Surgery

For 4th stage

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Part 1: General surgery

(Lump & Ulcer)

1- The History of a Lump or an Ulcer

- **Duration**: when was it first noticed? When it was first appeared?
- **First symptom**: what brought it to the patient’s notice? When washing, pain, someone else noticed it
- **Other symptoms**: What symptoms does it cause?
  - **Lump**: Interfere with movement, respiration, or swallowing.
  - **Ulcer**: bleeding, discharge, smell, interference with walking, eating, or defecation.
- **Progression**: How has it changed since it was first noticed?
  - **Lump**: Size: enlarged, got smaller, fluctuated in size.
  - **Ulcer**: size, shape, discharge and pain.
- **Persistence**: Has it ever disappeared or healed?
  - **Lump**: may disappear on lying down, or during exercise, and yet be irreducible at the time of examination.
  - **Ulcer**: has it healed or broken down? Record the history of each period.
- **Multiplicity**: Has (or had) the patient any other lumps or ulcers? Obtain a complete history of any other lumps or ulcers.
- **Cause**: What does the patient think caused it? Following injuries (record type & severity), or systemic illnesses.

2- The Examination of an Ulcer

- **Site**
- **Size (Depth)**: in millimeters, and by describing the structures it has penetrated
- **Shape**
- **Edge**: (sloping, punched out, undermined, rolled, everted)
- **Floor**: consists of slough, granulation tissue, tendon or bone
- **Discharge**: serous, sanguineous, serosanguinous or purulent
- **Mobility/fixedy**: Move the ulcer and inspect skin for movement. Ask the patient to tens the underlying muscle and then test mobility.

- **Inspect surrounding skin color. Palpate** for temperature, tenderness.
- **Palpate the edge of ulcer**: soft (healing), firm (non-healing), hard (malignancy)
- **State of the local tissues**: local blood supply, innervation of the adjacent skin, and regional lymph nodes.
- **General examination**.

**3- The Examination of a Lump**

- **Site**: described in exact anatomical terms, using distances measured (by tape measure) from bony points
- **Size**: width, length & depth. Irregular lumps may need a diagram.
- **Shape**: spheres, hemispheres, & asymmetrical outline (pear shaped or kidney shaped)
- **Overlying skin**: discolored, smooth, rough.
- **Temperature**: hot or of normal, assess by the dorsum of the hand.
- **Tenderness**: watch the patient’s face for signs of discomfort as you palpate. Always try to feel the non-tender part before feeling the tender area.
- **Surface**: smooth, irregular (cobblestones=bossedlated) or rough. Large lumps have mixture of surfaces.
- **Consistence**: stony hard, firm, rubbery, spongy soft.
- **Edge**: clearly defined or indistinct.
- **Fluctuation**: Pressure on one side of a fluid-filled cavity makes all the other surfaces protrude. Fluctuation can only be elicited by feeling at least two other areas of the lump whilst pressing on a third.
- **Compressibility**: vascular malformations and fluid collections can be compressed until they disappear, but when left the lump re-forms.
- **Reducibility**: hernia and some vascular lumps can be compressed so that it gets smaller and then move into another place (disappears). Ask the patient to cough, the lump may return (cough impulse), or it may tense on child’s cry.
- **Move**: to test mobility/fixedy
  - Pinch the skin overlying the lump. Immovable skin indicates skin attachment.
  - Move the lump and inspect skin for movement or puckering.
  - Underlying muscles must be tensed: if it is still mobile then it is not attached to the muscle. If it is less mobile, it is attached to the muscle. If it disappears then it arises from below the muscle.
Lumps that are attached to or arising from vessels or nerves may be moved from side to side across the length of the vessel or nerve, but not up and down along their length.

- **Palpate with both hands (Pulsatility):**
  Let your hand rest still for a few seconds on every lump to discover if it is pulsating. **Place the fingers of each hand on opposite sides of the lump.** **Expansile pulsation:** aneurysms and very vascular tumors push upwards and outwards. **Transmitted pulsation:** lump is near to an artery and are moved by its pulsations upward.

- **Flick the lump (Fluid thrill):** Large fluid collection easily conduct a percussion wave.

- **Percuss:** Dull note indicates solid and fluid-filled lumps. Resonant notes in gas-filled lumps.

- **10-Auscultate:** Vascular lumps that contain an arteriovenous fistula may have a systolic bruit. Hernia containing bowel may have audible bowel sounds.

- **Illuminate:** Translucence or Trans illumination requires a bright pinpoint light source and a darkened room. The light should be placed on one side of the lump, not directly on top of it. The light should be seen in an area distant from the site in contact with the light source.
  - **Positive** for water, serum, lymph, or highly refractile fat.
  - **Negative** for Blood and other opaque fluids do not transmit light.

- **State of local tissues:** artery (weak distal pulse), vein (distended veins & edema), nerve (paresis, loss of sensation), muscles (wasting), bone (erosion), and joints (movement of proximal and distal joint).

- **General examination**

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**Surgical scar:** see the type – site – length – position (linear – oblique – transverse) – stretch marks – discharge – bleeding – ulcer

**Symptoms with lump that indicate malignancy:**

- wasting
- weight loss
- anemia
- fatigue
- pressure symptoms
(Trauma)

- Trauma is the major cause of death in the first 40 years of life
- Trauma has 3 peaks of death:
  1. Death at time of accident (seconds to minutes)
  2. Death due to life threatening trauma (minutes to hours)
  3. Death after leaving the hospital (days to weeks)
- Triage: is the process of determining the priority of patients treatments based on the severity of their condition. it comes from French word and it mean to separate
- BLS = basic life support: يتم تعليمها للناس العاديين للتقليل من أضرار الإصابة
- CLS = cardiac life support like CPR, giving drugs like dopamine and other things important to save patients with emergency heart problem
- ATLS = advanced trauma life support that divide in to primary /secondary/tertiary:
  1. Primary survey: (ABCDEF)
     - A: airway patency: cervical spine stability – chin lift technique to avoid tongue swallow
     - B: breathing: chest tube – nasal tube
     - C: circulation: check the vital sign – blood group – clotting screen – give worm fluid – pressure on the site of bleeding, Put Two wide bore cannula, Give 1000cc of Ringer lactate, should be warm to avoid hypothermia which may cause 1-Coagulopathy 2-Acidoses.
     - D: disability: neurological problems - use Glasgow Coma Scale (form 3-15 score) or AVPU system (A alert - V verbal - P pain - U unresponsive)
     - E: Exposure and Environment: rapidly check the pt. from head to toe and keep warm environment to avoid hypothermia.
     - F: Fracture: do backslap or POP
   - Adjunct to primary survey:
     - Foley's catheter (if no urethral bleeding)
     - NG tube (if no fracture of the base of the skull)
     - Intubation either: Endotracheal tube through mouth or through opening of tracheostomy
     - Monitoring of vital signs: PR, BR and oximetry
     - Radiological investigation as X-ray (Chest, abdomen and pelvis), FAST (Focused Assessment with Sonography in Trauma) and CT.
     - ECG and cardiac markers (Troponin I and CK-MB) in cases of suspected cardiac trauma.
     - Diagnostic peritoneal lavage (examine peritoneal fluid).
     - Diagnostic and therapeutic laparotomy or thoracotomy.
  2. Secondary survey:
     - examination of patient from top to toe
• take rapid history: AMPLEx (A allergy – M medications – P past medical or surgical or pregnancy – L last meal – E event or environment)

