Internal Organ Injuries

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Disclosures

No disclosures!

Objectives

- Be able to identify blunt trauma sports injuries
- Obtain quick sideline evaluation and exam
- Know when to send an athlete with suspected internal organ injury to ED
- Have an understanding on return to play guidelines

Background

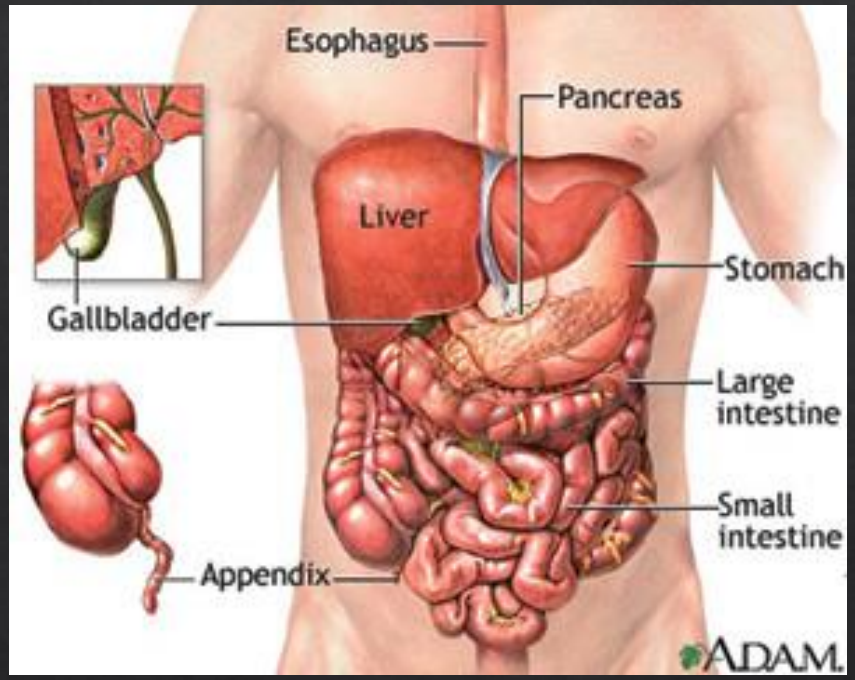
- Internal blunt organ injuries are uncommon, but can go undiagnosed
- Blunt abdominal trauma is most often in contact and high velocity sports
- Don’t forget about the acceleration/deceleration injuries that result in shearing forces on our organs

Considerations

- Know the mechanism of injury
- Have a high index of suspicion
- Remember your ABCs
- Serial exams and vitals
- Don’t forget about pregnancy in female athletes

Abdomen

- Abdominal wall
- Spleen
- Liver
- Gallbladder
- Pancreas
- Stomach
- Intestines



Abdominal injuries

- Pediatric abdominal organs are more susceptible to traumatic injury due to their position and still developing abdominal musculature.
- Rib cage cartilage is more pliable
- Abdominal pain complaints are sensitive but not specific for identification of injury
  - Up to 50% of athletes with abdominal pain have no significant internal organ injury

Splenic Injury

- It is the most vascular organ in our body (contains about 1 unit of blood at any given time)
- MC injured organ in sport and most frequent cause of death related to abdominal injury in sport
  - 25% of all blunt abdominal traumas
  - Peak incidence 15-35 years
- Spleen can encapsulate bleeding which can delay overt signs/symptoms of rupture
- Enlargement with certain illnesses can make it more susceptible (mono)
- ED transport if injury suspected

Splenic Injury

- Presentation – initial sharp pain in LUQ then continued dull left flank pain
  - Kehr's sign: acute pain to left shoulder from blood/irritant in the abdominal cavity when lying flat and legs elevated
- Exam – generalized AP +/- rebound/guarding
  - TTP over 10-12th ribs on left
  - Severe findings: hypotension, diaphoresis, tachypnea
- CT Abdomen with contrast is standard

