

These notes are complementary to the ER seminars.

## Emergency Medicine

### Non-Traumatic Chest Pain

- Can be cardiac, pulmonary, or musculoskeletal.
- Herpes Zoster: Dermatome, fire belt
- Anxiety and stress are precipitating factors to myocardial infarction
- Spontaneous pneumothorax (PT), Marfan's syndrome
  - Tall and thin → spontaneous PT
  - COPD, bronchial asthma → PT
- Pulmonary embolism → non-traumatic life-threatening injury
- Boerhaave's Syndrome: Esophageal rupture - Dangerous GI indication for ER
  - This is very important. Remember that it is the GI indication for ER.
- Cardiac tamponade: fluid in the cardiac sac

### Anginas

- Which questions do we ask?
  - How long has the pain lasted?
    - <10 minutes → stable
    - >20 minutes → unstable
  - Does the pain radiate?
    - Usually to the jaw, neck, inner aspect of the shoulders and left arm.
  - Does the patient have any sort of autonomic stimulation?
    - This includes dizziness, drowsiness, nausea and vomiting. Possibly diarrhea.
  - **Levine's sign** is a clenched fist held over the chest to describe ischemic chest pain

### *Stable Angina*

- Risk factors
  - Smoking, age, hypertension, diabetes, hyperlipidemia, postmenopausal
- Precipitating factors
  - exercise, heavy lifting, emotional stress, cold weather, heavy meal
- Relieving factors (for stable)
  - Rest and nitroglycerine

### *Unstable Angina*

- Types: Restful, nocturnal, transient, decubitus
- Nocturnal and decubitus increase the preload on the heart due to the position in which the patient is in. This will have a negative effect on the heart due to the change in gravity and perfusion/ventilation.
- New-onset angina

- If it has occurred more than once in less than one month, then we consider it an unstable angina
- If the time between two time periods of attacks was more than one month, then we consider it a stable angina.
- Crescendo angina increases in severity with a decrease in triggers with time.

#### Myocardial Infarction

- Silent MI → No chest pain. Occurs in two cases;
  - Diabetes → comes with hyperglycemia due to ischemia
  - Elderly → due to bypass and collateral pathway
- Radiation
  - Epigastric - only in cases of inferior MI\*\*
- Mainly due to atherosclerosis
- 30% silent
- Causes shortness of breath and autonomic stimulation

#### Pericarditis

- Stabbing, burning pain
- Friction rub sound on auscultation
- Increased by respiration and leaning forward
- Causes
  - MI, valve replacement, post-cardiac surgery, trauma, idiopathic, viral, TB (especially in Jordan), and uremia.
- Management: analgesia (endocele), then treat the cause.

#### Aortic Dissection

- **Hypertension, trauma, Marfan's syndrome**
- tearing pain, between shoulder blades that radiates to the back.

#### Pulmonary Embolism

- Causes
  - DVT, amputation, stasis (due to traveling, bedridden, or vascular injury patients), hypercoagulopathy, obesity, trauma, fat embolism, malignancy, oral contraceptives, and pregnancy.
- Most common sign is sinus tachycardia and non-specific ST segment changes.
- The diagnostic test is a CT angio\*\*\*\*\*
- Signs\*\*\*
  - Dyspnea, chest pain, palpitation, and hemoptysis
  - Rare (but pathognomonic) in 10% of patients, S1Q3T3 (Deep S in V1, Prominent Q in V3, and inverted T in V3)

#### Pericardial Tamponade

- Beck's Triad\*\*\*\*
  - Hypotension, increase JVP, and *muffled* heart sounds
- Treatment: Aspiration, pericardiocentesis (suction of fluid through a needle)
- Diagnostic: Chest radiography

#### Boerhaave's

- Causes

- Rupture of esophagus (mostly caused by endoscopy [iatrogenic]), odynophagia, tachypnea, dyspnea, and cyanosis