3- **Tertiary survey:** in special centers

**History of trauma ((from doctor))**

1- **Duration of present illness** (trauma): from the start of trauma until now  
2- **Pre-operative phase:** describe the accident event:  
   • Type of accident (road traffic accident RTA – Fall from height – bullet)  
   • Type of instrument or type of ground  
   • Loss of conscious  
   • Pain  
   • Wound  
   • Bleeding  
   • Vomiting  

3- **Pre-hospital phase:**  
   • Time of arrival to the hospital  
   • I.V fluid  
   • Bandage  
   • Antibiotics  
   • Stop of bleeding  

4- **Hospital phase**

**History of trauma ((from Browse’s))**

1. **Cognitive function:** ask who they are, where they live and their occupation.  
2. **History of the accident:** ask the patient what they remember of the accident, and useful if they can describe what happened. It is often helpful to know about:  
   - **Gunshot**  
     • Type of machine: low velocity (pistol), high velocity (gun)  
     • Number of bullets  
     • Distance from shooter  
     • Site of inlet and outlet  
   - **Road traffic accident:**  
     • Was he the walker (on the street, sidewalk), driver, passenger (front or back seats), protection (seat belts, airbags)  
     • Others in accident: injured, dead.  
     • Type of car and its speed (low or high velocity)  
     • Damage to the vehicle: collision, rolling
- Fall from a height:
  - Height of fall
  - Did the patient hit anything on his way?
  - What position was the body at time of impact?

3. Walking after accident: to exclude pelvic and lower limb injuries.

4. Associated symptoms: Loss of consciousness, bleeding, vomiting, urination, cough, dyspnea.

5. Transportation: car, ambulance

6. The distance of the hospital

7. What resuscitation and procedures done? What organs was damaged.

**Examination of the Trauma**

While doing general examination, palpate for symptomless swelling, laceration, bony depression and distortion (especially in the head).

**Post-operative Examination**

1. General appearance of the patient

2. Input & output: IV fluid, drain (amount, color)

3. Wound:
   - Get permission
   - Inspection:
     - Dressing (clean, soaked with discharge)
     - Stitches (silk, nylon)
     - Color: red
     - Shape: healed
     - Discharge: (pus, blood, serum)
     - Bulging: fluid or something else
   - Palpation: Induration (indicates healing)

4. Examine the system involved.
# Fluid replacement after trauma:

- Start as 2000 ml of crystalloid.
- One unit of blood loss = three units of crystalloid replacement.
- Increase the hematocrit as: one unit of hematocrit = one unit of blood.

# Blood gases test: Ph., O2, CO2 saturation, electrolytes and every gas.

# Cardiopulmonary resuscitation (CPR):

**CABC:**

- C = compression (100/min) and ventilation (1 breath/8 sec), depth of compression = 5 cm.
- A = airway patency.
- B = breathing.
- C = circulation.
(Hernia)

Definition:
It is the protrusion of an intra-abdominal organ (intestine, ...) through a defect in the abdominal wall

Causes:
- Congenital: such as vessel or viscous enters or leaves the abdomen
- Acquired: Alongside structures penetrating the abdominal wall, Acquired weakness from trauma or disease, Associated with raised intra-abdominal pressure

Types:
- inguinal
- femoral
- umbilical
- incisional
- epigastric

Physical signs:
- occur at congenital or acquired weakness in the abdominal wall
- most hernias can be reduced
- most hernias have an expansile cough impulse

Inguinal hernia

Surface anatomy:
- The inguinal ligament located between anterior superior iliac spine and pubic tubercle (2-3 cm from midline)
The inguinal ligament is the lower inwardly folded edge of the aponeurosis of the external oblique muscle.

The external or superficial inguinal ring is an extension of the same aponeurosis.

The internal or deep inguinal ring is the point of entrance of vas deference, testicular artery and inferior epigastric artery. And it is a common site of hernia.

### Direct inguinal hernia vs Indirect inguinal hernia

<table>
<thead>
<tr>
<th></th>
<th>Direct inguinal hernia</th>
<th>Indirect inguinal hernia</th>
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</thead>
<tbody>
<tr>
<td>Outside the spermatic cord</td>
<td>inside the spermatic cord</td>
<td></td>
</tr>
<tr>
<td>Not or rarely extend to the scrotum</td>
<td>usually extend to the scrotum</td>
<td></td>
</tr>
<tr>
<td>Wide neck of the hernia sac</td>
<td>narrow neck of the hernia sac</td>
<td></td>
</tr>
<tr>
<td>Medial to the inferior epigastric artery</td>
<td>lateral to the inferior epigastric artery</td>
<td></td>
</tr>
<tr>
<td>Less common</td>
<td>More common</td>
<td></td>
</tr>
<tr>
<td>Occur in old age</td>
<td>Occur in babies and adult</td>
<td></td>
</tr>
<tr>
<td>Not enter from the deep ring</td>
<td>Enter from the deep ring</td>
<td></td>
</tr>
<tr>
<td>Go out from the superficial ring</td>
<td>Go out from the superficial ring</td>
<td></td>
</tr>
</tbody>
</table>

### Features of a direct inguinal hernia

- Does not go down into the scrotum
- Reduces upwards and then straight backwards (hence the name ‘direct’)
- Not controlled after reduction by pressure over the internal inguinal ring
- After reduction, the bulge comes directly forwards
- Rare in children and young adults

### Features of an indirect inguinal hernia

- Can (and often does) descend into the scrotum
- Reduces upwards, then laterally and backwards
- Controlled, after reduction, by pressure over the internal inguinal ring
- After reduction, the bulge reappears in the middle of the inguinal region and flows medially and obliquely towards the scrotum
- Found in all age groups including children

### Examination: ((from the book))

1- **While the patient is standing upright.**

   - **Inspect:** the inguinal and femoral canals and the scrotum for any lumps or bulges.
   - **Ask the patient to cough:** look for an impulse over the femoral or inguinal canals and scrotum.
   - **Identify the anatomical relationships** between the bulge, the pubic tubercle and the inguinal ligament to distinguish a femoral from an inguinal hernia.