Splenic Injury

- Treatment
  - Minimal injury – observation
  - Ex lap with hemodynamic instability: laceration repair vs. removal
  - With removal: vaccination for encapsulated organisms (strep pneumo, H flu and N. meningitides)
- RTP
  - No clear guidelines
  - If due to mono- asymptomatic with normal spleen size on exam can have a gradual RTP at 4 weeks from day of symptom onset
  - Unclear if repeat imaging plays a role to help with return to sport (radiographic healing lags clinical sx)
  - Some say up to 3-4 months for non-surgical
  - Post-splenectomy patients may return faster than conservative management
    - At least 6 weeks post-op

Liver Laceration

- 2nd most common organ injured
- Common mechanism is a blow to the mid-abdomen and right lower chest
- Symptoms can be delayed in presentation
- Typically present with RUQ pain that can refer to the shoulder
- Presentation can be minor with generalized AP
  - May have trouble standing upright, nausea/vomiting, rebound or guarding
  - Be sure to check and monitor vitals
- FAST exam on the sideline can be diagnostic
- CT abdomen with contrast and LFTs should be obtained
  - If significant blood loss, be sure to monitor serial hemoglobin

Liver laceration

- Graded by the American Association for the Surgery of Trauma Hepatic Organ Injury Scale
- Treatment
  - 50-80% stop bleeding spontaneously
  - Rest, observation and IVFs
  - Laparotomy for those who are hemodynamically unstable
- RTP
  - No clear guidelines
  - Simple liver lacerations tend to heal within 2-4 months

