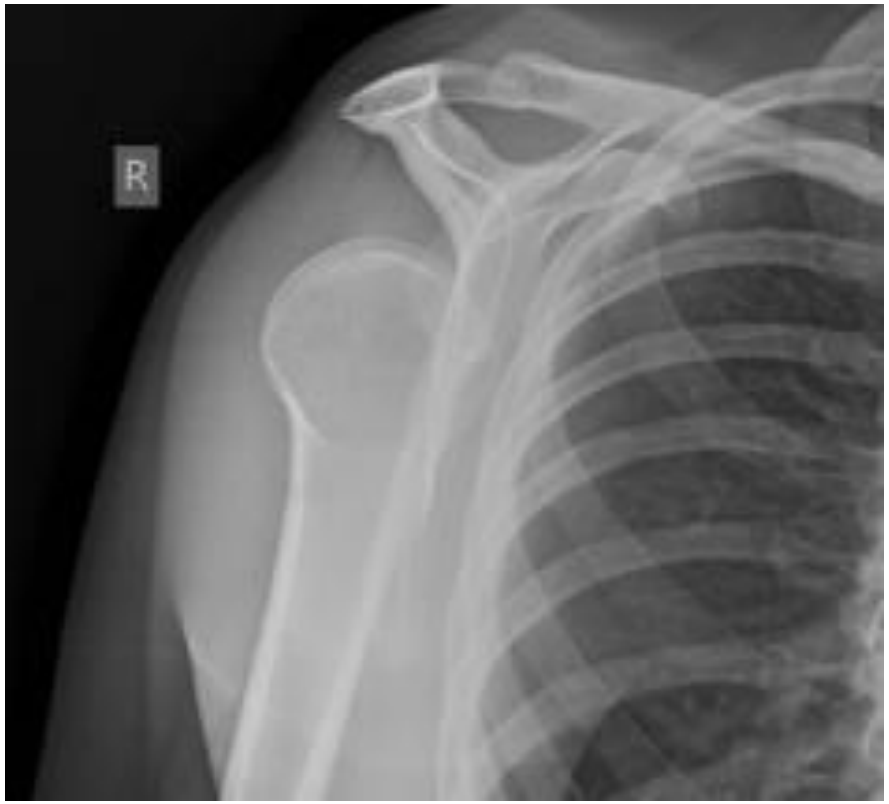


FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

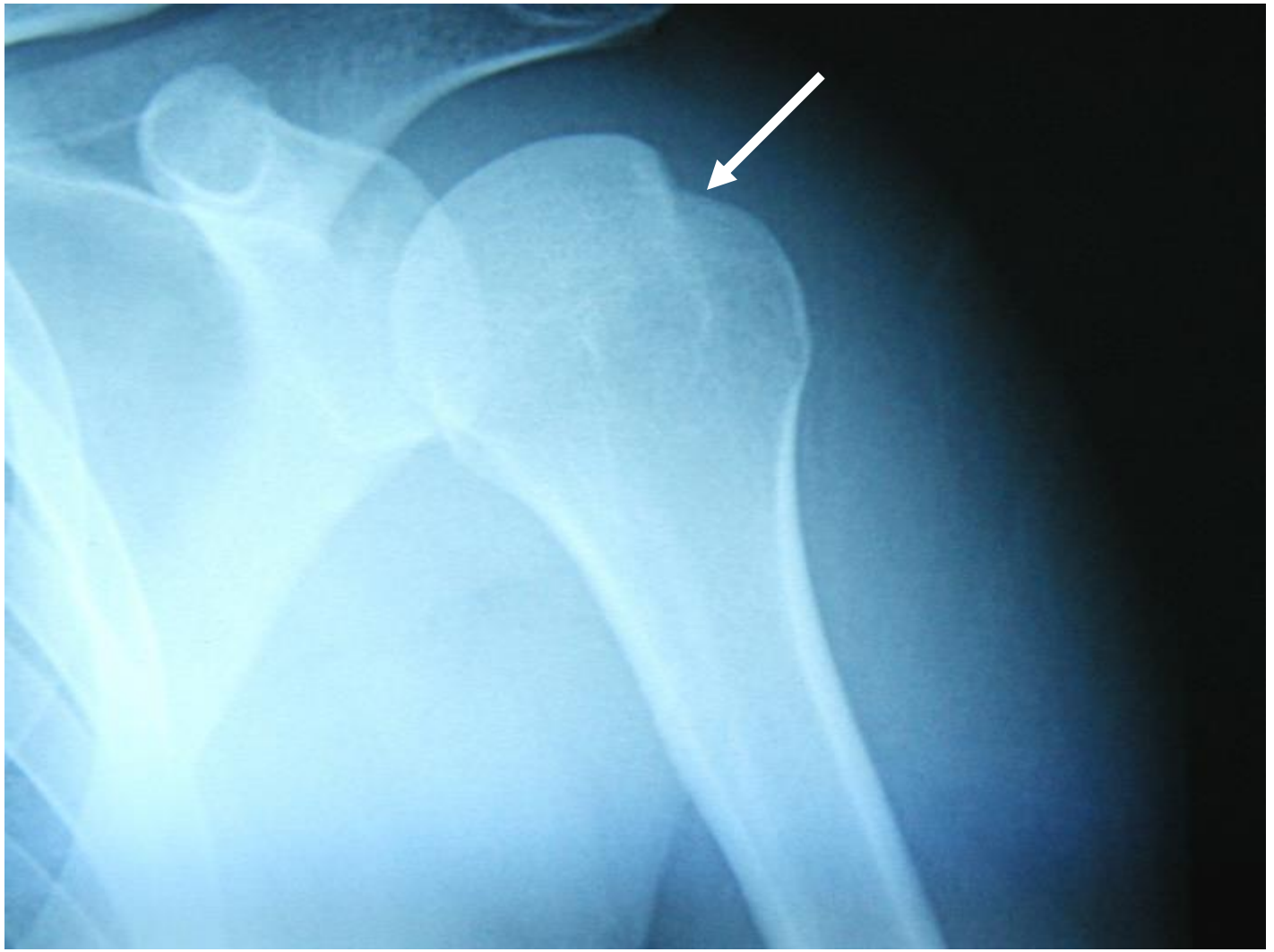

R


LEFT
PORTABLE
L



FEMC
Florida Emergency Medicine Clerkship

HILL-SACH FX

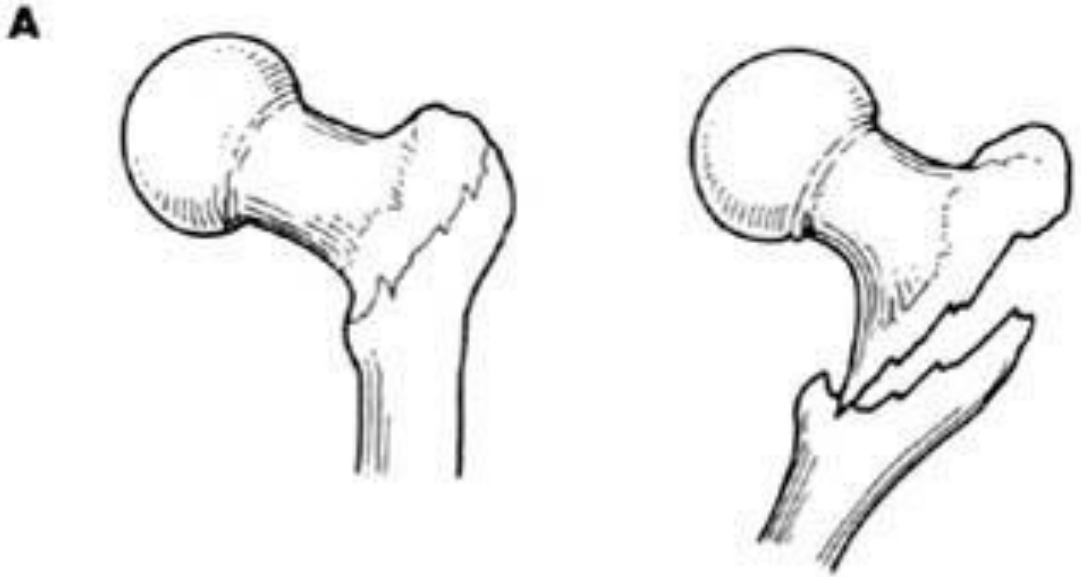


FEMC
Florida Emergency Medicine Clerkship

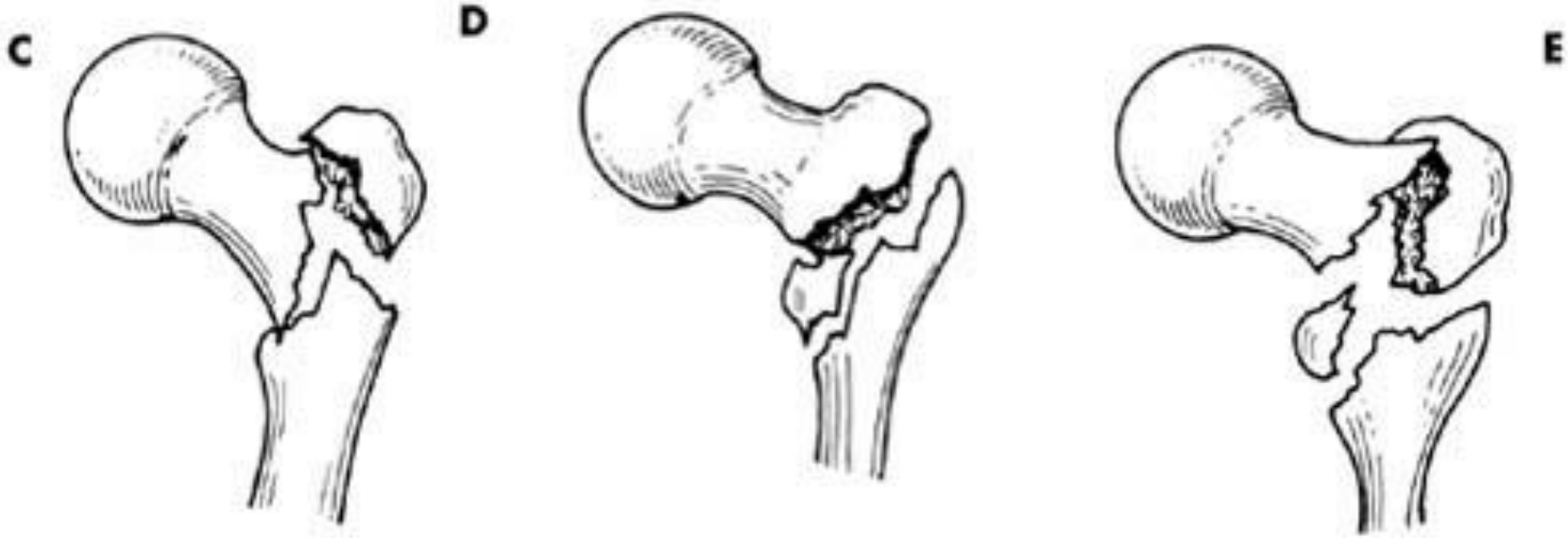
HIP INJURIES

- X-rays
- Able to walk does not indicate no injury
- Classification
  - Subcapital
  - Femoral neck
  - Interthrocanter
  - Subthrocanter
  - Throcanter avulsion

Stable



Unstable



FEMC
Florida Emergency Medicine Clerkship


Captain Morgan

KNEE INJURIES

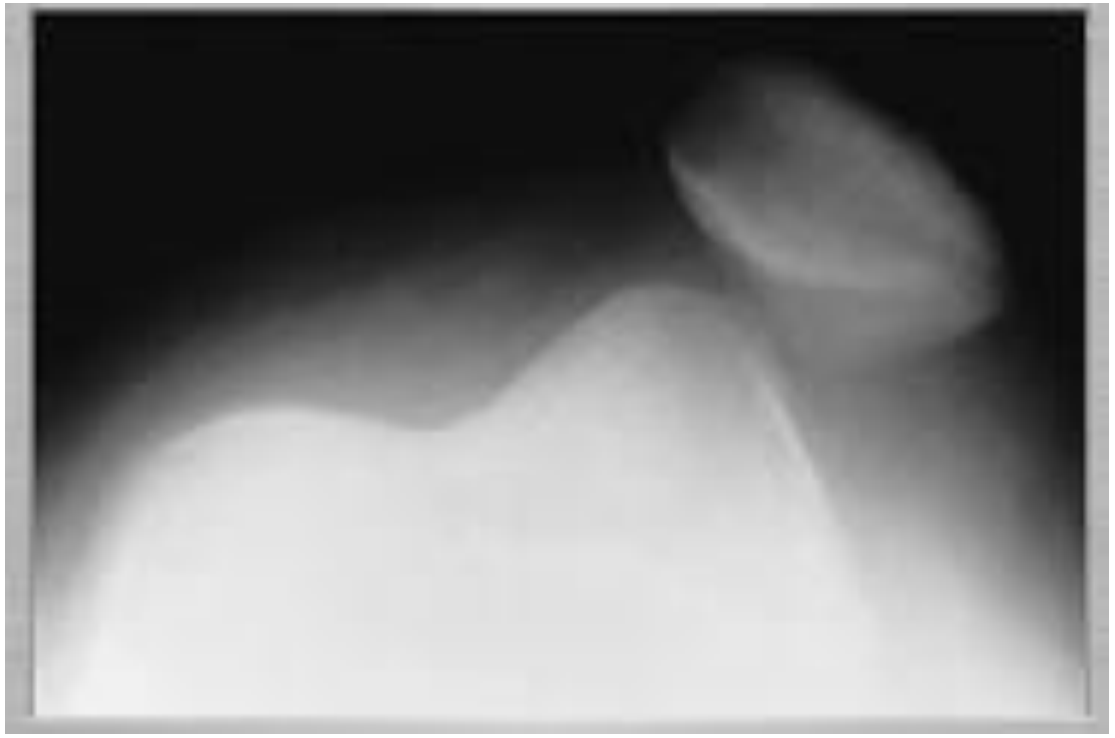
- Examination
  - Evaluate neurovascular status
  - Evaluate for swelling, pain
  - Extension and flexion abilities
  - Evaluate ligaments with knee at 15 degree in flexion
  - Unable to extent:
    - Quadriceps rupture
    - Transverse patellar fracture and displacement
    - Patellar ligament rupture
    - Meniscus rupture