2- **Palpate**

   - **Form front:** Examine the scrotum to decide whether the lump is a hernia or a true scrotal lump (you can’t get above a hernia).
   - **Form side:** Stand by the side of the patient with one hand on patient’s back to support him, and your examining hand on the lump to define its characteristics.

2- **Now ask the patient to lie down** and establish whether the hernia reduces spontaneously. If so, **press** two fingers over the internal inguinal ring at the mid-inguinal point and **ask the patient to cough or stand up** while you maintain pressure over the
internal inguinal ring. If the hernia reappears, it is a direct hernia. If it can be prevented from reappearing, it is an indirect inguinal hernia.

**Examination of both direct and indirect inguinal hernia: (from doctor)**

1. **Setting**
   - Ask the patient to stand up
   - Always examine both inguinal regions.

2. **Inspection**: Look at the lump from in front and assess:
   - the exact site and shape of the lump.
   - whether the lump extends down into the scrotum, if there are any other scrotal swelling
   - any swelling on the ‘normal’ side.

3. **Lying position**: ask the patient to lie down then cough => you will see the hernia by inspection

4. **Standing position**: exposure the inguinal region then stand in front of the patient and ask him to cough and you will see hernia in the left or right side, if there is right hernia go laterally from the right and put your hand on the hernia then make reduction of the hernia then ask the patient to lie down and ask him to cough, now if you see the protrusion of the hernia it is direct hernia but if you don't see it that means it is indirect hernia.

**Femoral hernia**: it is not reducible hernia so easily diagnosed

**Note:**

Put your hand on the hernia in the following manner:

- Thumb: put it on the deep inguinal ring
- Index: put it on the superficial inguinal ring (above pubic tubercle)
- Middle finger: put it lateral to the pubic tubercle and 4 cm below it

**The differential diagnosis of an inguinal hernia**

- Femoral hernia
- Hydrocele of the cord or the canal of Nuck
- Undescended testis
- Lipoma of the cord

**The differential diagnosis of femoral hernia**

- Inguinal hernia
- Enlarged lymph gland
- Saphena varix
- Ectopic testis
• Psoas abscess
• Psoas bursa
• Lipoma

The differential diagnosis of a lump in the groin

• Inguinal hernia
• Femoral hernia
• Enlarged lymph glands
• Saphena varix
• Ectopic testis
• Femoral aneurysm
• Hydrocele of the cord or hydrocele of the canal of Nuck
• Lipoma of the cord
• Psoas bursa
• Psoas abscess
(P.R examination)

1- Ask the patient about the pain: if there is pain you should give general anesthesia at first then do PR exam

2- Privacy of the patient

3- Position:
   - Left lateral position
   - Dorsal position
   - Elbow-knee flexion position

4- Inspection: see the following: skin – hair – pilonidal sinus – perianal abscess – ulcer-discoloration – hygiene – external hemorrhoids (position-size-color-thrombosis) – anal fissure (acute, chronic – most common site in male and female is posterior) – fistula in ano (single or multiple – above or below midline – anterior or posterior – distance from anus)

5- Sterile gloves

6- Introduce finger: feel the rectum and anal canal then feel the prostate (size-mucus above it-fixed or mobile) feel the wall (soft-hard-ulcer-mass)

7- Tell the patient to squeeze: sometimes touch mass descent from above

8- In female feel: cervix – uterus – vaginal wall – cervical excitation – Krukenberg tumor on the ovary - The recto-vesical/recto-uterine pouch

9- Thank and cover the patient

Important note: virgin female do PR instead of per vaginal

Indication of PR exam:
   - Suspected appendicitis
   - PR bleeding
   - Change bowel habits
   - Part of abdominal examination
   - Genitourinary problem
   - Pelvic or spinal trauma

Fig. 16.2 The prostate gland.
Ano-Rectal Diseases

- **Bleeding**: only blood passed by itself (diverticular disease, angiodysplasia), mixed with feces (or on surface of feces), after defecation (hemorrhoids), on toilet paper (hemorrhoids or fissure).
- **Tenesmus**: intense desire to defecate with either nothing or small amount of mucous and loose stool. Caused by anal or rectal carcinoma, IBD, IBS.
- **Pain on defecation**
- **Straining on defecation**
- **Pruritus**
- **Incontinence and soiling**: amount, color, consistency, frequency. Due to sphincter failure, impaction with overflow, extreme urgency, neurological impairment.
- **Prolapse**: with bowel action, during standing or walking. Fecal and urinary incontinence may coexist.
- **Changed bowel habit**
1- **Crystalloid**: water + electrolytes
   - **Normal saline** (NaCl 0.9%) = 154 mql Na + 154 mql Cl: it is isotonic, not pyrogenic, not immunogenic, used as volume expander in shock, trauma, burn and dehydration.
   - **Ringer's solution**: NaCl + K + Ca + lactate that correct acid-base balance
   - **Dextrose-water** (glucose-water) = 5%, 10%, 25%, 50%: it is used in nourishment of patient and in hypoglycemic state, but not used in shock and burn because it can lead to hypotension
   - **Dextrose-saline** (dextrose-water + normal saline) = 1/3, 1/5

Ringer's solution and Ringer's lactate used in burn and trauma

2- **Colloids**: high molecular weight solutions like:
   - Protein (albumin)
   - Polysaccharide
   - Glycine
   - Plasma
   - Hematin
   - Gelatin
   - Dextran

Take blood sample for cross-matching before give these solutions, and they could lead to infections transmission like malaria and hepatitis

**Post-surgical fluid**

There is neuro-hormonal response to trauma (like increase ADH and increase aldosterone that lead to edema and hypertension due to Na retention) so we give fluid according to this response.