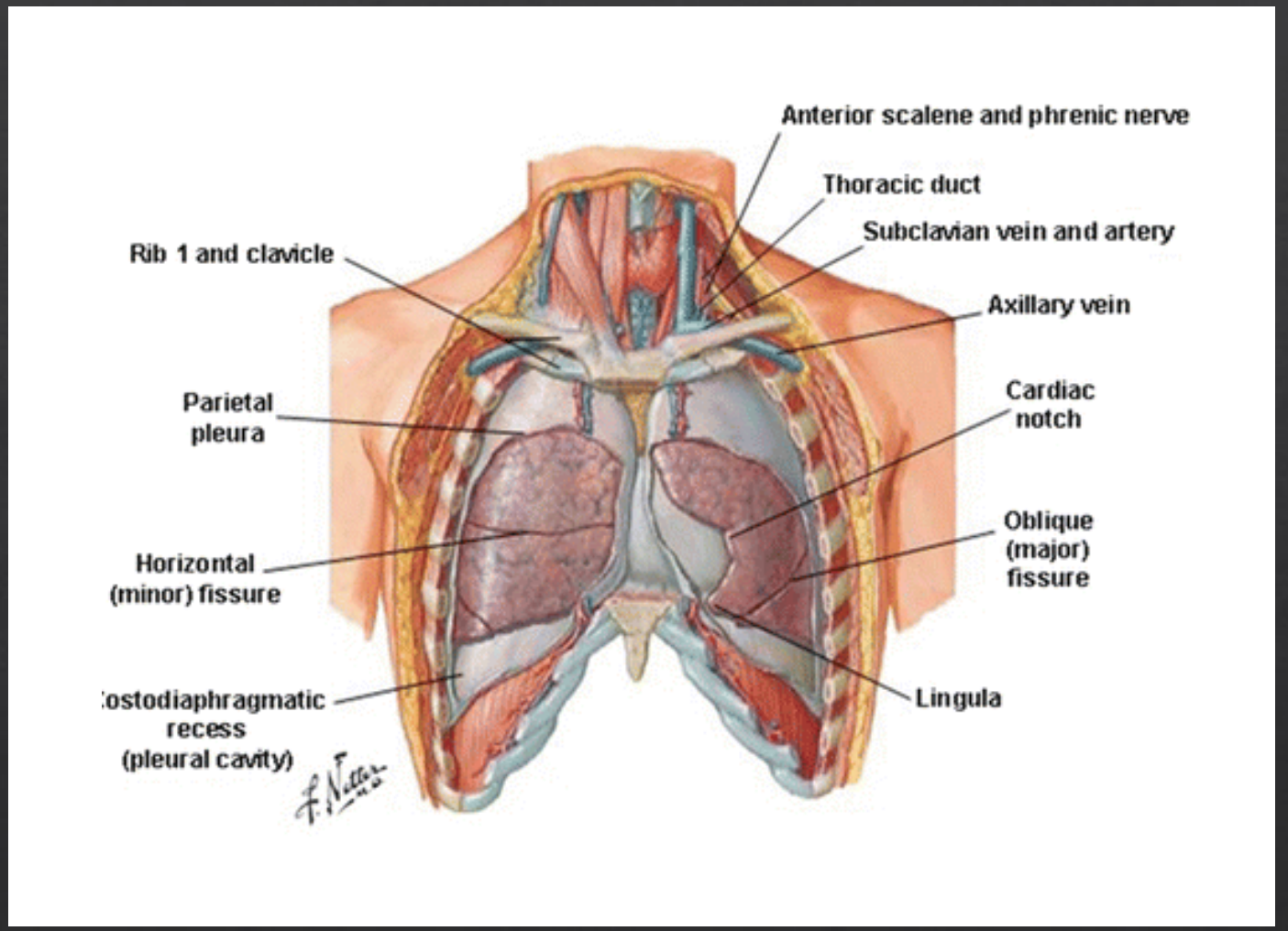
AAST Organ injury Scale for the Liver

Grade	Injury type	Injury description
I	Haematoma	Subcapsular <10 % surface
	Laceration	Capsular tear <1 cm parenchymal depth
II	Haematoma	Subcapsular 10–50 % surface area; intraprenchymal, <10 cm diameter
	Laceration	1–3 cm parenchymal depth, <10 cm in length
III	Haematoma	Subcapsular >50 % surface area or expanding, ruptured subcapsular or parenchymal haematoma. Intraprenchymal haematoma >10 cm
	Laceration	>3 cm parenchymal depth
IV	Laceration	Parenchymal disruption 25–75 % of hepatic lobe
	Vascular	Juxtavenous hepatic injuries i.e. retrohepatic vena cava/centrl major hepatic veins
VI	Vascular	Hepatic avulsion

Advance one grade for multiple injuries up to grade III
AAST liver injury scale (1994 revision)