#### Approach to trauma management and treatment

- O2, ECG, history, and cardiac enzymes
- ECG
  - MI Signs
    - ST elevation/depression (0-6 hours, acute)
    - ischemia (inverted T wave) (>6 hours)
    - Pronounced Q wave (>1/3 R segment) (>6 hours; old MI)
      - This will mean that there is necrosis of the cardiac muscle.
    - However, 50% of MIs show normal ECG
  - MI locations
    - Anterior: V1-2
    - Septal: V3-4
    - High lateral: V5-6
    - Inferior: aVF, L3
    - Lateral: aVL, L2
    - Posterior: V1 (Tall R, ST depression, and inverted T wave); also known as **mirror sign**
  - Abnormality in one lead is usually disregarded
  - Abnormality in 2-3 leads indicates pathology
- Cardiac Enzymes and MI Diagnostic markers
  - Myoglobin
    - non-specific but fastest indicator of MI injury (within 1 hour)
  - Troponin
    - 3-6 hours, stays for 10 days, has a peak of 24-48 hours
    - most reliable
  - Creatinine Kinase
    - Has different types of kinase depending on the location
    - For MI, we use CK(MB)
  - Q waves
  - ischemia
  - coronary artery intervention

#### Traumatic Chest Injury

- Rib fractures may cause liver and spleen damage if they are in the lower floating 11-12 rib
- Flail chest: 3 or more ribs at 2 or more sites
- Sternal fractures are very rare
- Tension PT → air in pleura
  - This creates a one-way valve where inspiration occurs and expiration does not. This will result in lung shrinkage and increase in the pleural space (where the gases now would go)
- Open PT → usually progresses to tension PT

## Management of PT

- ABC
  - Check Airway
    - for PT patients, you must immediately give needle decompression to get rid of the compressed air outside the lung and renewing the pressure difference.
    - This would occur before the application of a chest tube
  - Check Breathing
  - Compression

## Differences between Pneumothorax(PT) and Cardiac Tamponade (CT)

	PT	CT
Auscultation	hyper-resonance (air)	Dull (fluid)
Heart Sounds	Normal	Dull (muffled)
Percussion	normal	Dull
Anatomy	Deviation of trachea and bronchi away from site of PT	Normal
Other	Hypotension	Hypotension
	Cyanosis Distended neck veins	Cyanosis Distended Neck veins
Breath sounds	Absence (unilateral)	Normal

- Pathogenesis of aneurysm: dilatation due to trauma → weakness → aneurysm
- Aneurysm with blunt trauma results exclusively from Inferior MI
- Signs of aortic rupture in trauma:
  - Increase in Pulse pressure
  - Pressure differentiation between upper body and lower body parts

## Thoracotomy Indications

- MI
- Coronary artery disease
- tacheobronchial injury
- esophageal injury
- aortic injury

## Emergency Room Sections

- C - in pain but in good condition
- B - chest pain usually, possibly MI
- A - critical condition patients. Usually put in the resuscitation rooms.

- appendicitis is the most common cause of acute abdomen
  - epigastric → right lower quadrant pain
- cholecystitis
  - right upper quadrant, colicky
- pancreatitis
  - epigastric pain radiating to the back
- Ectopic pregnancy
  - vaginal bleeding that is dark
- Inferior MI → epigastric pain
- non-surgical\*\*\*\*\*
  - MI (inferior)\*, pneumonia (lower lobe)\*, pulmonary embolism\*, UTI, Herpes Zoster\*, IBD, sickle cell anemia\*, DKA\*
- Life-threatening
  - MI, mesenteric ischemia, Abdominal aortic aneurysm: ruptured ectopic pregnancy, bowel perforation.
- Surgical
  - Lots haha.
- Sites
  - Epigastric: pancreatitis, inferior MI, aortic aneurysm, gastritis, PUD
  - right: cholecystitis, hepatitis
  - right lower: diverticulitis, gynecological, appendicitis
  - left lower: diverticulitis, gynecological
  - flank: kidney
  - Others: sickle cell, herpes zoster, muscle strain, and herniation
- > 20 ml of blood - indicated for endoscopy, Upper GI → melena and melena may be caused from ferrous supplements
- Radiation
  - Left shoulder
    - tip for spleen rupture, diaphragmatic, and PU
  - Chest
    - GERD, PU
  - Back
    - Pancreatitis, abdominal aneurysm, and acute aortic dissection
- most common left gi bleeding cause for massive bleeding is upper gi bleeding
- lower gi bleeding → anal fissure and hemorrhoids
- murphy's sign → pain upon inspiration w/ hand over liver, acute cholecystitis
- Roffsing's sign, pain in the contralateral side - Complication of appendicitis
- PR indications\*\*\*\*\*: bleeding, mass, hemorrhoids, fissure, abscess
- pyelonephritis and nephrolithiasis → costovertebral angle
- lipase is used in test for pancreatitis, but it is not diagnostic/specific