1- **First day**:

Type of fluid: glucose-water // Amount of fluid:

- **Ongoing Loss**: IN diarrhea, sweating, drain, nasogastric tube, dehydration. Depend on conscious state and urine output (400-500 ml normally) (calcium needed). Give fluid according to type of trauma, surgery and patient.
- **Deficit**: give fluid according to type of trauma, surgery and patient.
- **Maintenance**:
  - Minimum requirement of patient is 5% dextrose water
- One liter of dextrose water = 50g of glucose
- BMR = 500 Kcal
- Rough method → minimum 2-3 liters fluid in 70 kg patient
- Calculate like the following →
  For example: 70 kg adult → first 10 kg = give 100 ml/kg = 1000 ml
  Second 10 kg = give 50 ml/kg = 500 ml
  Reminding kg = give 20 ml/kg = 1000 ml
  So we will give 2500 ml of iv fluid to this patient
  - Not give K in the first day because the trauma make the effect on aldosterone so there are sodium and potassium retention so not give K.

2- Second day:

Give glucose-saline in same amount (or) glucose saline + normal saline + electrolytes

3- Third day:

- Give K → 1 ml/kg = 60-80 ml of K
- K is given with fluid, Normal range of K = 3.5-5.0 (mEq/L)

4- After 3 days: change the type of nutrition from IV fluid to other types of parenteral nutrition
• **Stomas** A colostomy (or ileostomy) stoma is an artificial opening made in the colon (or small intestine) to divert feces and flatus outside the abdomen where they can be collected in an external appliance. Depending on the purpose for which the diversion has been necessary, a stoma may be temporary or permanent. Temporary or defunctioning stomas are usually fashioned as loop stomas, while end stomas usually as a result of surgical removal of distal bowel.

• **Ileostomy:** Formed from any part of the mid- or distal small bowel. Ileostomies (loop or end) are usually spouted, have prominent mucosal folds, tend to be dark pink/red in color, and are most common in the right side of the abdomen. Ileostomy effluent is usually liquid; patients are more likely to develop fluid and electrolytes problems.

• **Colostomy:** Formed from any part of the large bowel. Colostomies (loop or end) are usually flush, have flat mucosal folds, tend to be light pink in color. A colostomy effluent is usually solid and they are most common in the left side of the abdomen.

• **Stoma complications**
  - Skin irritation
  - Prolapse
  - Retraction
  - Ischemia
  - Stenosis
  - Parastomal hernia
  - Bleeding
  - Fistulation

• When you see a stoma (during abdominal examination) examine it.
  - Inspect:
    - Site.
    - Shape (spouted, flush)
    - Type.
    - Effluent.
    - Complications: prolapse, retraction, necrosis of the distal end, fistula, stenosis, hernia, bleeding, colostomy diarrhea, contact dermatitis.
  - Ask the patient to cough: stomal hernia, parastomal hernia.
  - Examine perineum:
    - Closed by abdominoperineal resection in permanent colostomy.
    - Intact in temporary colostomy.
Colostomy bag ((from doctor))

1- Site of colostomy: in the left iliac fossa it is related to the colon (colostomy) but in the right iliac fossa it is related to the small intestine (ileostomy)
2- Stool (color – amount - ...........)
3- Types of colostomy: permanent colostomy – temporal colostomy – terminal colostomy – loop colostomy – double burl colostomy
4- Types of ileostomy: temporal ileostomy – permanent or terminal ileostomy

Drains

Types of drainage:

1- Closed drainage system: tubes with bags ((the tubes should be flexible and rubber but we don't have this proper type of tubes))
2- Open drainage system: only tubes without bags
3- Active drainage: maintained under suction
4- Passive drainage: have no suction

Indication:

1- To evacuate (drain) existing abnormal collections of fluid or gas, To remove pus, blood, serous exudates, chyle or bile
2- To help eliminate dead space
3- To form a controlled fistula
4- To prevent buildup of normal or abnormal body fluid
5- To warn or prevent serious complications

Complications:

1- Damage to structures during insertion
2- Damage after insertion
3- Route for infection from external environment
4- Failure of drainage (Poor Drain Selection, Poor Drain Placement, Poor Post-operative Management) or false sense obscurity
5- Pain/discomfort
6- Insufficient drainage
7- Incision dehiscence / hernia
8- Premature Removal
9- Accumulation of fluid

Types of tubes:

1- T tube
2- Foley catheter
3- NG tube
(Acute abdomen)

#Causes of acute abdomen:

1- Most common causes:
   - Acute appendicitis
   - Acute cholecystitis
   - Pancreatitis
   - Inflammatory disease
   - Ectopic pregnancy

2- Other causes:
   - Acute Small Bowel Obstruction
   - Mesenteric Vascular Occlusion
   - Perforated Duodenal Ulcer
   - Acute peptic ulcer
   - Peritonitis
   - Pyelonephritis
   - Abdominal aortic aneurysm

3- Extra abdominal causes:
   - pleurisy

4- Non-surgical causes:
   - Diabetic ketoacidosis
   - Uremia
   - SLE
   - Hematological disorders

#patient with acute abdomen need:

- History taking
- Physical examination
- Investigations
- Laparoscope: to see the cause of acute abdomen + for definitive diagnosis

#Peritonitis features:

- Inspection: No abdominal movement on respiration
- Palpation: Tenderness, rebound tenderness, guarding, and rigidity.
- Percussion: tenderness on percussion
- Auscultation: Absence of bowel sound.
- Associated: Pyrexia and tachycardia.

#Examination of Acute Abdomen:

- **Inspection:**
  - Usual inspection of the abdomen
  - Ask the patient to cough (this elicits pain, you may find a hernia)
- **Palpation:** only superficial, using 1 or 2 fingers to score pain;
  - Mild: tenderness
  - Moderate: guarding
  - Sever: rigidity
- **Auscultation** for bowel sounds: rule of three (Auscultate 3 areas for 3 minutes)
  - Right iliac fossa for 1 minute
  - The right side of umbilicus for 1 minute
  - Lower abdomen for 1 minute
- **Percussion:** At the end of procedure because it elicits pain that may decreases bowel sounds.