KNEE INJURIES

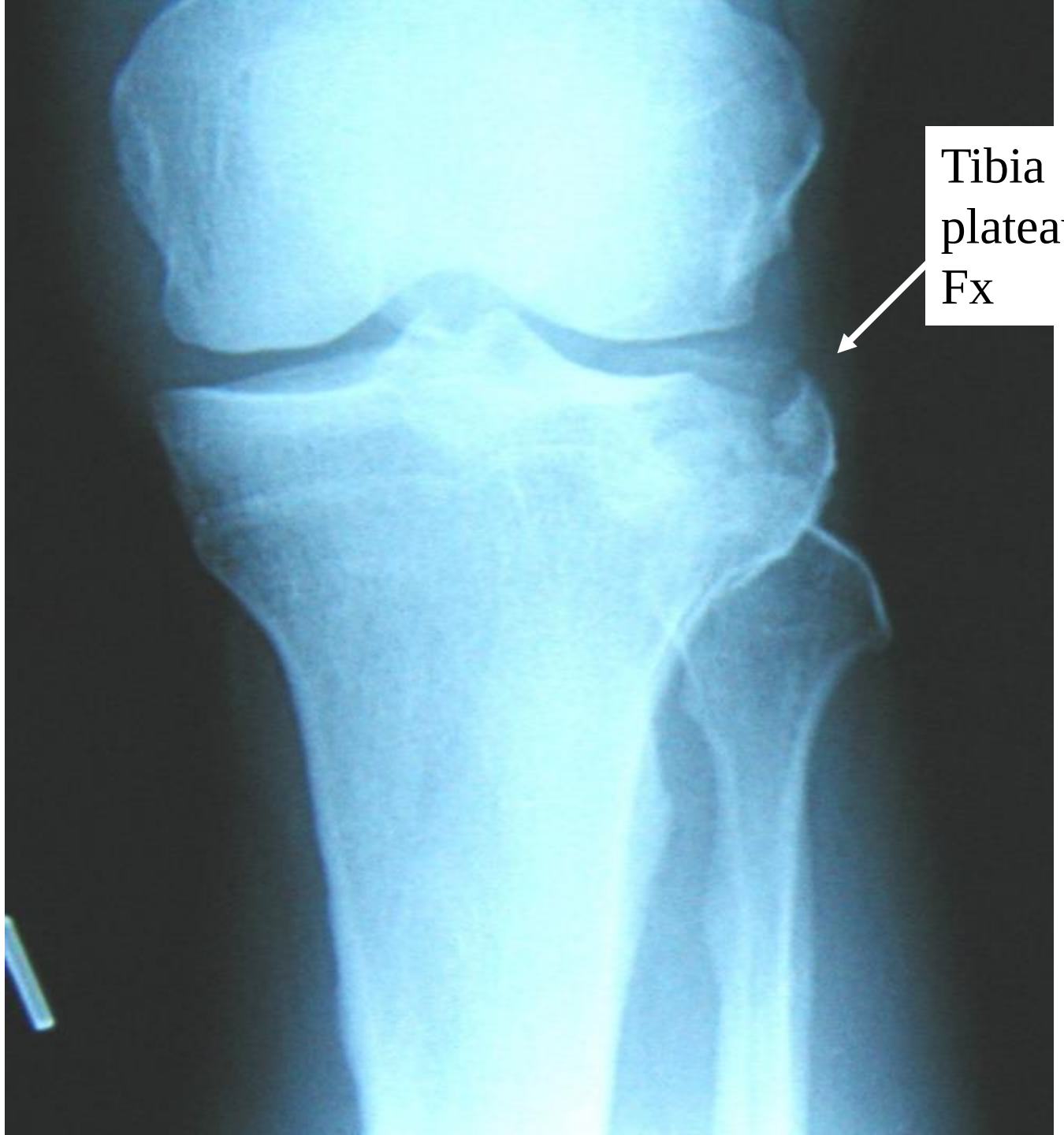
- Patellar dislocation
  - Reduce it by complete extension of the knee and lateral pressure
- Knee dislocation (tibia-femoral)
  - Emergency
  - Unstable knee
  - Neurovascular evaluation
  - Splint
  - Angiography

KNEE INJURY

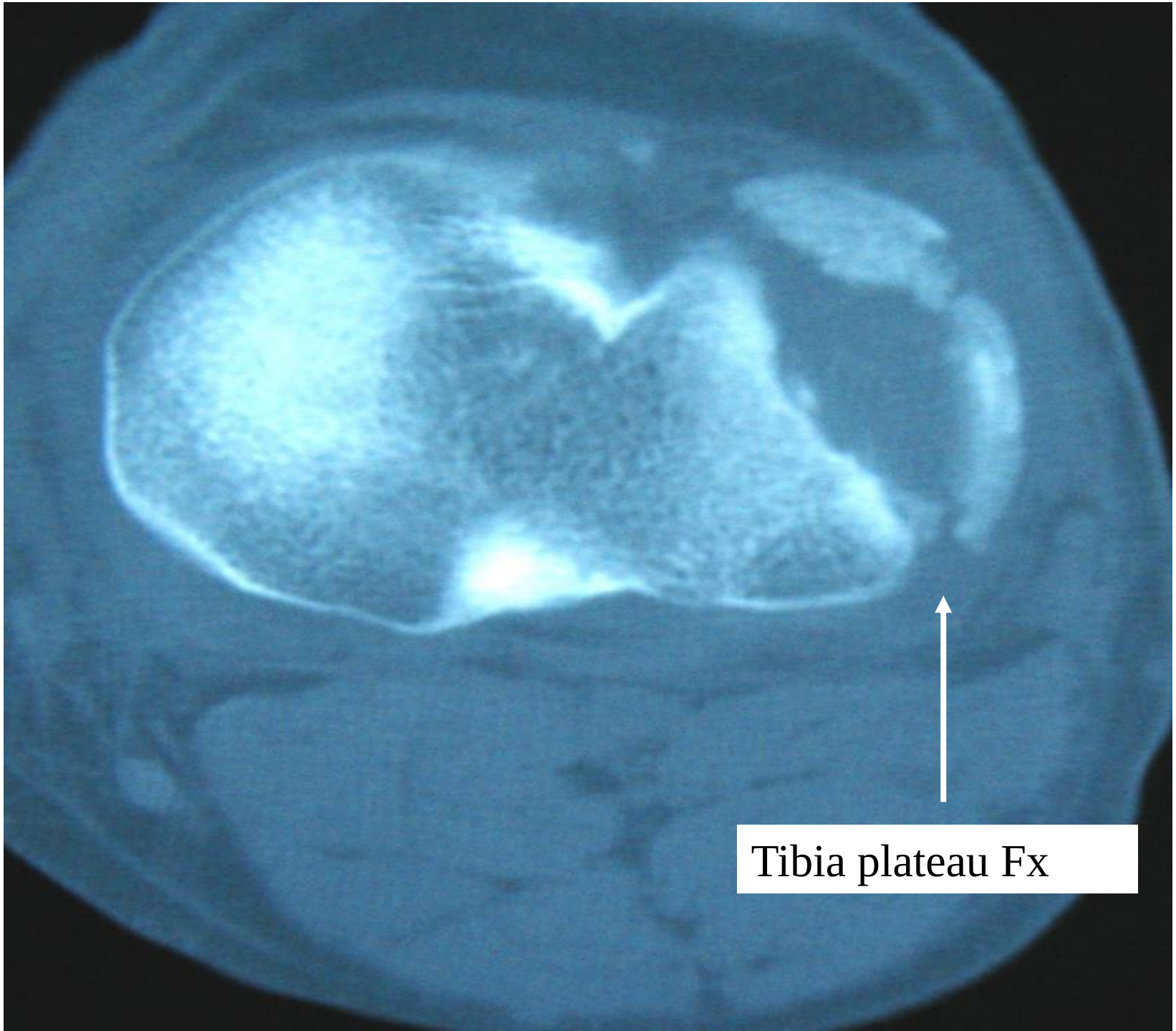
- Tibial plateau fracture
- Knee sprain
  - Immobilization



FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

ANKLE INJURY

- In children <12 y/o, pain above the malleolus may represent Salter I fracture
  - Normal X-rays
- Ankle sprain

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

CALCANEUS FRACTURE

- 2% of all fractures
- 60% of the tarsal bones fracture
- Be careful with…

- Lover's Triad Fractures
  - Calcaneus
  - Spine
  - Distal radius

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

FEMC
Florida Emergency Medicine Clerkship

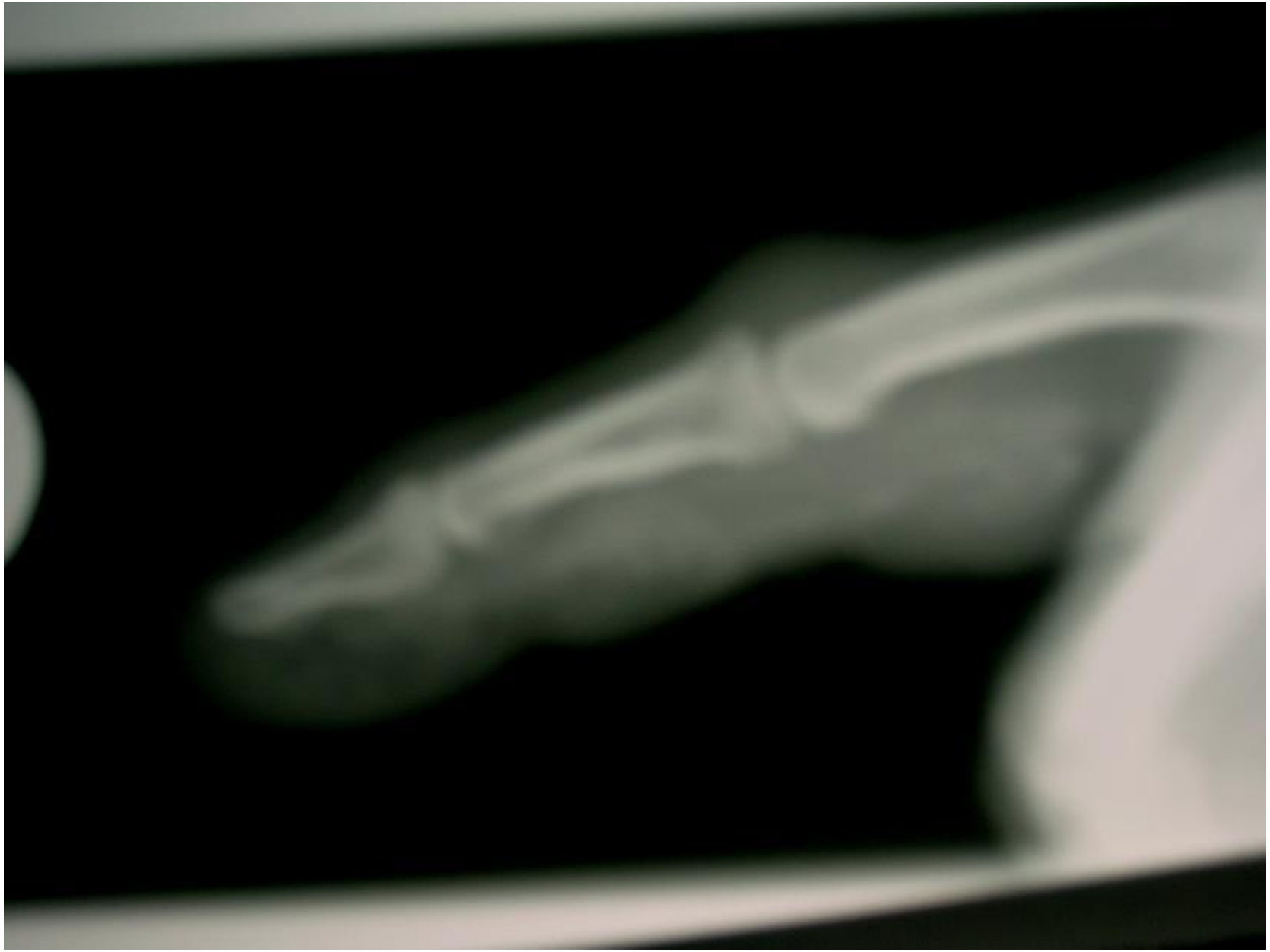
LISFRANC'S FX

FEMC
Florida Emergency Medicine Clerkship

Jones Fracture

TENOSYNOVITIS

FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

BURNS

THERMAL INJURIES

- Modern burn resuscitation has mirrored the changes in trauma fluid resuscitation.
- Adult patients with deep-partial and full-thickness burns involving more than 20 percent of the total body surface area (TBSA) should receive initial fluid resuscitation of 2 ml of lactated ringers/%TBSA.
- Target fluid resuscitation is calculated based on 3 ml/kg/%TBSA in pediatric trauma patients and 4 ml/kg/%TBSA for electrical burns.

THERMAL INJURIES

- Half of the fluid is given over the course of eight hours and the remaining half is provided over a span of 16 hours.
- The rate of fluid administration should be titrated to effect using a target urine output of 0.5 ml/kg/hr in adults or 1 ml/kg/hr in children who are hemodynamically normal.
- Boluses are reserved for unstable patients.

ETIOLOGY

- Fire – 75%
- Scalding – 15%
- Chemical – 5%
- Electrical – 5%
- Radiation – 1%

HOUSEHOLD: ETIOLOGY

- Smoking – 19%
- Heaters – 14%
- Fire – 16%
- Electrical – 12%
- Cooking – 7%
- Appliances – 4%
- Child play – 4%

BURN MECHANISMS

- Explosion
- Falls
- MVA
- High voltage injuries
- Steam injuries
- Caustics/chemical

AIRWAY

- Consider intubation in patient with respiratory distress
- 100% oxygen
- May need nasal airway

EXTENSION OF BURNS

- Percent of the total body surface area (BSA)
- Adult palm = 1%
- Rule of 9
- Burn chart