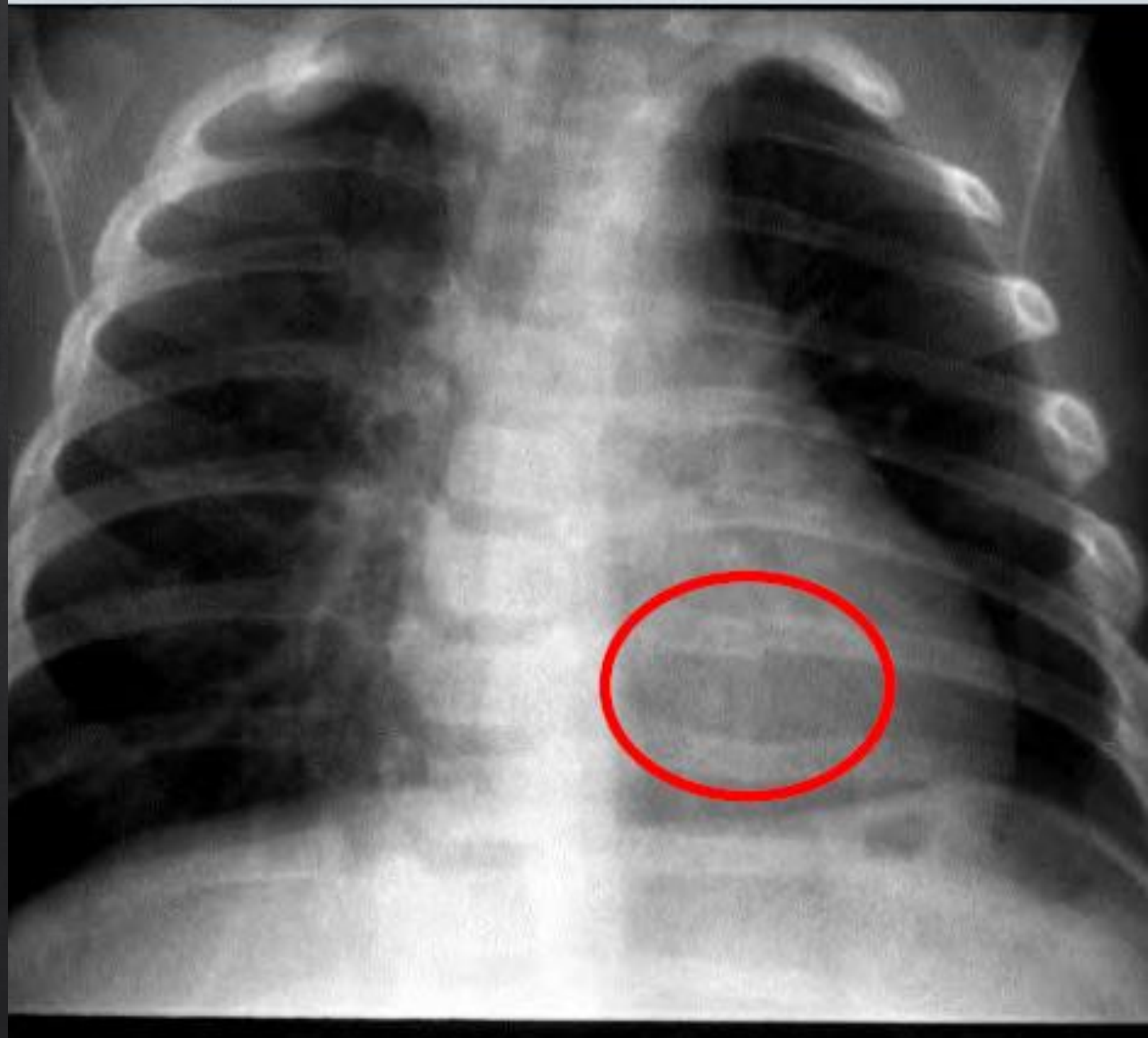
Chest

- Ribs
- Muscles
- Lungs
- Heart
- Mediastinum
- Esophagus
- Trachea
- Large blood vessels



Rib Fractures

- With first or 2nd rib injuries, or displaced rib fractures, these should be sent to ED for evaluation ASAP
- Lower rib injuries (9-12) can damage liver, kidneys or spleen
  - Up to 20% left lower rib fractures have associated splenic trauma 10% of right lower rib fractures with associated liver injury
- Imaging – XR (low sensitivity) or CT scan (especially with suspected 1st rib fx)