#Investigations:

1- **Investigations in acute Cholecystitis:**
   - Hematological: TSB (total serum bilirubin) – WBC count – Alkaline phosphatase (obstructive jaundice) – serum amylase (indicate acute pancreatitis) – GUE (general urine examination)
   - Radiological: US (gold standard) – X ray (erect and supine abdomen x-ray) – CT scan (highly sensitive to peritonitis)

2- **Biliary tree:** gold standard investigations are U.S + X ray

3- **Pancreatitis:** gold standard investigations are CT scan + contrast test

#surgery:

Patient with acute abdomen need surgical intervention in the following conditions:
Tachycardia + Tachypnea + Hypotension + Fever + Abdominal distention
# Cardinal signs of some disease of acute abdomen:

## 1- Cardinal signs of intestinal obstruction:

Site of obstruction above the pyloric region:

1. Pain
2. Vomiting: watery and acidic
3. Distention: no distention
4. Absolute constipation: not absolute

Site of obstruction mid-intestinal region:

1. Pain
2. Vomiting: bile content
3. Distention: mild distention
4. Absolute constipation: little absolute

Site of obstruction left colon region:

1. Pain
2. Vomiting: little amount of vomiting
3. Distention: obvious distention
4. Absolute constipation: absolute

## Note:

Types of abdominal pain:

1. Constant griping pain: could contracting pain, it is due to inflammation
2. Colic pain: due to muscular tube obstruction

## Note:

The constipation could be relieved easily without surgery but the obstruction very difficult to be relieved

## 2- Cardinal signs of acute Cholecystitis:

- Febrile
- Nausea
- Colic abdominal pain if there is biliary obstruction but if there is inflammation it will spread to make constant referral pain
- Post-meal pain (30 min)
- Fatty meal will increase the pain
- The pain is sudden, severe, continuous, radiated to tip of right scapula, aggravated by moving and coughing, relieved by analgesics and the site is right hypochondrium.

## 3- Cardinal signs of chronic Cholecystitis:

- Some signs of acute cholecystitis
- Distention
- Fibrosis
- Thickness

  seen in imaging studies like U.S

## 4- Cardinal signs of acute on chronic Cholecystitis:

- Picture of acute abdomen
• Fever
• Hypertension
• Abdominal pain
• Loss of apatite
• Signs of septicemia

5- Cardinal signs of diverticulitis:

The most common type of diverticulitis is sigmoid diverticulitis and it is caused by fiber full food and it is acquired type of diverticulitis and not occur in developing countries

• Lead to inflammation → acute abdomen
• Diarrhea
• Bleeding per rectum
• Nausea
• Pain
• Vomiting

6- Cardinal signs of sigmoid volvulus:

• Sign of acute abdomen
• Acquired or congenital
• Occur in developing countries

7- Cardinal signs of Meckel's diverticulum:

• Congenital
• Sign of acute abdomen
• Pain in right iliac fossa
• Nausea
• Vomiting

8- Cardinal signs of Acute appendicitis:

• History: Nausea, vomiting, central abdominal pain which later shifts to the right iliac fossa
• Examination: Peritonitis features, palpable mass in the right iliac fossa. Rovsing’s sign (Palpation in the left iliac fossa produces pain in the right iliac fossa). Iliopsoas test (for Retroileal appendicitis, iliopsoas abscess): Ask the patient to flex the thigh against the resistance of your hand; a painful response indicates an inflammatory process involving the right psoas muscle.

9- Cardinal signs of Perforated peptic ulcer with acute peritonitis:

• History: history of dyspepsia, ulcer disease, NSAIDs or corticosteroid therapy. Vomiting at onset associated with severe acute onset abdominal pain, previous
• Examination: Peritonitis features
10- Cardinal signs of Acute pancreatitis:
- History: alcohol abuse/cholelithiasis, Anorexia, nausea, vomiting, constant severe epigastric pain
- Examination: Peritonitis features, epigastric tenderness, periumbilical bruising (Cullen’s sign) or loin bruising (Grey–Turner’s sign, fever)

11- Cardinal signs of Ruptured aortic aneurysm:
- History: history of vascular disease and/or high blood pressure. Sudden onset of severe, tearing back/loin/abdominal pain.
- Examination: Shock and hypotension, pulsatile, tender, abdominal mass, asymmetrical femoral pulses, Grey–Turner’s and Cullen’s sign.

12- Cardinal signs of acute mesenteric ischemia:
- History: Anorexia, nausea, vomiting, bloody diarrhea, constant, abdominal pain, previous history of vascular disease and/or high blood pressure
- Examination: Atrial fibrillation, heart failure, asymmetrical peripheral pulses, absent bowel sounds, variable tenderness and guarding

13- Cardinal signs of Intestinal obstruction:
- History: Colicky abdominal pain, vomiting, distention and constipation
- Examination: Surgical scars, hernias, mass, distension, visible peristalsis, increased bowel sounds

--

**Murphy's sign**

is tested for during an abdominal examination; it is performed by asking the patient to breathe out and then gently placing the hand below the costal margin on the right side at the mid-clavicular line (the approximate location of the gallbladder). The patient is then instructed to inspire (breathe in). Normally, during inspiration, the abdominal contents are pushed downward as the diaphragm moves down (and lungs expand). If the patient stops breathing in (as the gallbladder is tender and, in moving downward, comes in contact with the examiner's fingers) and winces with a 'catch' in breath, the test is considered positive. In order for the test to be considered positive, the same maneuver must not elicit pain when performed on the left side. Ultrasound imaging can be used to ensure the hand is properly positioned over the gallbladder.
(Acute appendicitis)

Definition: defined as an inflammation of the inner lining of the vermiform appendix that spreads to its other parts. Despite diagnostic and therapeutic advancement in medicine, appendicitis remains a clinical emergency and is one of the more common causes of acute abdominal pain.

Causes: Obstruction of the appendiceal lumen by:

- lymphoid hyperplasia secondary to inflammatory bowel disease (IBD)
- infections (bacteria, parasites)
- fecal stasis and fecaliths
- foreign bodies
- neoplasms (carcinoid tumor)
- strictures
- swollen peyer's patches

History of acute appendicitis (clinical presentation)

1- shifting pain: start as visceral pain (around the umbilicus) then shift to parietal pain (in the R.I.F)
2- Sudden onset of sever pain in the R.I.F ((in 1/3 of patients))
3- Nausea
4- Vomiting ((one or two times per day – and usually start after the pain))
5- Loss of appetite
6- Diarrhea or constipation ((in 18% of patients))

Investigations:

- Acute appendicitis is diagnosed from history and clinical examination but we do many investigations for differential diagnosis and complications
- There are a lot of investigations in acute appendicitis like: WBC count, General urine analysis, X-ray, U.S, C.T scan, Laparoscopy and pregnancy test.
1- Patient with R.I.F pain: we do **WBC count** and **General urine analysis** for differential diagnosis of
  1- Acute appendicitis
  2- Urinary Tract Infection (UTI)
  3- Stone formation
  4- irritation of the urinary bladder wall

2- Use **Ultra Sound (U.S)** for differential diagnosis of:
   - ectopic pregnancy
   - overian cyst in female, and presented with: menstrual irregularity and hirsutism and obesity.
   - salpingitis
   - ureteric stone
   - Pyelonephritis in male