- AST, ALT, GGT is used in test for liver
- PTT for coagulation
- Ranson criteria for mortality of pancreatitis
  - Make sure to memorize the 24-hour/48-hour criteria
- Causes of Pancreatitis
  - **G**all stones
  - **E**thanol
  - **T**rauma
  - **S**corpion bite
  - **M**umps
  - **A**utoimmune
  - **S**teroids
  - **H**yperlipidemia, hypocalcemia
  - **ERCP**
  - **D**rugs (thiazides for example)
- Criteria for cholecystitis ultrasound
  - Major - Gall bladder stones
  - minor -
    - thickening in the wall
    - CBD dilated > 1 cm (0.5-0.7 normal)
    - perisystolic fluid
    - dilated hepatic and intrahepatic duct
  - Management
    - NPO - nil per os
    - avoid pain killers
- Abdominal aortic aneurysm
  - =< 2 cm and 1.5 cm at bifurcation
  - 4-5 cm dilatation is an emergency due to risk of rupture
- Most common causes of large bowel obstruction
  - diverticular diseases, fecal impaction, volvulus, and tumours
- abdomen plain xray = 30-40 times exposure than chest.
- Xray indications non-specific abdomen
  - Bowel obstruction, perforation by PU (air under diaphragm), renal stones (90%), gallstones (10%), ingestion of foreign body
- Scoring system of appendicitis
  - pain migration to iliac fossa - 1 point
  - temperature - 1
  - anorexia - 1
  - nausea and vomiting - 1
  - tenderness in the right iliac fossa - 1
  - rebound tenderness - 1
  - leukocytosis\*\*\*\*\* - 2
- Right iliac fossa pain
  - Charcot triad (cholangitis)

- Iliac fossa pain (upper quadrant), jaundice, fever

#### Traumatic abdominal pain

- Spleen, liver and small bowel
- Kehr's sign - pain at tip of shoulder, ruptured spleen, patient lying down and legs up
- Gastric tube - drainage of fluid to decrease aspiration
- FAST
  - Focussed Assessment Sonography in Trauma
  - advantages: non-invasive US - good for cardiac tamponade and hemoperitonium, rapid, portable, does not use contrast
  - indications: any trauma to the abdomen, and spinal cord injury
  - CI: obese patients, subcutaneous air, previous abdominal surgery, retroperitoneal injury, doctor-dependent and can miss the bowel and cannot differentiate fluid from blood
- DPL
  - Diagnostic Peritoneal Lavage
  - Indications: blunt abdominal trauma, alcohol, spinal cord lesion, lab belt sign, unexplained hyper/hypotension, penetrating trauma
  - absolute CI: air under diaphragm
  - relative CI: previous abdominal surgery, severe coagulopathy, and morbid obesity
  - Positive DPL (looking for RBC)
    - >100000 blunt trauma
    - >5000 stab wounds/lower chest/abdominal gun shot
    - RBCs are the most accurate measure of lavage
- CT
  - uses: hemodynamically patients with negative US
  - hemodynamically unstable patients repeat FAST and do DPL
  - disadvantages: moving the patient, giving oral contrast (IV oral contrast is needed for optimal results; if creatinine is between 1.5-2, it is CI), invasive measure
- Laprotomy
  - Indications: Positive FAST, positive DPL, blunt trauma, organs are sticking outside, penetrating wounds, bleeding from stomach.
  - If the wound didn't penetrate the peritoneum, there is no need for laprotomy.

#### Types of Fractures

- Simple: Single break with no effect on overlying/underlying tissue or structures
- Compound: Open fracture; wounds that communicate with the fracture exposing bone to contamination
  - Orthopedic surgery
- Comminuted: splintering of the bone between 2 main fragments, i.e. breakage at 2 or more sites. Most difficult to treat.
- Greenstick: bending of the bone. Pediatric fracture.
- Colle's: Fracture of the distal radius with dorsal displacement of the wrist and the hand.

- Impacted: One end driven into the other end in the bone.

*Pathological Fractures:* Minor force needs to be applied to create a fracture to an already weakened bone; usually occurs with the following diseases:

- Osteoporosis
- Osteomalacia
- 1ry or 2ry tumor
- Osteogenesis imperfecta
- Renal osteodystrophy
- Parathyroid bone disease
- Paget's disease

Extra facts for fractures

- Reduction involves restoring the bone to its original shape
- RICE
  - Rest
  - Ice
  - Compression
  - Elevation
- Compartment Syndrome
  - compression of nerves, blood vessels, and muscle inside a closed space within the body. This leads to hypoxia and tissue death.
  - A pressure greater than 30 mm Hg usually requires emergency fasciotomy in the operating room.
- Signs of acute ischemia
  - **Pain**
  - **Pallor**
  - **Paresthesia**
  - **Pulseless**
  - **Paralysis**
  - **Perishing cold (extra)**
- **Scaphoid** fracture takes two weeks to appear on an XRay
  - Usually caused with a fall on an outstretched hand with the weight landing on the palm