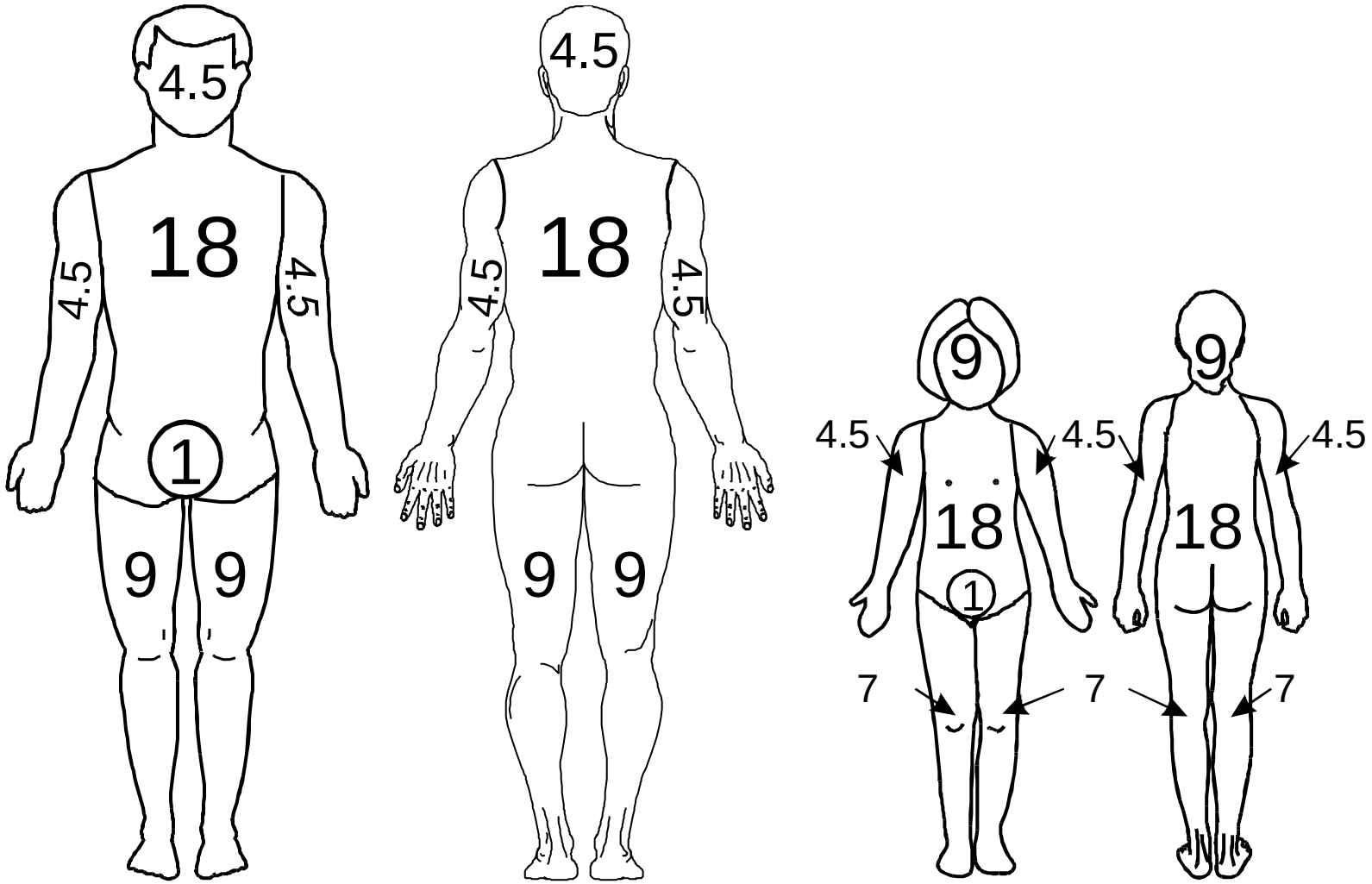
RULE OF NINE

- Head – 9%
- Arm – 9%
- Anterior trunk – 18%
- Posterior trunk – 18%
- Lower extremity – 18%
- Genitalia – 1%

BODY SURFACE AREA

- Rule of Nines
  - Best used for large surface areas
  - Expedient tool to measure extent of burn
- Rule of Palms
  - Best used for burns < 10% BSA

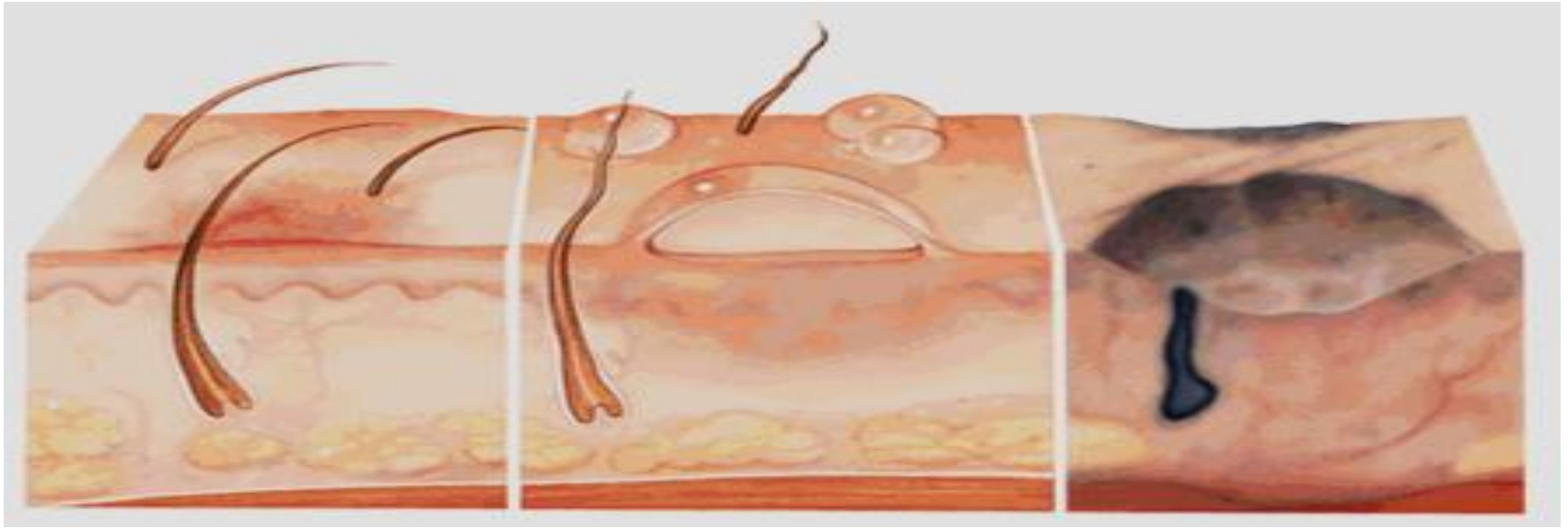
RULES OF NINES

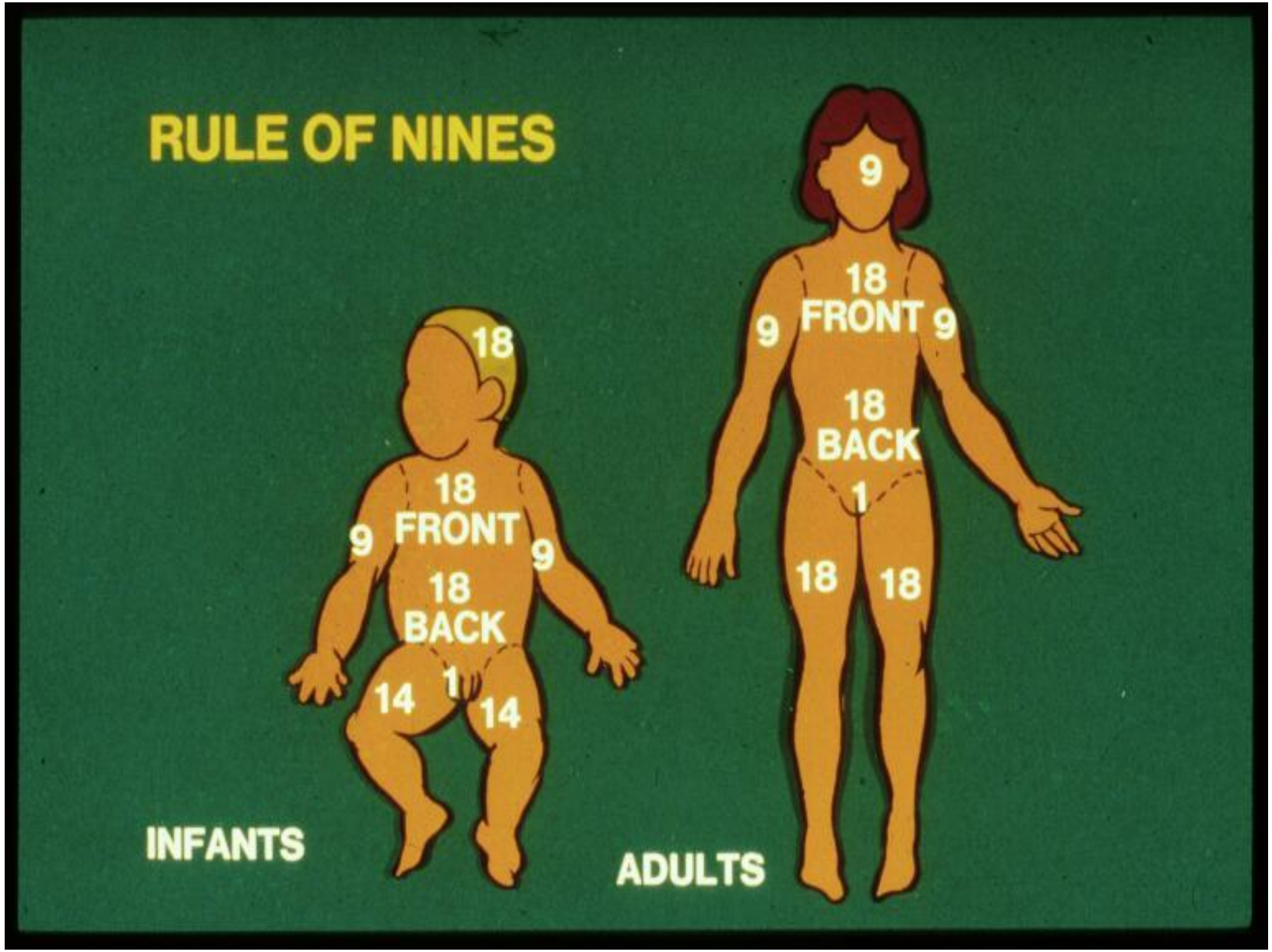


FEMC
Florida Emergency Medicine Clerkship

RULE OF PALMS

- A burn equivalent to the size of the patient's hand is equal to 1% body surface area (BSA)