3- Use **Abdominal X ray (A.X.R)** for differential diagnosis of:
   - Intestinal obstruction
   - ureteric stone
   - Pyelonephritis (radio-opaque)

4- Use **C.T scan** for differential diagnosis of:
   - Tumor
   - Perforated appendix
   - Perforated viscous
   - Pancreatitis

5- Use **laparoscopy ((diagnostic and therapeutic))** for differential diagnosis of:
   - Gynecological complications
   - Advantage for obese

**Clinical signs of patient with acute appendicitis:**

1- **Rovsing's sign**: pressure on left iliac fossa and the pain will appear in Right iliac fossa
2- **McBurney's sign**: deep tenderness at the McBurney's point
3- **Obturator sign**: pain due to contact between the inflamed appendix and obturator muscle.
4- **Psoas sign**: The pain results because the psoas borders the peritoneal cavity, so stretching (by hyperextension at the hip) or contraction (by flexion of the hip) of the muscles causes friction against nearby inflamed tissues like appendix.
5- **Aaron's sign**: is a referred pain felt in the epigastrium upon continuous firm pressure over McBurney's point. It is indicative of appendicitis
6- **Blumberg's sign**: A positive sign is indicated by presence of pain upon removal of pressure on the abdominal wall. It is very similar to rebound tenderness

7- **Cough sign**: increase pain with cough because of parietal pain

8- **Shifting pain**

9- **Shifting tenderness**: pressure on left iliac fossa and the pain will appear in Right iliac fossa

10- **R.I.F Tenderness**

11- **Rebound tenderness**: lead to sever pain after sudden release of the hand above appendix

12- **percussion tenderness**: percussion on McBurney's point lead to sever tenderness

13- **guarding sign**: The tensed muscles of the abdominal wall automatically go into spasm to keep the tender underlying tissues (appendix) from being disturbed.

### Right iliac fossa pain differentials:

1- For child:
   - Acute appendicitis
   - Cystitis (UTI)
   - Torsion of testes
   - Intestinal obstruction
   - Enteritis
   - Intussusception
   - Mesenteric lymphadenoma
   - Meckel's diverticulum
   - Gastroenteritis

2- For young adult male:
   - Acute appendicitis
   - Acute pyelonephritis
   - Ureteric stone
   - Cancer
   - UTI
   - Inflammatory bowel disease

3- For female:
   - Ectopic pregnancy
   - UTI
   - Complication of pregnancy
   - Sigmoid

4- For elderly:
   - Cancer

---

**Note:**

To differentiate between acute appendicitis and Meckel's diverticulum:

- rotate the baby to the left side then exam the pain if the pain is still in the R.I.F it is acute appendicitis but if the pain disappear it is Meckel's diverticulum
- both have the same clinical characters

**Note:**

To differentiate between acute appendicitis and Mesenteric lymphadenoma: via shifting pain

---

[Diagram: Umbilicus, upper 2/3, lower 1/3, McBurney's point = base of the appendix, Ant. Sup. Iliac spine]
• Inflammatory bowel disease
• Sigmoid

Surgery:

1- General anesthesia
2- Appendectomy
3- Type of surgery: conventional and laparoscopic
4- Types of incisions:
   • Lanz incision
   • Gridiron incision
   • Muscle splitting incision
   • Rutherford incision
   • Middle line surgery
   • Right para-median

5- Size of incisions is 6-7 cm

Complications of acute appendicitis:

1- Appendicular abscess
2- Appendicular mass
3- Generalized peritonitis
4- Perforation:
   • Predisposing factors: delayed diagnosis – immunocompromised patient – two extreme of age.
   • Site: occur in the tip of appendix → lead to appendicular abscess → pelvic abscess → generalized peritonitis.
   • Need surgery + drainage of abscess + aspiration under U.S guide.

Note:

Ochsner sherren regimen:

• Is an expected management giving to a patient with appendicular mass
• Aim: treatment of infections + pain relief + fluids and electrolytes supplement
• Period: 48-72 hours
• The regimen is: Nothing by mouth + fluids and electrolytes supplement + antibiotics + analgesics + chart ( contain pulse measure + pressure measure + general examination + measure input and output of fluids )
• For more information visit: http://www.medimag.com.ng/ochsner-sherren-regimen-and-appendix-mass/
Differential diagnosis of appendicular mass:

1- T.B peritonitis
2- Hematoma
3- Crohn's disease
4- Tumor
5- Abscess
6- Ovarian cyst
7- Ectopic kidney
8- Lymphoma
9- Tissue mass

Differential diagnosis of appendicular mass (other source)

1- appendicular mass
2- ileocaecaltuberculosis (hyperplastic type)
3- Intussusception
4- Crohn`s disease
5- carcinoma caecum
6- Tubo-ovarian mass, e.g. abscess
7- undescended testis
8- transplanted kidney
9- ectopic kidney
10- psoas abscess
11- non-Hodgkin lymphoma

Complications of appendectomy:

1- Septicemia
2- D.V.T
3- Inconel hernia
4- Respiratory complications
5- Intestinal obstruction
6- Infections
(Intestinal obstruction)

#Types of intestinal obstruction:

1- **complete** (total blockage of the lumen) - **incomplete** (partial blockage)
2- **small** intestine obstruction - **large** intestine obstruction
3- **Dynamic** (mechanical) obstruction - **Adynamic** obstruction (paralytic ileus) due to loss of transmission of peristalsis and hypokalemia
4- **Acute** intestinal obstruction - **Chronic** intestinal obstruction

<table>
<thead>
<tr>
<th>Causes of Dynamic (mechanical) obstruction</th>
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<tbody>
<tr>
<td>Extra-mural</td>
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<tr>
<td>Adhesions</td>
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<tr>
<td>Bands</td>
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<td>Internal hernia</td>
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<td>external hernia</td>
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<td>tumor</td>
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<th>Causes of Dynamic (mechanical) obstruction</th>
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<th>Acute and chronic intestinal obstruction</th>
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<tr>
<td><strong>Duration</strong></td>
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<tr>
<td>Acute: less than 2 weeks</td>
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<tr>
<td>Chronic: more than 2 weeks</td>
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</tbody>
</table>

#Causes of intestinal obstruction:

1- In neonate:
   - Congenital anomalies (like congenital pyloric stenosis)
   - Atresia
   - Hirschberg disease
   - Hernia
   - Family history of intestinal obstruction
2- In infant:
   - Meconium ileus
   - Perforated anus
   - Hirschberg disease
• Congenital anomalies
3- In children:
  • Volvulus
  • Tumor
  • Adhesion
  • Intussusception
4- In adult and elderly:
  • Hernia
  • Tumor
  • Adhesion

#Clinical features of intestinal obstruction:

1- **Vomiting**: start green, yellow then feculent color. More proximal obstruction lead to increase vomiting and distention
2- **Abdominal pain**: colicky (in paralytic ileus is less pain)
3- **Abdominal distention**: Gas Nitrogen (produced by swallow of air and bacterial fermentation) Fluid (produced by secretions and dietary source)
4- **Constipation**: but in some condition there is diarrhea
5- **Extra-intestinal features**: fever – dehydration – electrolyte disturbance

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<th>Note: هام</th>
<th>Intestinal obstruction with diarrhea:</th>
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<tr>
<td></td>
<td>• Richter's hernia</td>
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<td>• Gallstone ileus: called ball valve mechanism يوم مسدود يوم إسهال – called aerobilia (air in the biliary tree)</td>
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<td>• Pelvic abscess</td>
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<td>• Fecal impaction</td>
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<td>• Mesenteric vascular occlusion</td>
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</tbody>
</table>

#Management of intestinal obstruction: resuscitation-investigations-treatment

=Resuscitation:

• I.V fluid (wide bore cannula): ringer lactate ((lower intestinal obstruction is acidic but upper intestinal obstruction is alkaline so not give ringer lactate in upper intestinal obstruction like gastric outlet obstruction and give normal saline with potassium instead))
• Blood sample for investigations
• Nasogastric tube
• Foley's catheter
• Antibiotics: against gram negative and anaerobic bacteria
• Analgesia
• Check vital signs

=Investigations:

X-ray:
• Erect and supine → supine give earlier diagnosis
• See air/fluid level → 5cm is normal – above 5 cm is abnormal
• Small intestine: central – small diameter - diameter more than 6 cm
• Large intestine: peripheral – large diameter – diameter more than 8 cm. if more than 10 cm it indicate perforation.

=Treatment:
• Treat underlying cause
• Surgery

#Closed loop syndrome:
• Obstruction in two sides
• May lead to dilatation and green vomiting and perforation
• Occur in colon: CA colon or incompetent ileocecal valve
• Occur in small intestine: volvulus of small intestine
• Occur in sigmoid volvulus (anti clock wise obstruction)

#Sigmoid volvulus:
• Resuscitation: like that of intestinal obstruction
• Deflating rectal tube
• Sigmoidoscope (diagnostic and therapeutic)

#Intussusception:
• Occur in the ileum – cecum – colon
• Occur from 9 months of age to 10 years
• Clinical features: vomiting – abdominal pain – blood per rectum – palpable abdominal mass – lethargy – red current jelly – scream
• Etiology: idiopathic – viral gastrointestinal pathogens like rotavirus, echovirus, reovirus
• Differential diagnosis: rectal prolapse
• Treatment: IV line + nasogastric tube + IV antibiotics + hydrostatic barium enema or pneumatic enema + surgery

Note:
Sigmoid colon: is the commonest site of volvulus, tumor and diverticulosis because of its shape and fecal material storage
# Causes of chronic intestinal obstruction (Intestinal Pseudo-Obstruction)

1- The 3 most common associations are the following:
   - Trauma (especially retroperitoneal)
   - Serious infection
   - Cardiac disease (especially myocardial infarction and congestive heart failure)

2- Other conditions commonly associated with colonic pseudo-obstruction are:
   - Recent surgery (abdominal, urologic, gynecologic, orthopedic, cardiac, or neurologic)
   - Spinal cord injury
   - Old age
   - Neurologic disorders
   - Hypothyroidism
   - Electrolyte imbalances (hyponatremia, hypokalemia, hypocalcemia, hypercalcemia, or hypomagnesemia)
   - Respiratory disorders
   - Renal insufficiency
   - Medications (eg, narcotics, tricyclic antidepressants, phenothiazines, antiparkinsonian drugs, and anesthetic agents)
   - Severe constipation

3- The condition may also observed in patients with the following:
   - Intestinal hypoperistalsis syndrome
   - Megacystis megacolon
   - Amyloidosis
   - GI carcinoma
   - Guillain-Barré syndrome
   - Multiple myeloma
   - Alcohol abuse

# Mesenteric vascular occlusion:

- Causes: High cholesterol - Blood clots - Cocaine and methamphetamine use – surgery
- Symptoms include: abdominal pain and tenderness - bloating or a sense of fullness – diarrhea – nausea – vomiting - fever
- Diagnosis: CT – U.S – MRI - MRA (magnetic resonance angiography) - Arteriogram
• Treatment: Angioplasty + Lifestyle adjustments + medications (antibiotics - vasodilator drugs - heparin or warfarin)

#Hypokalemia:

• **Potassium normal range**: 3.5-5.2 mmol/L
• **Causes**: Decreased intake - Shift into cells - Extra-renal losses (GIT) - Renal losses - Spurious
• **Clinical manifestations**: Neuromuscular disorders (Muscle Weakness, flaccid paralysis, respiratory arrest) GIT (nausea, constipation paralytic ileus) Acquired Nephrogenic DI (Polyuria, polydypsia) Heart (Arrhythmias, Postural hypotension)
• **ECG Changes**: Flat T-wave - appearance of U wave - Cardiac arrest
• **Management**: treat underlying cause + correction of alkalosis + Oral KCL Tabs

#Notes#

**History of jaundice:**

1- Obstructive jaundice due to benign cause: painful + fluctuating jaundice like gallstone
2- Obstructive jaundice due to Malignant cause: painless + constant jaundice like cancer

**How to ask patient about bowel motion:**


**Diarrhea:**

• More than 3 bowel motion/day or more than 300 mg/day
• It is important to ask the patient if there are changes in the bowel motion because it differs from person to person
• Early morning diarrhea = malignancy (like CA colon)
(Splenomegaly)

Causes:

1- Infections:
   - Viral: infectious mononucleosis
   - Bacterial: brucellosis – syphilis – T.B
   - Protozoal: malaria - kala azar
2- Hematological: leukemia, lymphoma
3- Metabolic: Gaucher's disease
4- Vascular malformations
5- Liver disease: cirrhosis
6- Portal hypertension
7- Hemolytic anemia
8- Tumor and secondary metastasis

Indications of splenectomy:

1- Trauma
2- Hereditary spherocytosis
3- Portal hypertension
4- Malignancy (CA stomach - lymphoma)

Complications of splenectomy

1- Respiratory complications:
   - Basal atelectasis: cough after splenectomy due to lung collapse
   - Plural effusion
   - Empyema
2- Increase susceptibility to infections like
   - H.influenzae (pneumonia) , N.meningitidis (meningitis)
3- D.V.T
4- Thrombocytosis ( can lead to thrombosis )
5- Acute gastric dilatation
6- Bleeding
7- Injury to adjacent organs
8- Pancratitis
9- Septicemia ( by streptococcus – haemophilus )

Note:
There is conservative management instead of splenectomy

Note:
After splenectomy give antibiotics and vaccines
Fig. 15.20 Bilateral enlargement of the kidneys.