### **Classification of burns**

1. First-degree burn involves only the epidermis and is characterized by erythema, edema, pain, and the absence of blistering. Sunburn is an example of first-degree burn.
2. Second-degree burn involves the dermis and is a partial-thickness burn. It may be further classified as a superficial or deep partial-thickness burn. In superficial burns, deeper layers of the dermis, including hair follicles and sweat glands, are not involved. These burns are characterized by blisters and pain.
3. Third-degree burns are full-thickness burns and involve the epidermis, dermis, and subcutaneous fat. The skin is charred and leathery, and thrombosed blood vessels may be seen. These burns are insensate.

4. Fourth-degree burns are those involving structures underlying the skin, including fascia, bone, and muscle.
- Size of the burn is expressed as a percentage of body surface area. Estimating the percentage of burn area is important in determining the amount of fluid resuscitation the patient needs.
    - The “rule of nines” divides the body surface area into areas of approximately 9% each. In children, the head accounts for a larger percentage of body surface area, whereas the legs account for a smaller percentage.
    - The “rule of palms” approximates that the palm size of the patient estimates 1% of the patient’s body surface area. Adding up the number of palm areas gives the approximate percentage of body surface area burned.
  - Inhalation burns, which may be associated with carbon monoxide poisoning, poisoning by other noxious gases, or thermal injury to the airways, may be suspected if burns occurred in an enclosed space, involved the **face, singed nasal hairs**, or caused **carbonaceous sputum**.

SIRS, Systemic Inflammatory Response Syndrome will have 2 or more of the following :  
 (; denotes “or”)

- Tachypnea > 20 breaths/minute; PCO<sub>2</sub> < 32 mmHg
- WBC > 12000; WBC < 4000 cells/mm<sup>3</sup>
- Heart rate > 90 bpm
- Fever > 38.5 C; Hypothermia < 35.0 C
- MAP < 65 mmHg

**The four classes of haemorrhagic shock**

	Class I	Class II	Class III	Class IV
Blood loss (ml)	Up to 750	750–1500	1500–2000	>2000
Blood loss (% Blood volume)	Up to 15%	15–30%	30–40%	>40%
Pulse rate	<100	>100	>120	>140
Blood pressure	Normal	Normal	Decreased	Decreased
Pulse pressure (mmHg)	Normal or increased	Decreased	Decreased	Decreased
Respiratory rate	14–20	20–30	30–40	>35
Urine output (ml/h)	>30	20–30	5–15	Negligible
CNS/mental status	Slightly anxious	Mildly anxious	Anxious, confused	Confused, lethargic

- Most common cause of cardiopulmonary arrest in pediatrics is SIDS
- Shockable: ventricular fibrillation, pulseless ventricular tachycardia → amiodarone

- Amiodarone: 300 mg bolus (first); 150 mg (second)
- Non-shockable: asystole, pulseless electrical activity → adrenaline
  - Adrenaline 1mg/3-5 minutes
- Push hard (≥2 inches [5 cm]).
- Push fast (≥ 100/min).
- Infant CPR: 15 compressions vs. 30 compressions

Reversible causes of cardiac arrest

## ***The 6 Hs and 5 Ts of PEA:***

**Hypoxia**

**Hydrogen ion overload  
(acidosis)**

**Hyperkalemia/  
hypokalemia**

**Hypoglycemia**

**Hypothermia**

**Hypovolemia**

**Toxins**

**Tamponade (cardiac)**

**Tension pneumothorax**

**Thromboembolism (PE)**

**Thrombosis (coronary)**

Test yourself (This will be expanded on Monday in the afternoon inshAllah)

- Which type of fracture is rarely overlooked on a radiograph?

- A Tibial plateau fracture
- B Scaphoid (navicular) fracture
- C Fifth metatarsal fracture
- D Nondisplaced supracondylar fracture
- E Colles' fracture

Answer: E

- Which type of fracture is regularly overlooked on a radiograph?
  - A Tibial plateau fracture
  - B Scaphoid (navicular) fracture
  - C Fifth metatarsal fracture
  - D Nondisplaced supracondylar fracture
  - E Colles' fracture

Answer: B