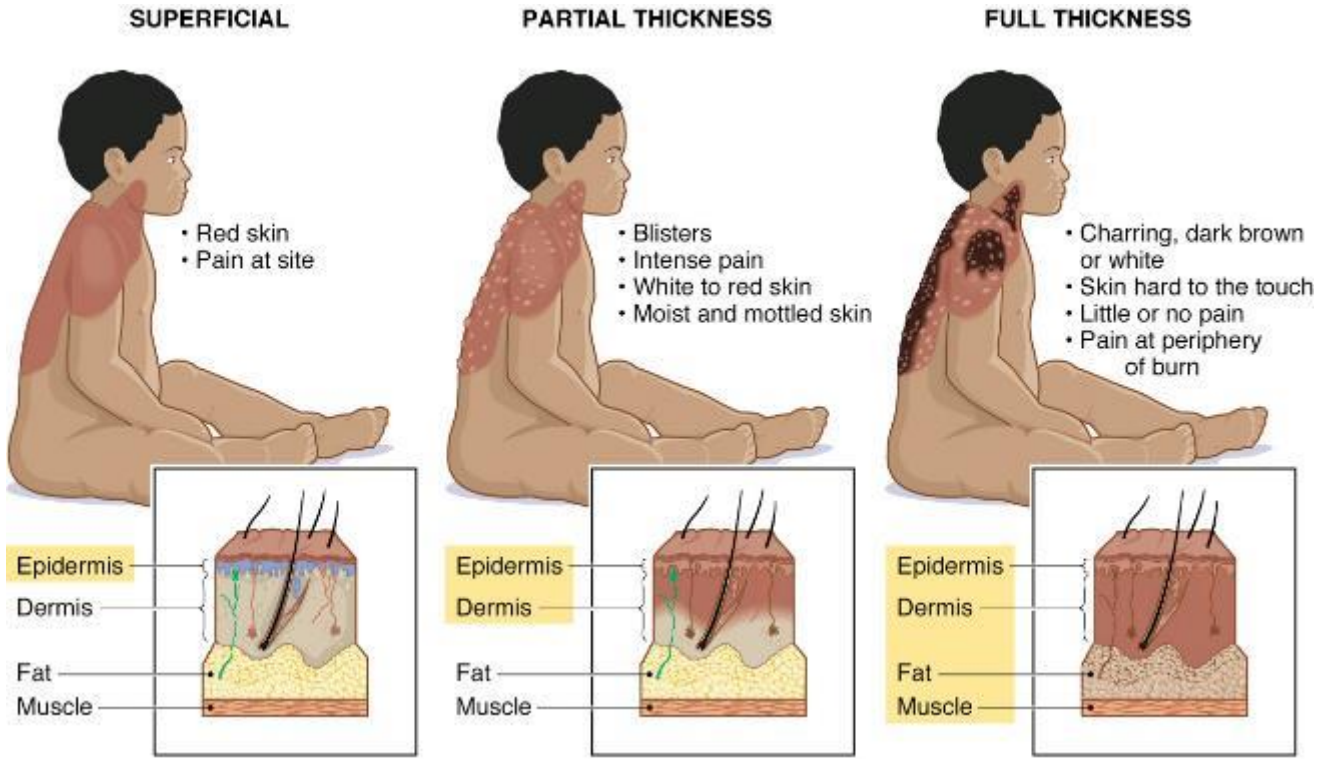




FEMC
Florida Emergency Medicine Clerkship

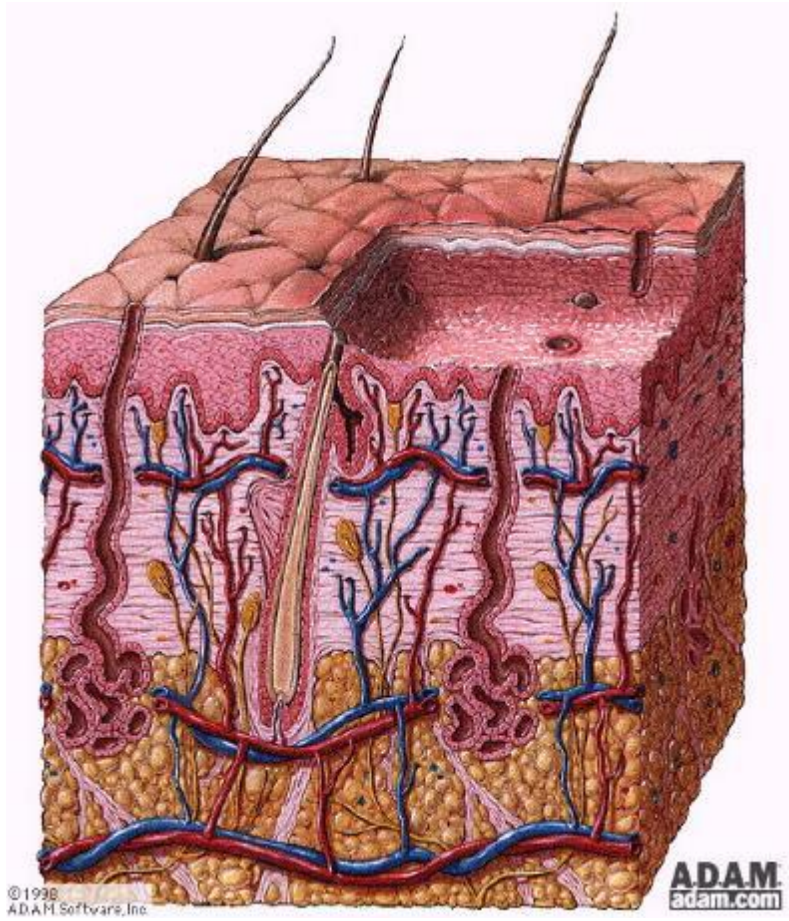
DEPTH OF BURN

- Superficial Burn
- Partial Thickness Burn
- Full Thickness Burn



FEMC
Florida Emergency Medicine Clerkship

BURN DEPTH

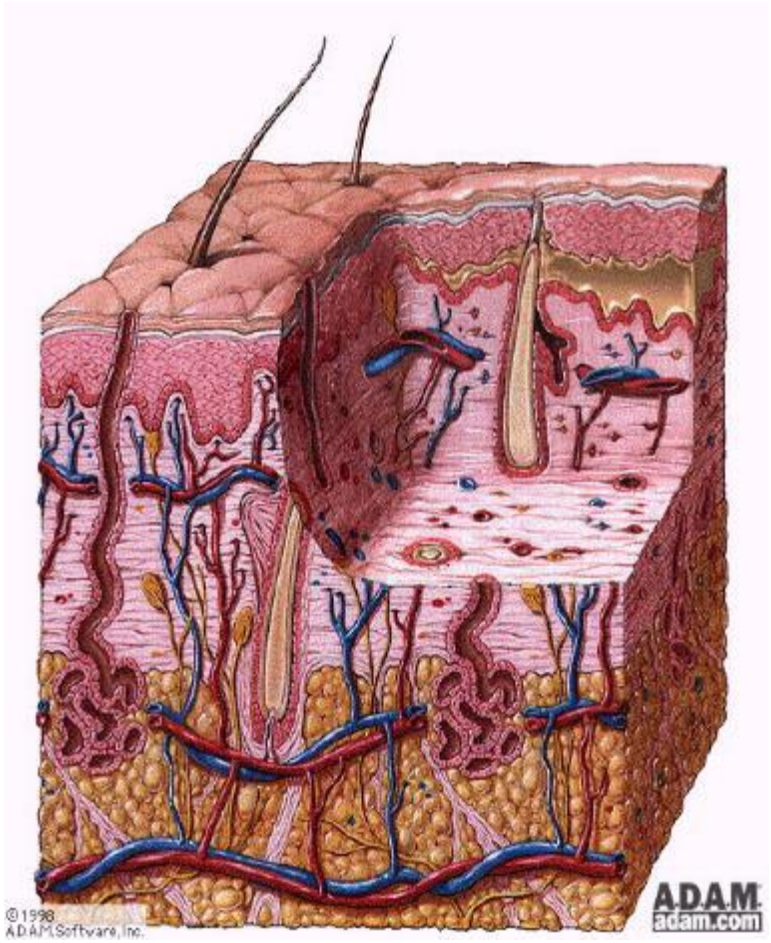


- Superficial Burn:
  1st Degree Burn
  - Signs & Symptoms
    - Reddened skin
    - Pain at burn site
    - Involves only epidermis

1ST DEGREE BURNS

- Scalding
  - Erythema, no blisters
  - Pain
  - Edema
  - Heal in 3 - 7 days, no scar
  - Analgesia

BURN DEPTH



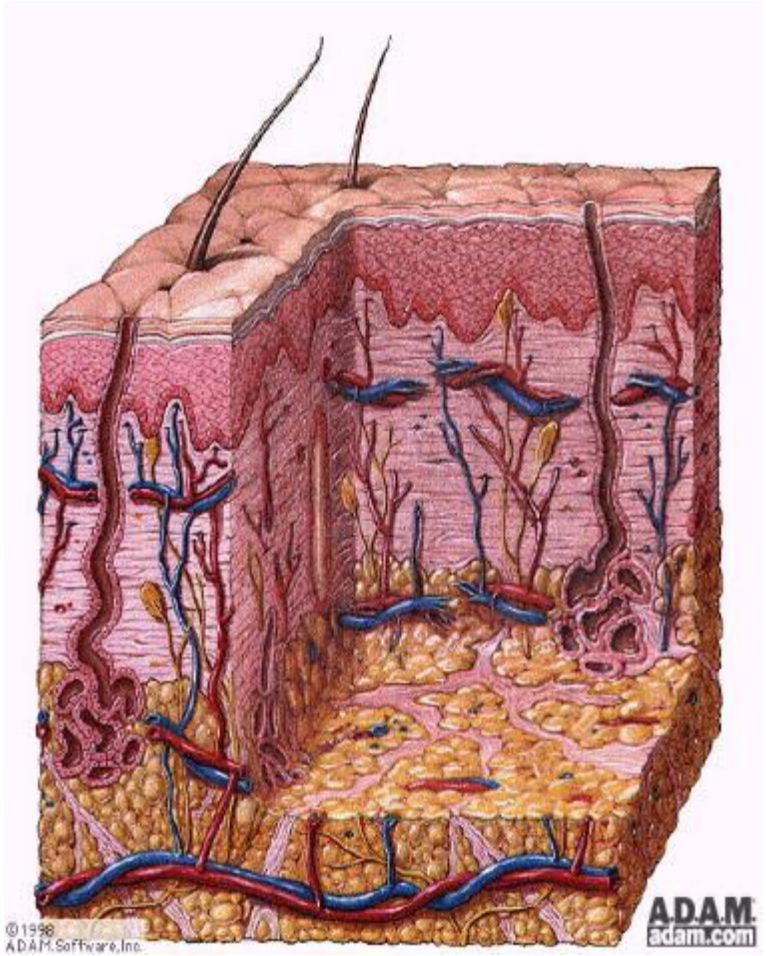
- Partial-Thickness Burn: 2nd Degree Burn
  - Signs & Symptoms
    - Intense pain
    - White to red skin
    - Blisters
    - Involves epidermis & dermis

FEMC
Florida Emergency Medicine Clerkship

2ND DEGREE BURN

- Injury to superficial dermis
  - Erythema
  - Bulla
    - Clear
    - Hemorrhagic
  - Pain
  - May scar
  - Heal in 21 - 28 days
  - Antibacterial ointments
  - Possibility for skin graft

BURN DEPTH



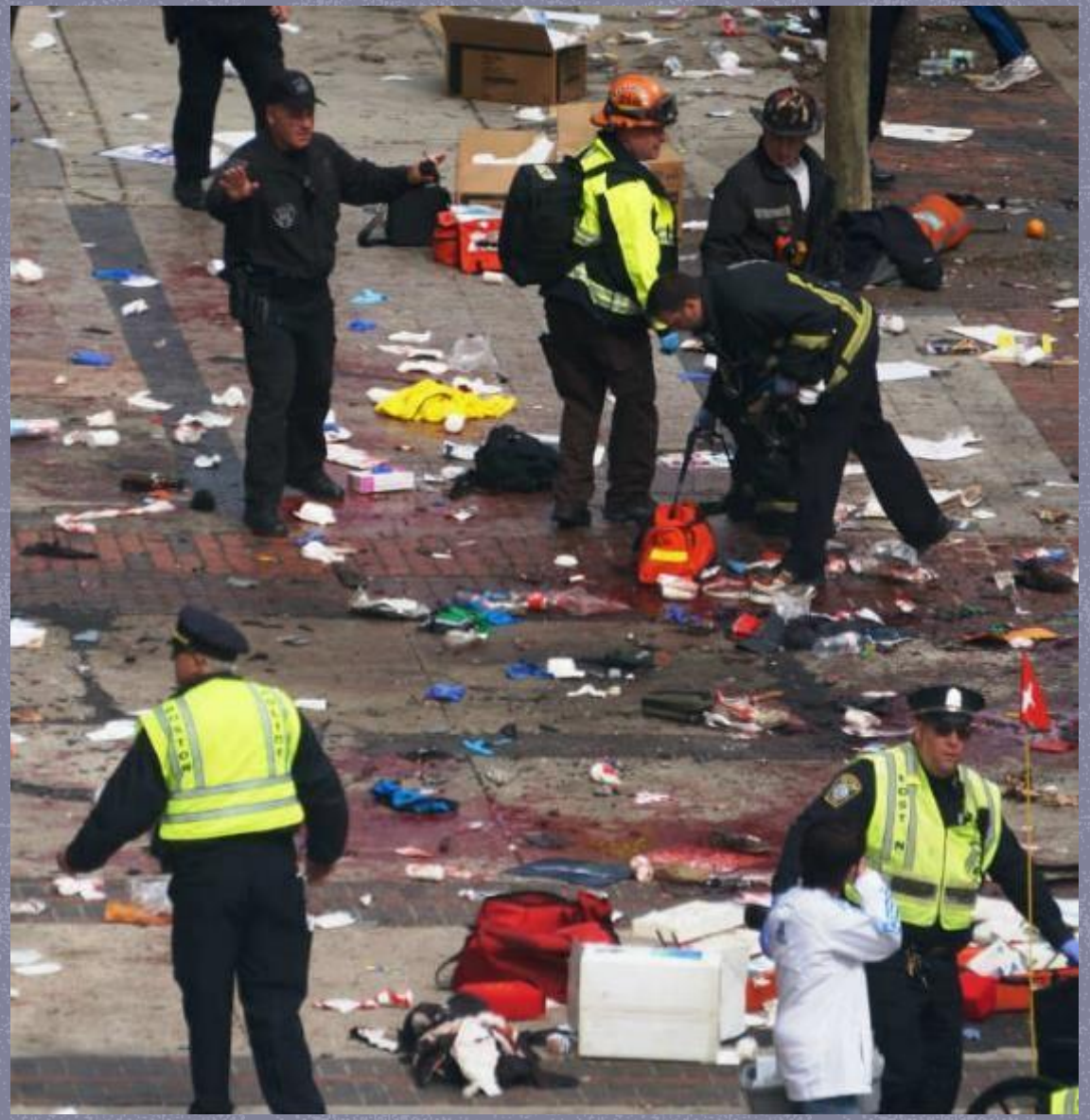
- Full-Thickness Burn: 3rd Degree Burn
  - Signs & Symptoms
    - Dry, leathery skin (white, dark brown, or charred)
    - Loss of sensation (little pain)
    - All dermal layers/tissue may be involved

3RD DEGREE BURN

- Penetrate subcutaneous tissue; destruction of dermis
  - Black or white skin
  - Sensory decreased
  - Vascular thrombosis
  - Healing if the borders are < 1 ¼ ” in diameter
  - Skin graft

ALSO REMEMBER…

- CO
- CN
- Rhabdo
- Underlying explosion
  - Blast wave pressure (hollow viscous injury)
  - Debris (penetrating)
  - Trauma from patient thrown/hit by objects
  - Everything else (burns, smoke, BRC (biological, radiation, chemical)
  - Be careful with 2ry explosion



PEDIATRIC TRAUMA

- A 7-year-old boy is struck by a moving car while riding his bicycle.
- He was not wearing a helmet.
- He is unresponsive on arrival, breathing rapidly, and pale with dusky extremities.
- Vital signs on admission: HR 144, RR 38, BP 84/60, GCS score 5 (E = 1, V = 2, M = 2)

GOALS

- Kids are not small adults
- Identification and management of injuries
- Recognize child abuse

PEDIATRIC TRAUMA

- The recommendation for the site for needle decompression of the chest continues to be the second intercostal space mid-clavicular line in this new edition.
- Damage control resuscitation for pediatric trauma patients is defined as an attempt to limit the use of crystalloid resuscitation, as in adults.
  - An initial bolus of 20 ml/kg bolus of fluid is followed by 10–20 ml/kg of packed red blood cells and 10–20 ml/kg of fresh frozen plasma and platelets as part of a massive transfusion protocol.
  - Thus far, no survival advantage has been demonstrated with this approach.

SHOCK

- Inadequate tissue perfusion
- Initial compensation
- Tachycardia
- Hypotension ~ 25% Blood loss
- Bradycardia
- Death

PEDIATRIC BLOOD VOLUME

- Average child 80 mL/kg
- After 25% hemorrhage, hypotension occurs
- 20 mL/kg is 25% of 80 mL/kg
- Systolic = 80 + 2 x age
- Diastolic 2/3 of systolic

RESUSCITATION

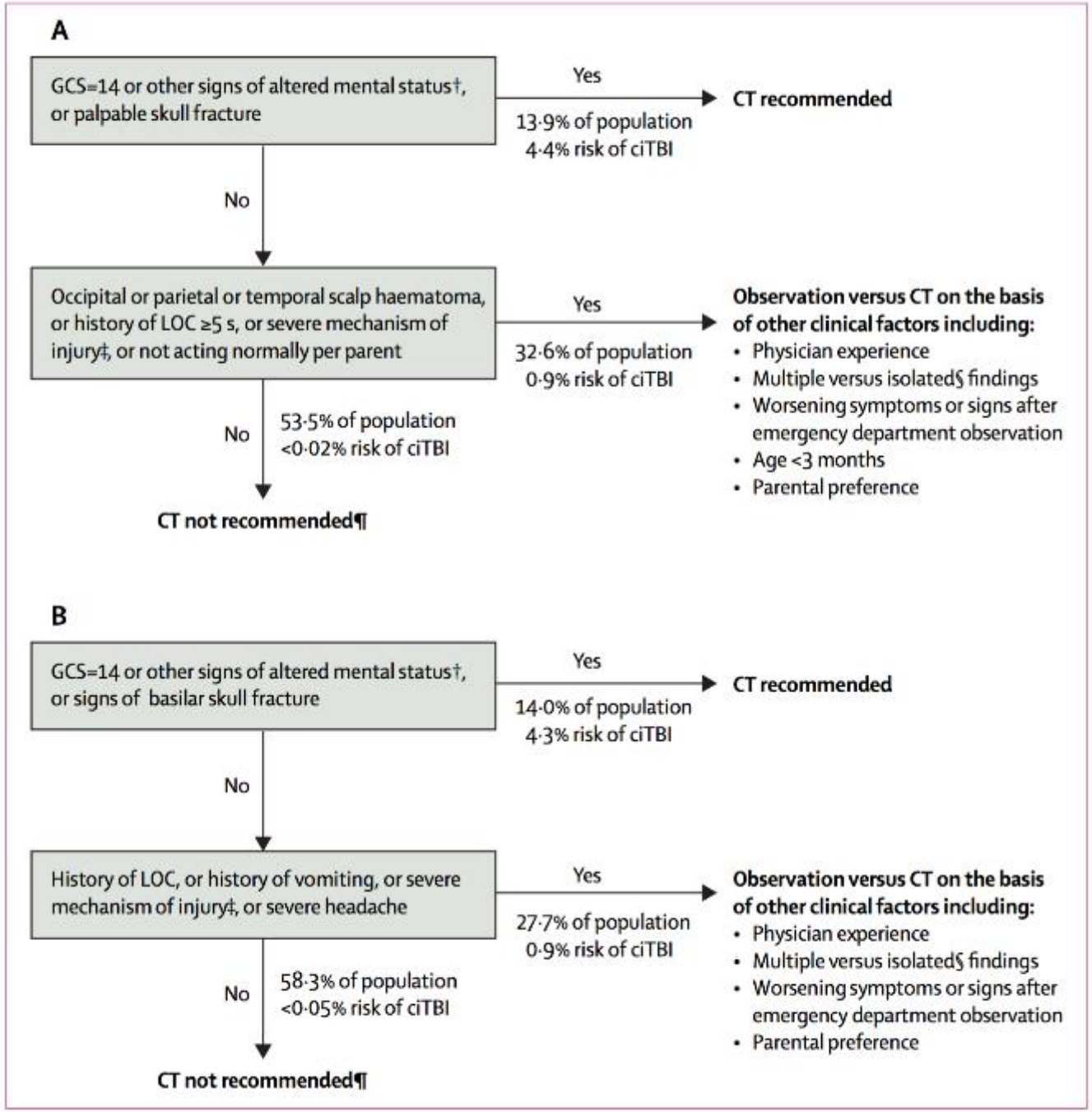
- Peripheral IV
- Intraosseous
- Crystalloid bolus of 20 mL/kg X 2
- PRBC's 10 mL/kg
- Climate control

PEDIATRIC TRAUMA

FEMC
Florida Emergency Medicine Clerkship

ADEQUATE TREATMENT?