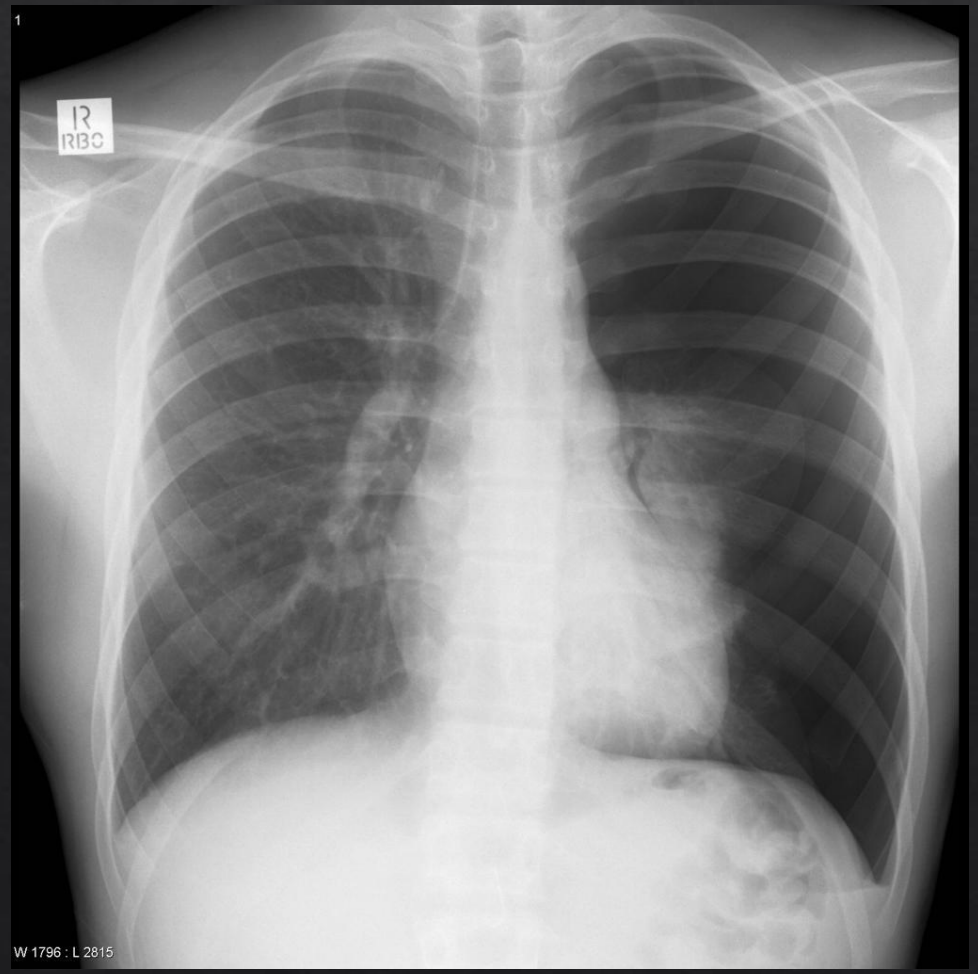


Sternal Fractures

- Blunt trauma to central chest
- Large amount of force required
- 55-70% have underlying internal injuries
  - Consider cardiac contusions (can lead to dysrhythmia, conduction abnl, VS instability) with displaced fx – need initial EKG and one 6 hrs later; Troponin 4-6 hours after trauma
- Mid body follow by manubrium are most common
- Dx with CXR and dedicated lateral sternal view
- Tx mostly conservative
- RTP often gradual consider radiographic healing, often in about 8-12 weeks