- Heart rate <130/min
- Color and capillary refill return
- Mental status improves
- UO > 1 mL/kg/hr.
- SBP > 80 mmHg.



FEMC
Florida Emergency Medicine Clerkship

HEAD TRAUMA

- 80% of trauma in kids
- Etiology of 80 to 90% of traumatic deaths
- 6% are surgical lesions
- Cerebral edema is most common
- Epidural or subgaleal bleeding
- Anterior fontanel hematoma
- Vomiting is not always increased ICP

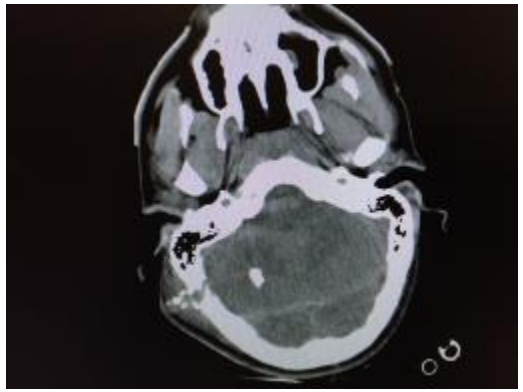
MODIFIED GCS

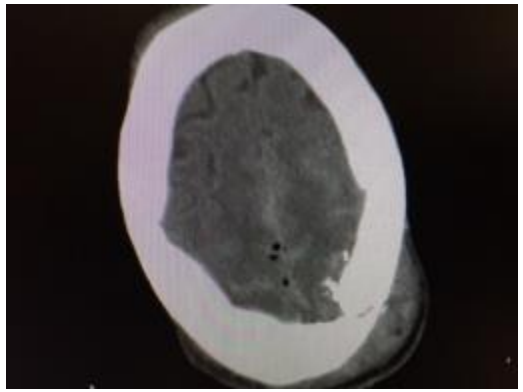
- **Eye Opening**
  - Spontaneous - 4
  - To voice - 3
  - To pain - 2
  - Closed - 1
- **Verbal Response**
  - Cries strong - 5
  - Irritable - 4
  - Cries with stimuli - 3
  - Cries with pain - 2
  - None - 1
- **Motor Response**
  - Obeys -6
  - To stimuli -5
  - Pain withdrawal -4
  - Flexion -3
  - Extension -2
  - None -1

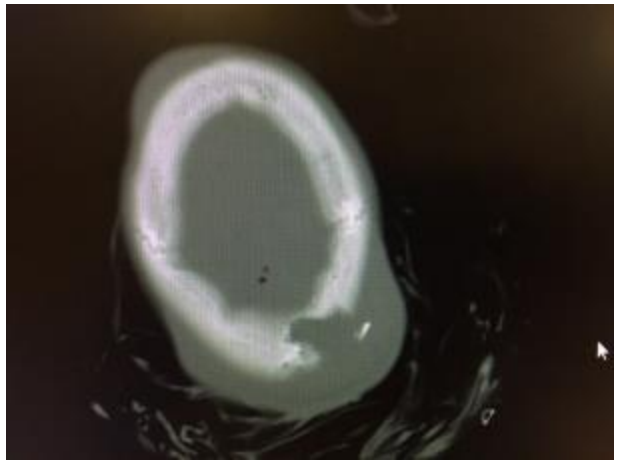
FEMC Florida Emergency Medicine Clerkship

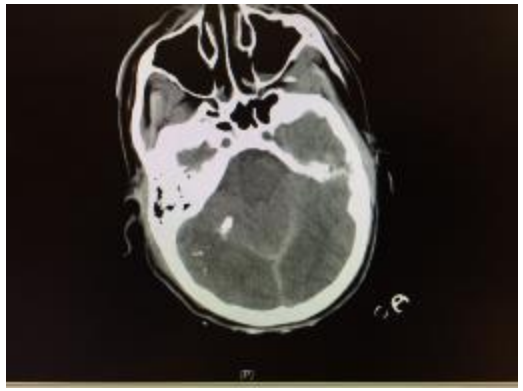
MODIFIED VERBAL GCS

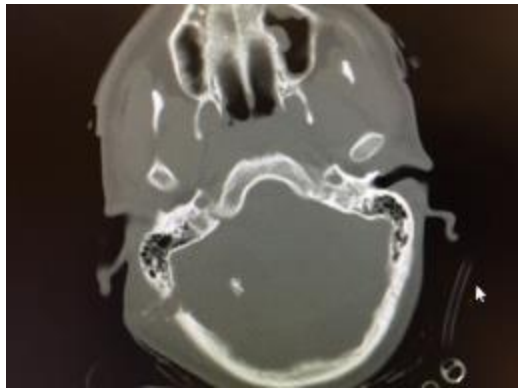
Cries recognizes objects	- 5	
Consolable crying		- 4
Irritable, not cooperative	- 3	
Lethargic		- 2
No response		- 1

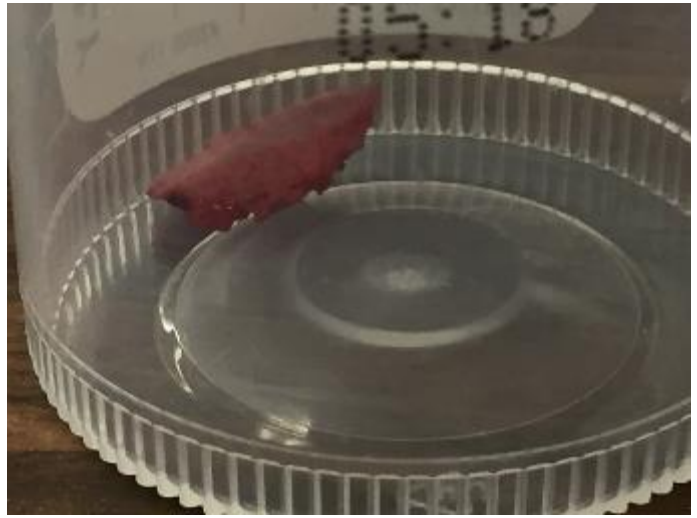


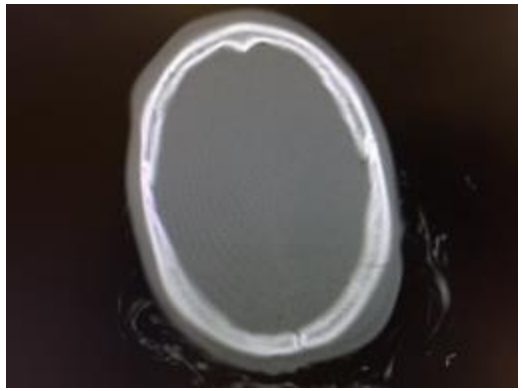


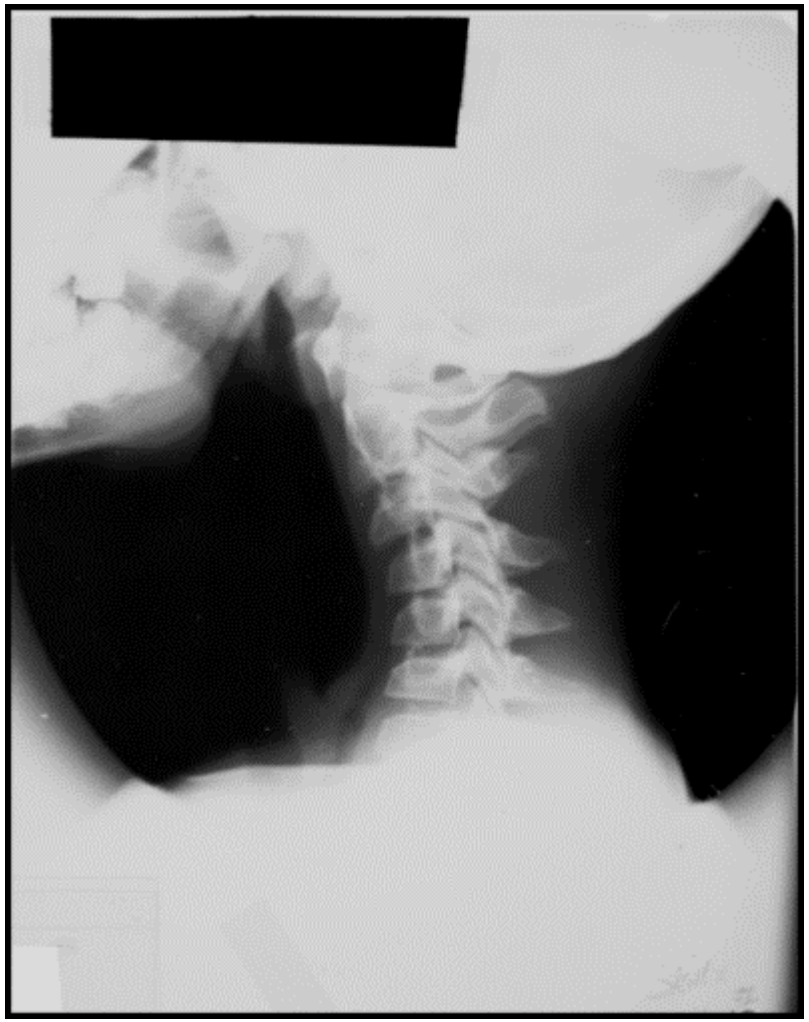












Flexible spinal ligaments
Anteriorly wedged vertebrae
Flat facet joints
Angular momentum forces
Pseudosubluxation
SCIWORA

NECK TRAUMA

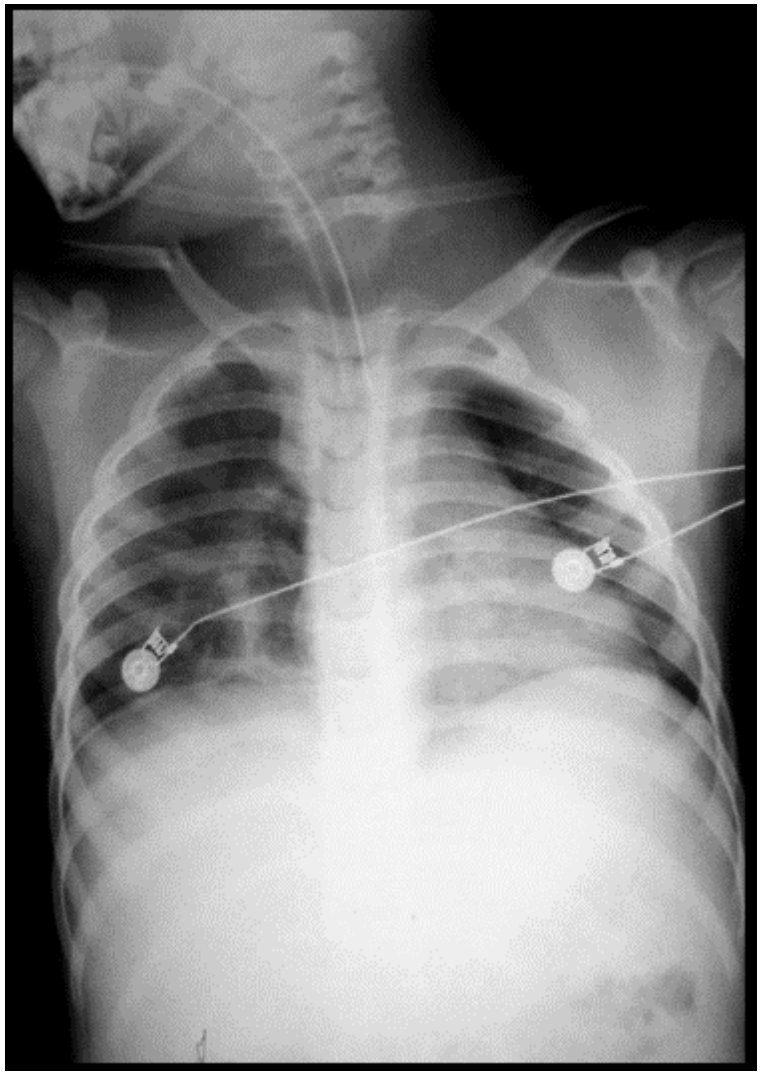
- Loose ligaments
- Do you have neck pain?
- SCIWORA
  - Spinal cord injury without radiological abnormality

C-SPINE X-RAYS

- Pseudo-subluxation of C2 & C3 or C3 & C4.
- Pre-dental space 5 mm
- Pre-vertebral space false edema on expiration
- Fracture *vs.* cartilage

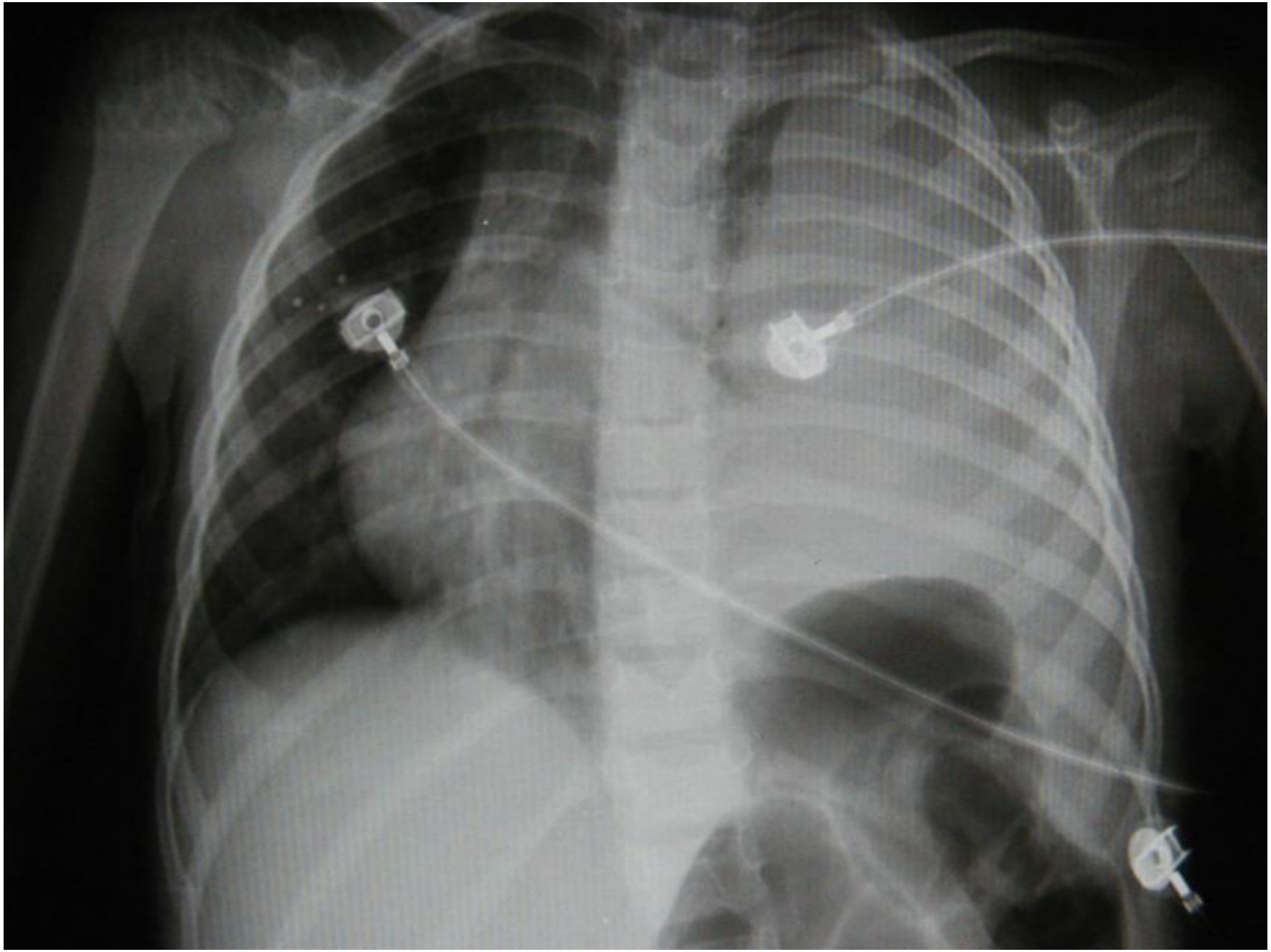
THORAX AND ABDOMINAL TRAUMA

- Primary and secondary surveys are similar to adult
- Rib fractures means strong force
- Rare aortic lesions
- Relative organomegaly