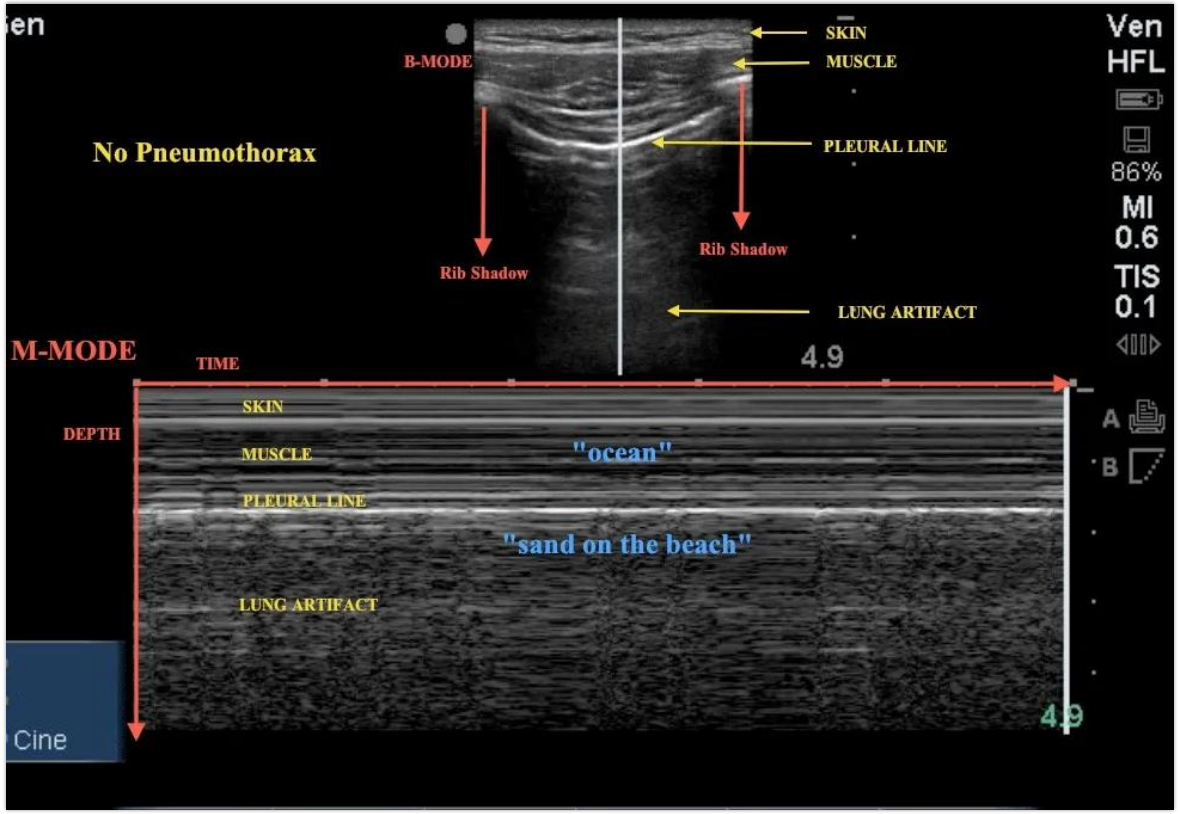
Pneumothorax

- Nonspontaneous
  - Penetrating or direct blow to the chest
- Spontaneous and tension types
  - Primary- rupture of blebs/bullae (tall, young, thin men, often smokers)
  - Secondary- due to underlying lung conditions
  - Often after increased intrathoracic pressure (cough, sneeze, straining, Valsalva)
- Symptoms – SOB and pleuritic chest pain
- Exam – shallow breathing, tachypnea, absent/decreased breath sounds



Pneumothorax

- Diagnosis with CXR
  - Sometimes will need inspiratory/expiratory views
- Treatment
  - Minimal (15-20%), stable and asymptomatic – observation with serial exams and CXR
  - Large with symptoms should transport to ED for possible chest tube insertion
- RTP
  - No vigorous activities for 2-3 weeks after chest tube removal
  - Gradual return under supervision
  - Primary spontaneous pneumo have increased risk of recurrence
  - Air travel not advised until XR resolution



Pneumo US eval

Pleural/Lung sliding is the key!!!

Commotio Cordis

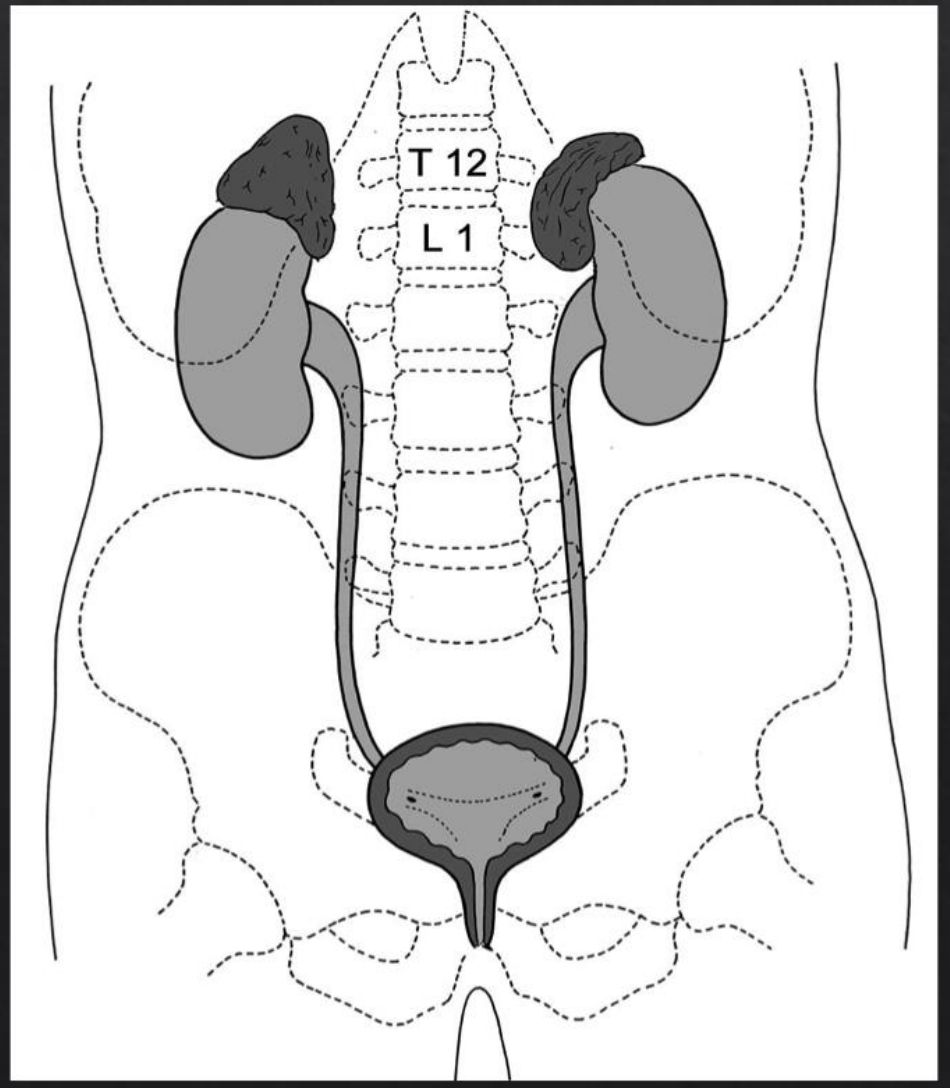
- Cardiac contusion
- Direct high-speed impact to the anterior chest overlying te cardiac silhouette
- >50% of cases baseball/softball
- Youth athletes
  - 70% <16
  - Smaller AP diameter
  - Chest wall more compressible
- Mechanism is unclear – Increased LV pressure 15-30 ms prior to the T-wave peak (1% of entire cardiac cycle) – go into ventricular fibrillation from the impact due to inappropriate ventricular repolarization