Soft, pliable, soft wall – pulmonary contusion
Horizontally aligned ribs, weak intercostal muscles
Rib fractures indicate significant force
Tension pneumothorax poorly tolerated

FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

CHILD ABUSE

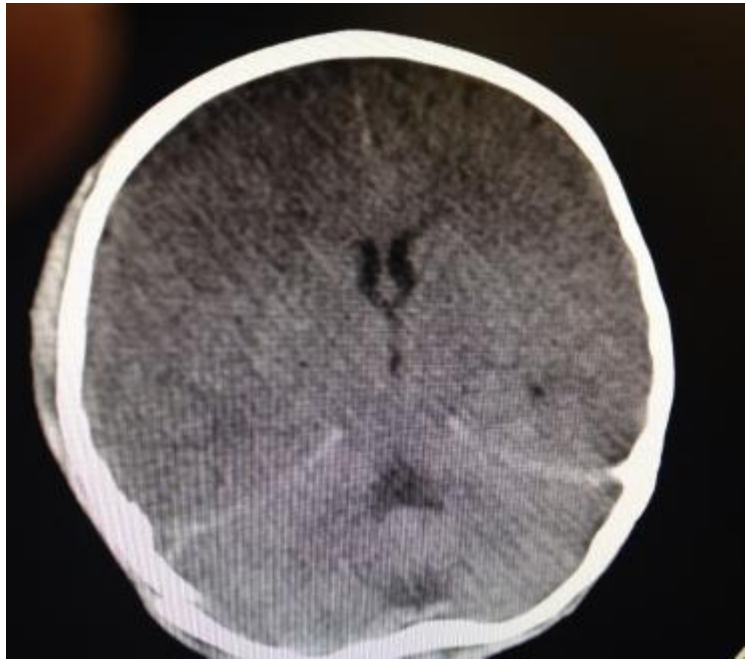
- Non-accidental trauma
- Usually caused by caretakers
- Intervention and prevention
- Error on the side of caution
- Not a cultural issue

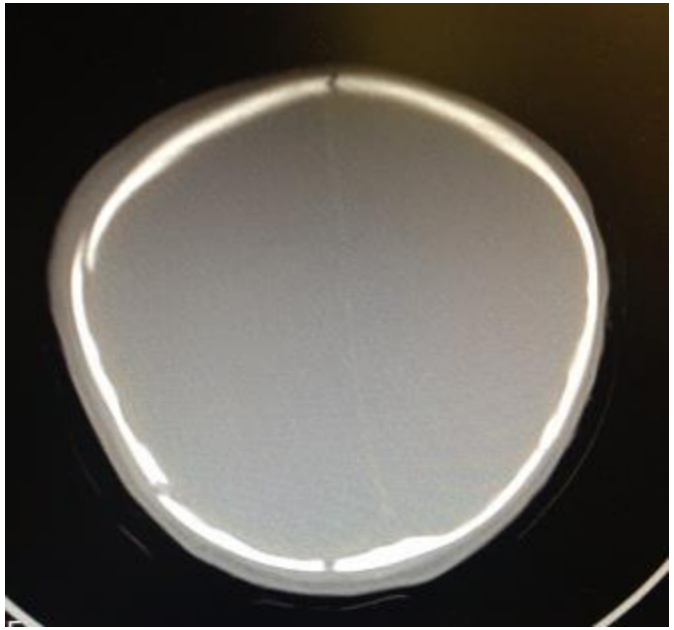
CHILD ABUSE

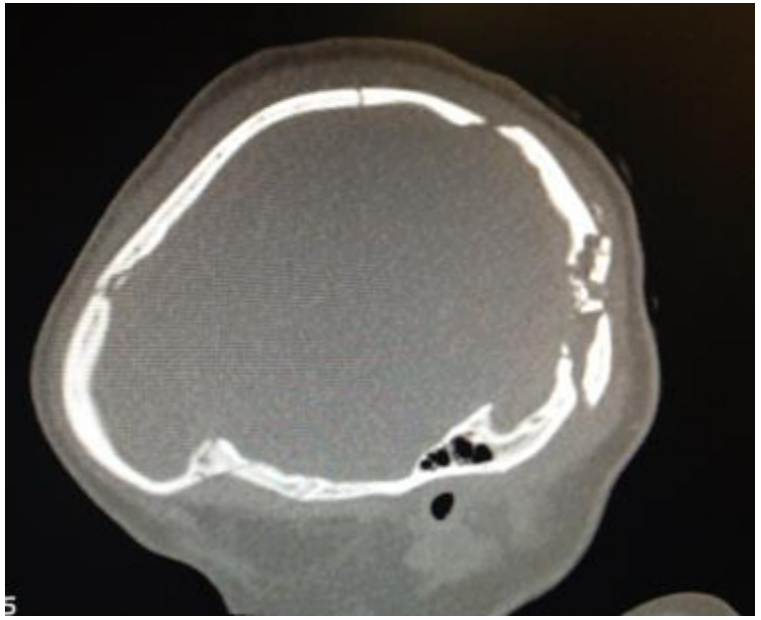
- History that is inconsistent with injury
- Delay in treatment
- Caretaker with inappropriate response
- Patient is afraid of caretaker

FEMC
Florida Emergency Medicine Clerkship

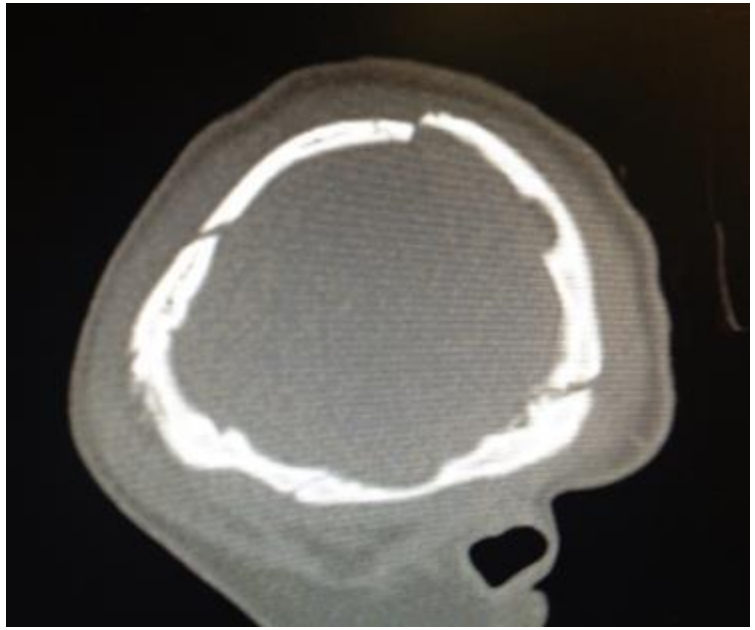
FEMC
Florida Emergency Medicine Clerkship



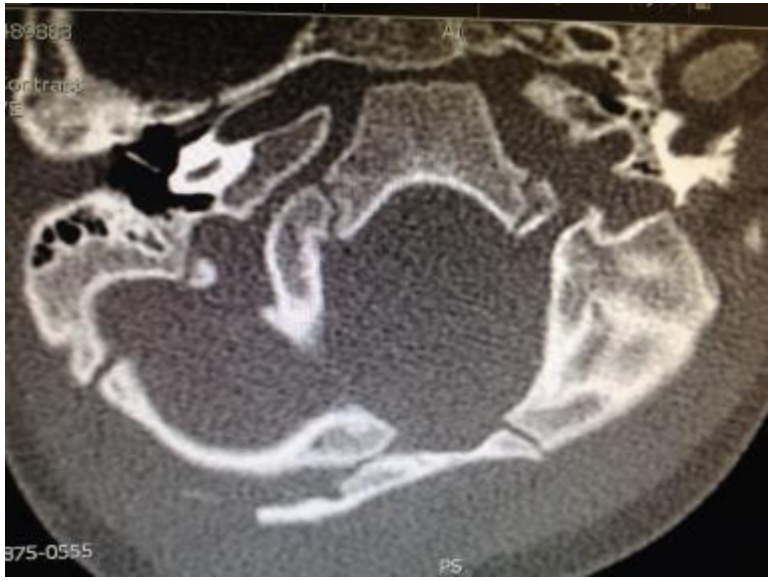




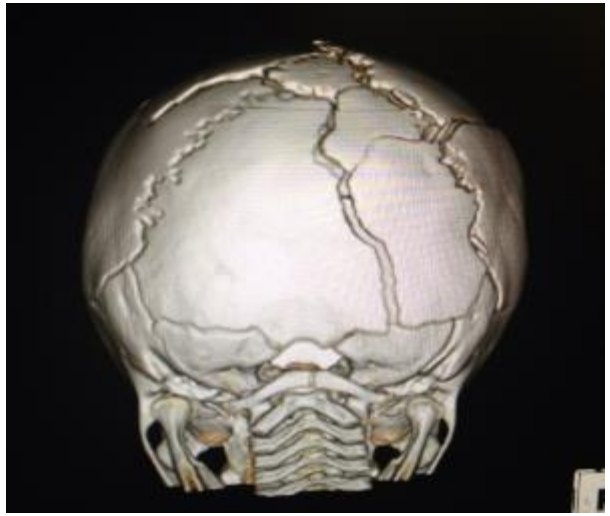
FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship



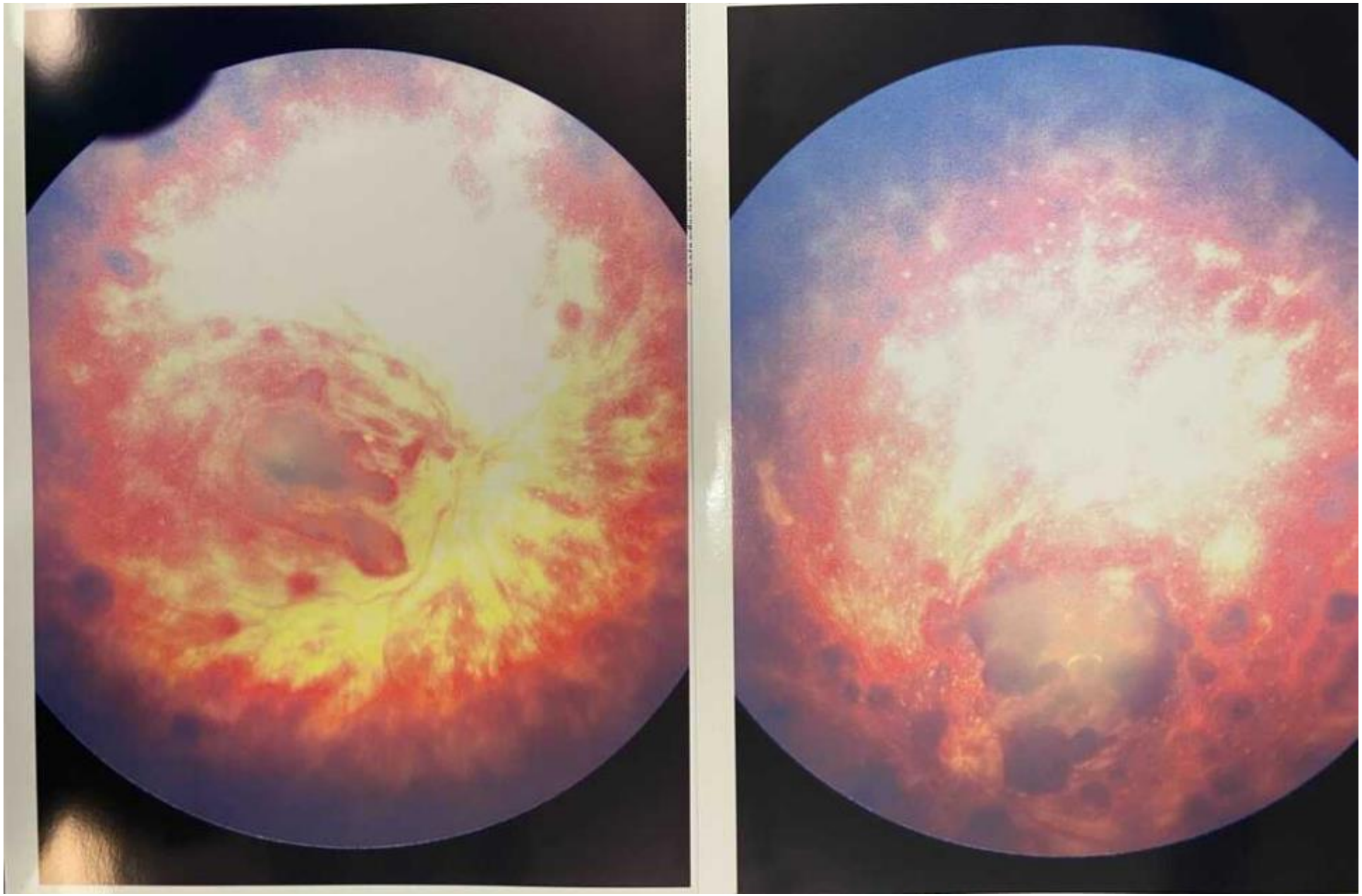
FEMC
Florida Emergency Medicine Clerkship



FEMC
Florida Emergency Medicine Clerkship

CHILD ABUSE EXAM

- Retinal hemorrhage
- Peri-oral, perineal, anal, or genital lesions
- Ecchymosis of different stages and areas
- Cigarette burns
- Belt or rope marks
- Patterned burns
- "Grab" marks



FEMC
Florida Emergency Medicine Clerkship

GERIATRIC TRAUMA

- The elderly are becoming an increasingly prevalent demographic among trauma patients.
- The following five preexisting conditions affect morbidity and mortality:
  - Cirrhosis
  - Coagulopathy
  - Chronic obstructive pulmonary disease
  - Ischemic heart disease
  - Diabetes mellitus
- Medications like BB's and CCB's can mask shock

GERIATRIC TRAUMA

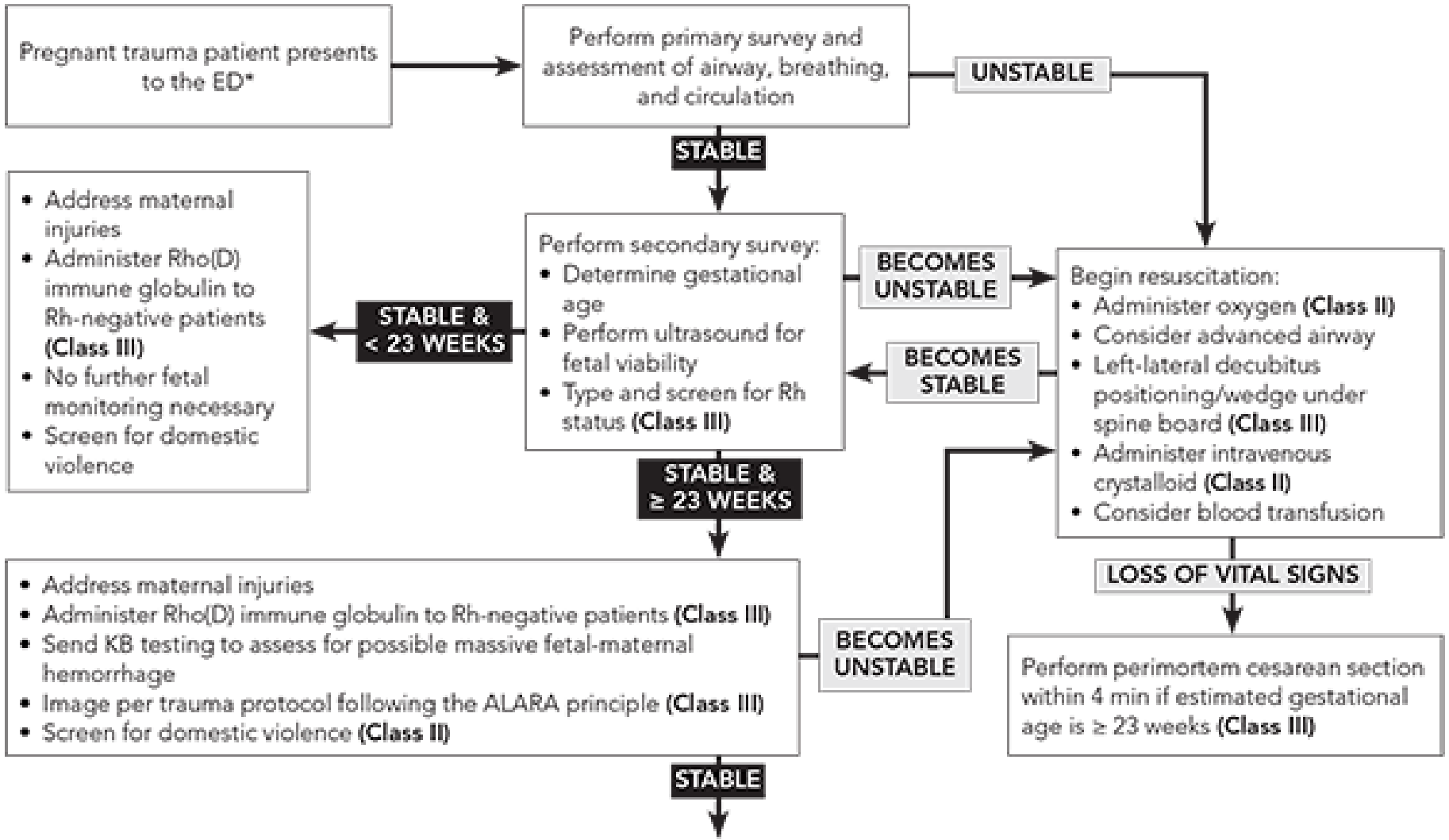
- Elderly patients with one or more of these preexisting conditions are twice as likely to die as those without.
- Pelvic fractures in older patients result in a greater need for transfusion even with stable patterns of injury. The mortality is four times higher with these injuries, hospital stays are longer, and these patients may not return to independent lifestyles.

TRAUMA IN PREGNANCY

TRAUMA IN PREGNANCY AND INTERPERSONAL VIOLENCE

- The key content update in this chapter concerns the following: Indication of amniotic fluid leakage is vaginal fluid ph of >4.5.

Clinical Pathway for Management of Pregnant Trauma Patients in the Emergency Department



FEMC Florida Emergency Medicine Clerkship

Trauma in the obstetrical patient: a bedside tool

VITAL SIGNS			
Position	Hypotension treatment and prophylaxis > 20 weeks, left lateral decubitus.		
Hypotension	See “Treatments,” below.	IV fluids	Transfusion
Hypertension	Criteria: ≥140 systolic, >90 diastolic		Treat: >160 systolic, >110 diastolic
Fetal Uterine Monitoring	>20 weeks; initiate as soon as possible.		
	If unable to offer OB intervention, stabilize and arrange prompt transfer.		
Vaginal Bleeding	Treat hypotension as above, OB consultation, Rh negative gets RhIG.		

Trauma in the obstetrical patient: a bedside tool

LAB (IN ADDITION TO USUAL TRAUMA STUDIES)	
CBC	Low hematocrit
Type screen Kleihauer-Betke	Rh-negative
Coagulation Profile	INR, PTT, fibrin degradation, fibrinogen, i-Coombs

DIAGNOSTIC IMAGING

- Order for the same general indications as for nonpregnant patients.
- Coordinate with radiologist and consider ultrasound to replace x-ray when possible.
- Shield abdomen, pelvis, and neck when possible.

Trauma in the obstetrical patient: a bedside tool

TREATMENTS (MEDICATIONS LISTED ARE COMMONLY RECOMMENDED)		
IV Fluids	Patients require larger fluid requirements when hypotensive; avoid dextrose (D5) loads.	
Oxygen	To avoid fetal hypoxia, administer high-concentration oxygen.	
Intubation and rapid sequence induction	Indications for procedures are generally similar to nonpregnancy.	
Analgesia	Use as needed, and inform OB of doses and times if fetal delivery is anticipated.	
Antiemetics	metoclopramide	5–10 mg IV or IM
	ondansetron	4–8 mg IV
Antibiotics	Ceftriaxone	1 g IV
	(if penicillin allergy) clindamycin	600 mg IV
Transfusion	CMV antibody—neg	leukocyte—reduce
Rh-negative	RhIG 1 ampule (300 g) IM	
Tetanus	Td safe	
BP >160 s, >110 d Hypertension	labetalol 10–20 mg IV bolus	
Seizures	Eclamptic	magnesium sulfate 4–6 Gm IV load over 15–20 minutes
	Non-eclamptic	lorazepam 1–2 mg/min IV
CPR ACLS >20 wks	Patient should be in left lateral decubitus position. If no return of spontaneously circulation after 4 minutes of CPR, consider cesarean delivery of viable fetus.	

FEMC Florida Emergency Medicine Clerkship

Trauma in the obstetrical patient: a bedside tool

DISPOSITION	
Admission and Monitoring	4 hours fetal monitoring of potentially viable fetus
Discharge	Prompt follow up with OB

SUPINE HYPOTENSIVE SYNDROME

- Hypotension from uterine compression inferior vena cava
- Displace uterus to the left
- Elevate the right side of the backboard

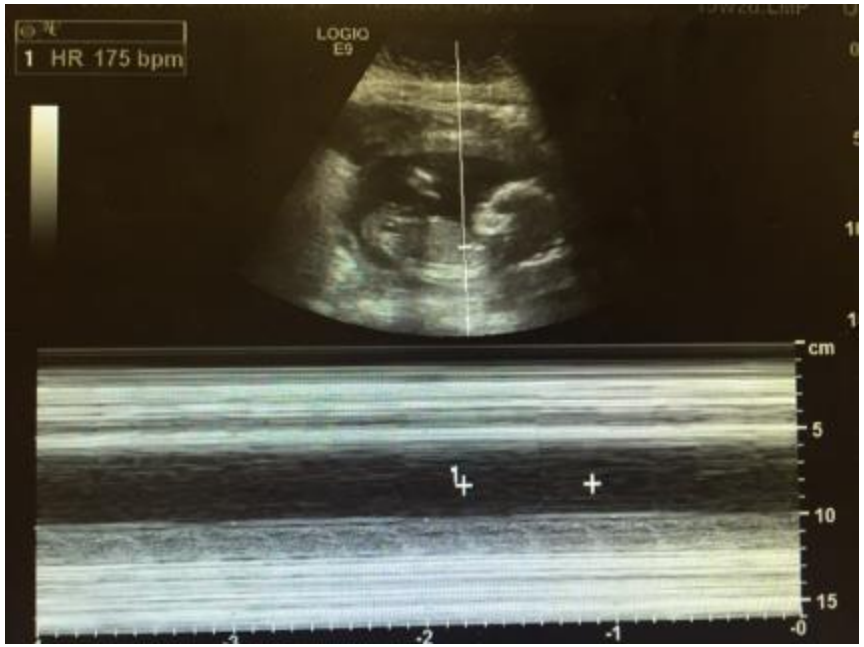
PLACENTAL ABRUPTION

- Separation of placenta from uterus
- Tender firm uterus
- ±Vaginal dark red bleeding
  - Concealed bleeding
- Minor trauma
- Abruption in 3% cases
- Account for 90% of all abruptions
- Fetal heart monitoring for six hours

FEMC
Florida Emergency Medicine Clerkship

PLACENTA PREVIA

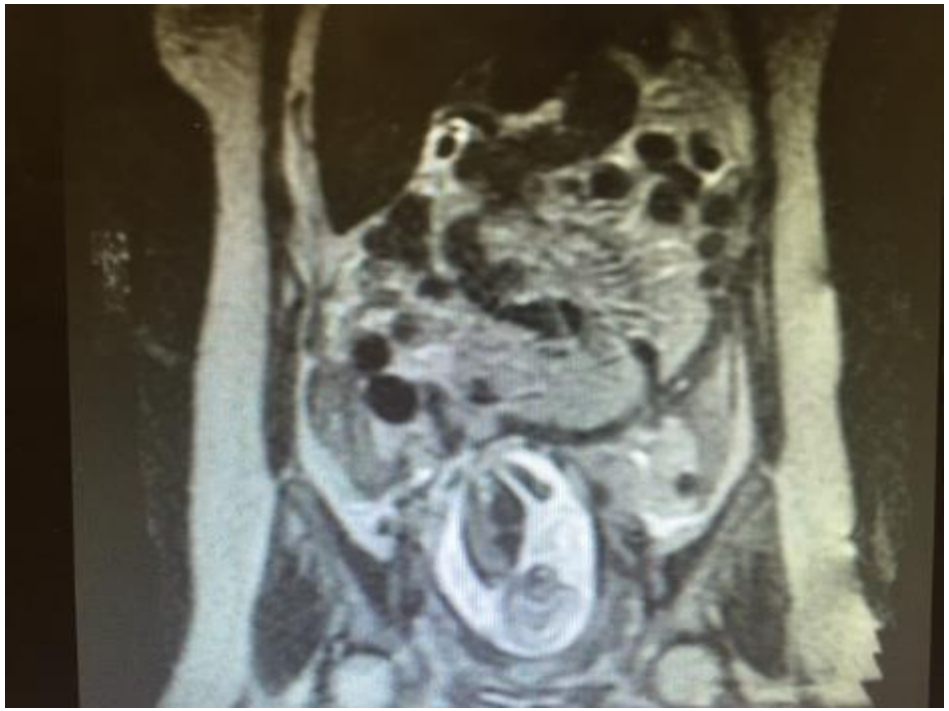
- Tear in placenta insertion
- Third trimester
- Painless red bleeding
- ED vaginal exam is contraindicated
  - Double setup
  - OR

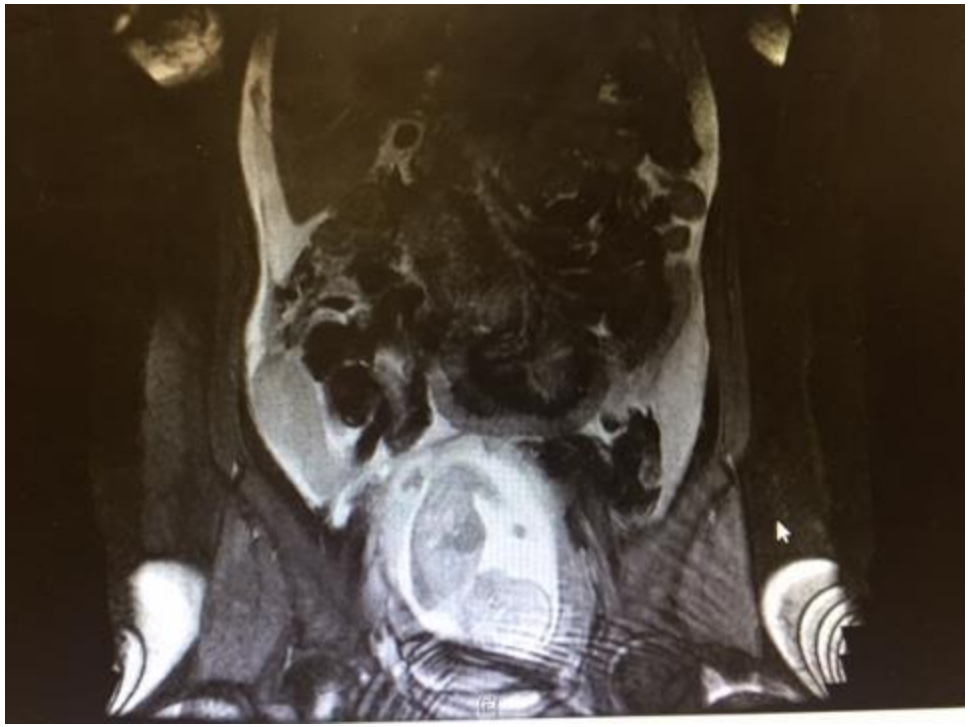


FEMC
Florida Emergency Medicine Clerkship

UTERINE RUPTURE

- Only after 12 weeks
- More likely during the 2nd half of pregnancy
- Less than 1% all trauma
- High energy impact
- Local tenderness
- Loss of uterine contour
- Hysterectomy




R

OTHER COMPLICATIONS

- Amniotic fluid embolism (rare)
  - Abdominal contusion
  - Manifests as DIC/PE
- Increased risk for DVT

ISOIMMUNIZATION

- Rh negative patients
  - Minor trauma
  - Rhogam should be given within 72 hours
  - 12 weeks
  - 300 mcg rhogam will neutralize 30 mL of fetal blood
  - Keinhauer Betke test may be used to quantify fetal blood in maternal circulation

PERI-MORTUM C-SECTION

- Last heroic effort
- Possible life saving for mom or fetus
- Four minutes to make decision
- Four minutes to do procedure

SUMMARY

- ABC's
- Secondary evaluation
  - Uterus and fetus
- Venacaval compression
- Maternal hypotension
- Rh isoimmunization
- Analgesia
- **Mom comes first!**

WHAT TRAUMATIC INJURIES ARE OFTEN MISSED ON CT?