Commotio Cordis

- Autopsies are negative except for a chest wall bruise
- Management – IMMEDIATE CPR and AED
  - If defibrillation delayed more than 3 minutes there is a less than 3% survival
  - 10-25% survival rate with immediate awareness of impact

Genitourinary

- Kidneys
- Ureter
- Bladder
- Urethra
- Reproductive organs



Kidney Injury

- Most common GU injury
  - Approximately 245,000 cases of traumatic renal injuries worldwide each year (Netter SM citation)
- Direct blow to the low back or rapid deceleration
- Signs
  - Hematuria
    - >2 RBCs pHPF; dipstick very sensitive
    - Vascular leakage
    - Amount does not correlate to severity of the injury
  - Flank pain/ CVA tenderness
  - Grey-Turner's sign – flank bruising associated with retroperitoneal hemorrhage

Kidney Injuries

- Obtain labs
  - CBC, UA, BMP, LFTs
- Deciding wo to image:
  - Adults – gross hematuria, microscopic hematuria with hypotension, significant injury
  - Children – hematuria, hypotension, significant injury
- US can identify a kidney laceration, but not the degree or depth
- CT abdomen with IV contrast (renal protocol) is gold standard

AAST Organ injury Scale for the Kidney

Grade[a]	Type of Injury	Description of Injury
I	Contusion	Microscopic or gross hematuria, urologic studies normal
	Hematoma	Subcapsular, nonexpanding without parenchymal laceration
II	Hematoma	Nonexpanding perirenal hematoma confirmed to renal retroperitoneum
	Laceration	<1.0 cm parenchymal depth of renal cortex without urinary extravagation
III	Laceration	<1.0 cm parenchymal depth of renal cortex without collecting system rupture or urinary extravagation
	Laceration	Parenchymal laceration extending through renal cortex, medulla, and collecting system
IV	Vascular	Main renal artery or vein injury with contained hemorrhage
V	Laceration	Completely shattered kidney
	Vascular	Avulsion of renal hilum, which devascularizes kidney

Abbreviation: AAST, American Association for the Surgery of Trauma.
[a]Advance one grade for bilateral injuries up to grade III.

Kidney Injuries

- Most sport related kidney injuries are grade I contusions
- Management
  - Grade I – observation and supportive care including bed rest, IVF
  - Grades II-V – likely need surgical consult
- RTP
  - Need full resolution of hematuria
  - Varies from 4-6 weeks until a gradual RTP
    - Most will agree non-contact for 6 weeks
  - Most severe injuries can be 6-12 months

Internal Organ Injury Summary

- Need to have a high clinical suspicion for internal organ injury in contact sports
- Important to make decisions on travel when on the road
- Return to play is challenging and often becomes an individualized, case by case scenario

Thanks!!