Name 2

WHAT TRAUMATIC INJURIES ARE OFTEN MISSED ON CT?

Diaphragmatic injury
Pancreas injury
Basilar skull fractures
Hollow viscous injuries

WHEN SHOULD A PATIENT BE TRANSFERRED TO A BURN CENTER?

Name 2 Criteria

WHEN SHOULD A PATIENT BE TRANSFERRED TO A BURN CENTER?

Criteria for Transfer to Burn Center

- 2nd degree > 10%
- Any 3rd/4th degree burns
- Burns on hands, face, feet, genitals, major joints
- Electrical or chemical burns
- Inhalation injuries
- Circumferential burns
- Significant comorbidities or associated trauma

INDICATION FOR ED THORACOTOMY?

Penetrating Chest Trauma + ???

INDICATION FOR OR THORACOTOMY?

Initial Chest Tube Output??

INDICATION FOR ED THORACOTOMY?

Penetrating Chest Trauma + Witnessed Loss of Vitals

INDICATION FOR OR THORACOTOMY?

Initial Chest Tube Output: >1500cc

FEMC
Florida Emergency Medicine Clerkship

WHEN SHOULD PENETRATING ABDOMINAL INJURY BE TAKEN STRAIGHT TO THE OR?

Name 2 Criteria

FEMC
Florida Emergency Medicine Clerkship

WHEN SHOULD PENETRATING ABDOMINAL INJURY BE TAKEN STRAIGHT TO THE OR?

Peritoneal signs

+FAST w/ hemodynamic instability

Evisceration

Blood at rectum

Free air

WHEN SHOULD DIAGNOSTIC PERITONEAL LAVAGE BE CONSIDERED POSITIVE FOR PENETRATING TRAUMA?

Gross Blood Amount??

After 1L NS??

WHEN SHOULD DIAGNOSTIC PERITONEAL LAVAGE BE CONSIDERED POSITIVE FOR PENETRATING TRAUMA?

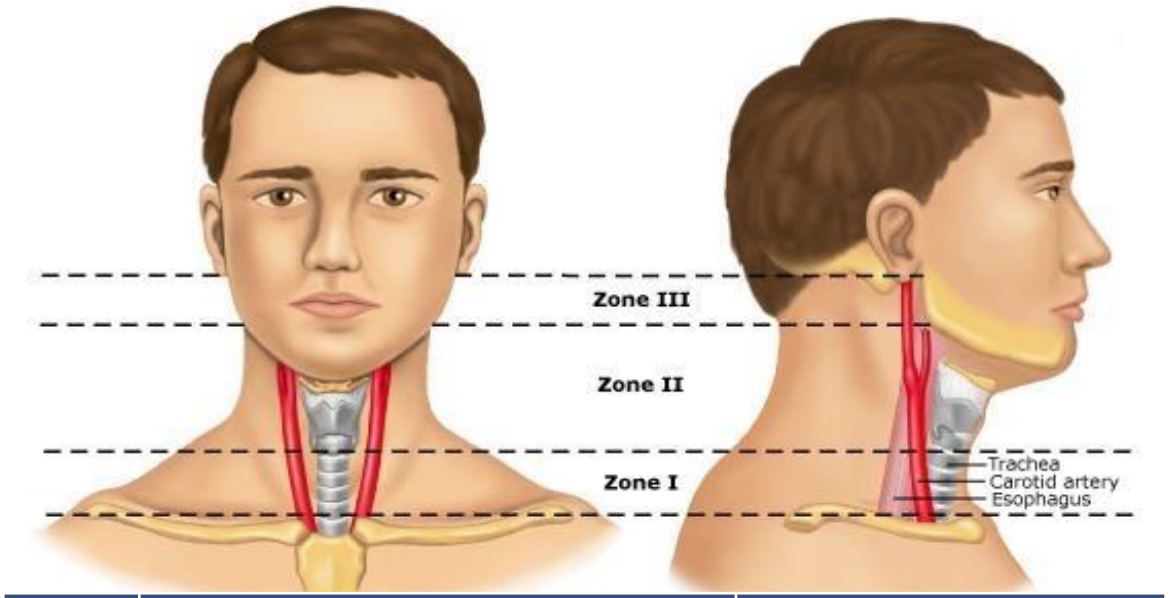
Gross Blood Amount -> 10mL

After 1L NS -> 10,000 RBCs

This injury is located in which neck zone?

Zone II

Neck Zones



Zone	Location	Workup
1	Sternum/Clavicles to Cricoid	CTA, Esophagram, EGD
2	Cricoid to Angle of Mandible (MC)	Above + OR exploration
3	Angle of Mandible to Base of Skull	CTA, Inspect oropharynx

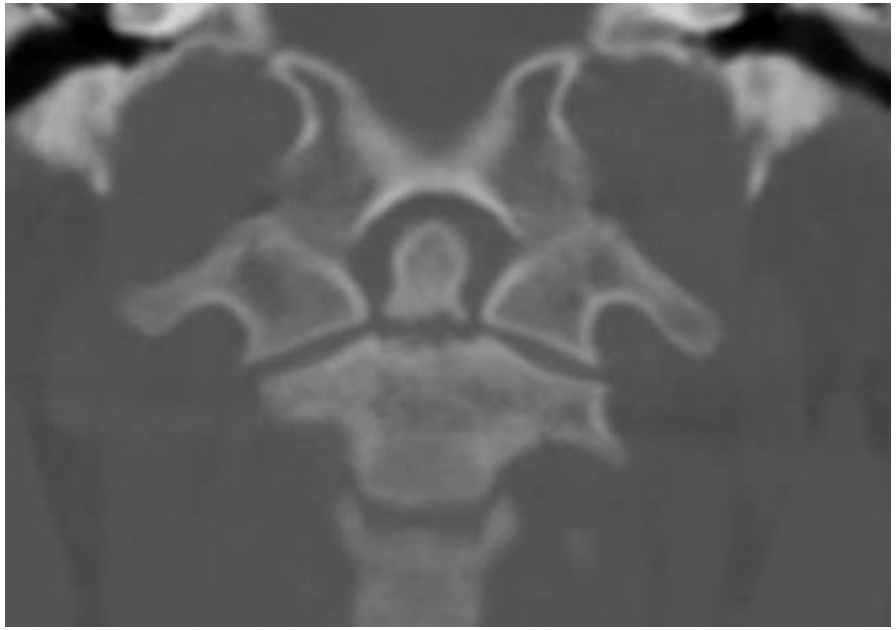
Management of Vascular Injury

Hard Signs

- ANY OF:
  - Hypotension
  - Arterial Bleeding
  - Rapidly Expanding Hematoma
  - Pulse Deficit
  - Bruit
- Straight to OR

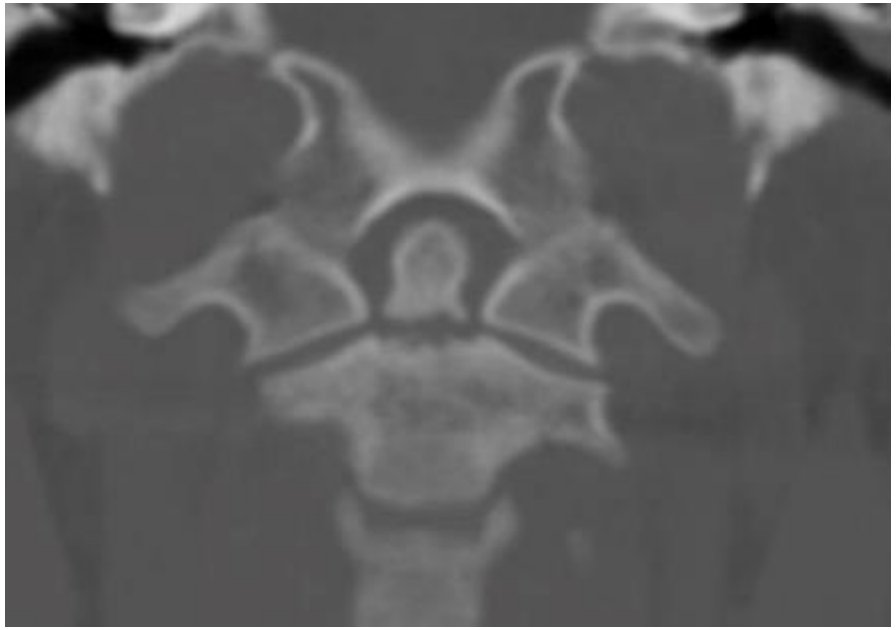
Soft Signs

- Stable patient PLUS
  - Peripheral Nerve Deficit
  - Moderate Hemorrhage
  - Reduced (palpable) pulse
  - Proximity to Major Artery
- CT Angiography



Name the injury.
(be specific)

Stable or
Unstable?



Type II
Odontoid Fracture

Unstable

Unstable C-spine Fractures

Jefferson Bit Off A Hangman's Toe

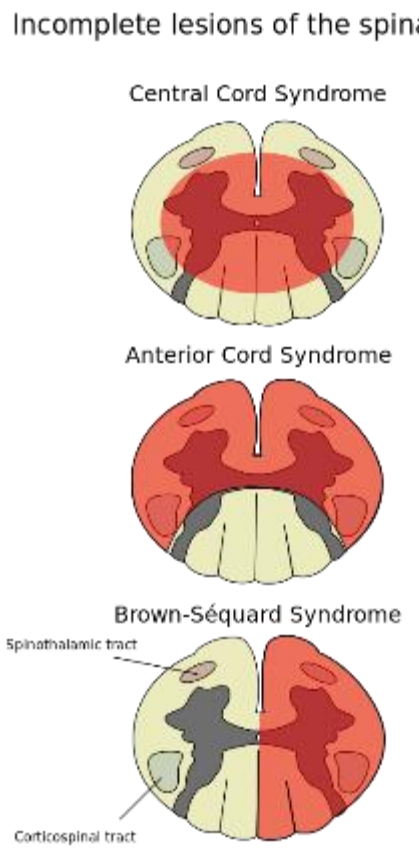
- Jefferson Fx - C1 burst fracture 2/2 axial load
- Bilateral Facet Joint Dislocation - 2/2 hyperflexion
- Odontoid - Type I: tip (stable), II: neck (unstable), III: body (Unstable)
- Altanto-axial Dislocation - C1/C2 dislocation
- Hangman's Fx - bilateral C2 pedicle fracture 2/2 hyperextension
- Teardrop Fx - anterior and inferior vertebral body fx + interspinous ligament tear, due to flexion followed by extension

WHAT ARE THE CLINICAL FINDINGS OF CENTRAL CORD SYNDROME?

WHAT ARE THE CLINICAL FINDINGS OF CENTRAL CORD SYNDROME?

Upper Extremity > Lower Extremity Motor Deficit

Spinal Cord Syndromes



Central Cord

- 2/2 hyperextension
- Usually elderly person hitting chin
- UE > LE motor deficit, urinary retention

Anterior Cord

- 2/2 hyperflexion
- Bilateral motor paralysis
- No pain sensation, but normal proprioception

Brown-Séquard

- Penetrating injury to 1/2 spinal cord
- Half of body with ipsilateral motor/proprioception loss
- Other half (contralateral) with pain/temp loss

FEMC Florida Emergency Medicine Clerkship

A TRAUMA PATIENT OPENS EYES TO PAIN, MUMBLES INCOMPREHENSIBLE SOUNDS AND LOCALIZES PAINFUL STIMULI.

What is the patient's GCS??

Immediately intubate??

A TRAUMA PATIENT OPENS EYES TO PAIN, MUMBLES INCOMPREHENSIBLE SOUNDS AND LOCALIZES PAINFUL STIMULI.

GCS: 9 (E2, V2, M5)

Immediately intubate? No

Glasgow Coma Scale

Glasgow Coma Scale for Head Injury	
Glasgow Coma Scale, Eye opening	
Spontaneous	4
To loud voice	3
To pain	2
None	1
Verbal response	
Oriented	5
Confused, disoriented	4
Inappropriate words	3
Incomprehensible sounds	2
None	1
Best motor response	
Obeys	6
Localizes	5
Withdraws (flexion)	4
Abnormal flexion posturing	3
Extension posturing	2
None	1

Tips for Remembering GCS

- **EVM 4-5-6**
- **Eyes** 3 (soft stimuli) or 2 (hard stimuli)
- **Verbal** 4 (sentences), 3 (words), 2 (sounds)
- **Motor** 5 (purposeful), 4 (withdrawal), 3 (Flexion), 2 (Extension)

- **GCS 15**: eyes open, making sense, following commands
- **GCS 3**: unresponsive
- **GCS ≤ 8**: intubate (calc carefully near this)

FEMC Florida Emergency Medicine Clerkship

HR 130, BP 80/50, ANXIOUS…

Estimated % Blood Volume Loss

Trauma + Blood at Urethral Meatus

What imaging is indicated?

Blunt Trauma with Low BP, Low HR and Warm Extremities

What is the most likely cause?

FEMC
Florida Emergency Medicine Clerkship

HR 130, BP 80/50, ANXIOUS…

30-40%, Hemorrhagic Shock Class III

Trauma + Blood at Urethral Meatus

Retrograde Urethrogram (RUG)

Blunt Trauma with Low BP, Low HR and Warm Extremities

Neurogenic Shock

Penetrating Glass After Bomb

What type (I-IV) of Blast Injury is this?

Flail Chest (>3 adjacent rib fx)

Associated with what other injury?

BP 85/50, HR 115

When should this patient be sent for CT?

Penetrating Glass After Bomb

Blast Injury Types I-IV
I- Blast Wave Pressure (hollow viscous injury),
II- Debris from blast/Shrapnel,
III- Trauma from pt thrown/hit objects,
IV- everything else (burns, smoke, radiation, etc)

Flail Chest (≥3 adjacent rib fx)

Pulmonary Contusion

BP 85/50, HR 115

Never, or at least not until stabilized

FEMC
Florida Emergency Medicine Clerkship

Most common abd organ injured in GSW

???

Most common abd organ injured in stab

???

Most common abd organ injured in blunt trauma

???

Most common abd organ injured in GSW

Small bowel

Most common abd organ injured in stab

Liver

Most common abd organ injured in blunt trauma

Spleen