Fig. 15.21 A pancreatic, lesser sac, pseudocyst.

Fig. 15.22 A mesenteric cyst.

Fig. 15.23 A colon distended with faeces. The masses are indentable. Faecal impaction of this degree is likely to be caused by Hirschsprung's disease or gross constipation.

Fig. 15.24 Stomach mass.

Fig. 15.16 Hepatomegaly.

Fig. 15.25 An enlarged gallbladder.

Fig. 15.17 Splenomegaly. The notch is not always palpable.

Fig. 15.26 A colon distended with faeces. The masses are indentable. Faecal impaction of this degree is likely to be caused by Hirschsprung's disease or gross constipation.

Fig. 15.28 A large ovarian cyst.

Fig. 15.18 A large fibroid uterus.

Fig. 15.27 A distended urinary bladder.
Part 3: Chest

(Chest Trauma & Chest Tube)

((Chest Trauma))

# Mechanism of trauma of the chest

- **Penetrating trauma**
  - causes:
    1. Bullet injury (the tract is straight) (may result in shock wave and cavitation)
    2. Shell injury (the tract is zigzag like)
    3. Stab wound
  - penetrating trauma (has inlet only) perforating trauma (has inlet and outlet)
  - Penetrating trauma $\rightarrow$ may lead to laceration of the lung, pneumothorax, hemothorax, heart injury.

- **Blunt trauma**
  - Crushing chest wall between two blunt objects
  - Causes:
    1. RTA (Road Traffic Accident)
    2. FFH (Fall From Height)
    3. Blunt object trauma
  - Blunt trauma $\rightarrow$ may lead to Ecchymosis, bruising, rib fracture, flail chest, pneumothorax, hemothorax.

- **Blast trauma**
  - It is due to explosion of a bomb, which lead to formation of intense positive wave followed by negative wave collectively known as ~Shock Wave~ which may result in an injury to the micro-structures in the lungs as alveoli and capillaries.
  - May lead to:
    1. Interstitial hemorrhage
    2. Intra alveolar hemorrhage
    3. Diffuse capillary hemorrhage
    4. lung edema
    5. ARDS (acute respiratory distress syndrome)
    6. Pneumothorax and hemothorax
# Components of chest trauma

- Chest wall (skin – subcutaneous tissue – intercostal muscles – neurovascular bundle – ribs) ➔ may lead to open pneumothorax or fracture of the ribs.
- Parietal and visceral pleura ➔ may lead to pneumothorax, hemothorax, empyema.
- The lung ➔ may lead to laceration of the lung, pneumothorax, hemothorax, collapse, respiratory distress, hemoptysis.
- The heart and great vessels ➔ may lead to massive bleeding, massive cardiac tamponade, constrictive pericarditis, ventricular aneurysm, VSD, ASD, valve injury.
- Thoracic duct ➔ may lead to chylothorax (milky color) which need surgery and conservative management (bed rest + no fatty meal + total parenteral nutrition TPN).
- Esophagus ➔ may lead to mediastinitis and sepsis.
- Trachea and bronchus ➔ may lead to tracheal laceration, rupture of the trachea, rupture of the bronchus, pneumothorax, emphysema, hemoptysis, obstruction.
- Diaphragm ➔ may lead to herniation of abdominal content into the chest and it is diagnosed by barium meal.
- Spinal cord ➔ may lead to injury in the spinal cord.

# Effects of chest Trauma

- Chest trauma may effects:
  1. Breathing
  2. Blood flow
- Thoracic inlet includes structure that pass into the chest medial to the clavicle
- Thoracic outlet includes structures that pass out of the chest superlateral to the clavicle
- Trauma to the chest could cause:
  - Insult without fracture ➔ Manage by: Analgesia, breathing, high flow O2 (ABO).
  - Fracture of ribs ➔ If only one or two ribs treat conservatively (ABO).
  - Flail chest ➔ mostly treated conservatively but may need chest tube or mechanical ventilation in severe cases, with/without surgical intervention.
  - Loss of part of the chest wall ➔ needs surgical intervention.
- Lung injury:
  a. Contusion: hazy area on CXR
  b. Direct injury: damage to tissues that may cause bleeding.
- Cardiac injury ➔ especially if the trauma associated with fractured sternum (indicated severity of trauma); could be assessed by:
  1. Trponin I and CK-MB monitoring
  2. ECG, suspect:
     a. BBB (bundle branch block) b-1st degree heart block c-tachyarrhythmia.
     Most commonly associated with tamponade
# General principles in treatment of chest trauma

- Resuscitation from shock ➔ restoration of blood volume and relief of pain
- Restoration of normal cardiopulmonary function:
  - Relief of upper airway obstruction (remove forging body + lateral position + tracheostomy)
  - Decompression of pleural cavity (drainage by chest tube)
  - Relief pericardial tamponade
  - Stabilization of chest movement (in flail chest injury)
- Prevention of infection

# Management of Chest Trauma in general

- ABC
- Blood tests, blood gases, blood group and matching and preparing 2 pints of blood.
- CXR (chest X-ray)
- ECG and Echo (Esophageal echo is the best investigation to reveal cardiac injury).
- Endoscopy: to check for esophageal perforation, also you can use water soluble contrast which can be swallowed + fluoroscopy.
- Bronchoscopy: to look for bleeding or damage to bronchi.

# Patient with chest trauma is treated by

- 85% by chest tube
- 15% by thoracotomy

# Indication of Thoracotomy:

- Initial gush of 1500 cc of blood or 250cc/hr. for the first 3 hours (Suggests continuous bleeding which needs repair)
- Heavy air leak in pneumothorax (suggests bronchial injury)
- Thoracic duct injury
- Late complication like: Empyema, Fibrosis, Lung abscess, Broncho-pleural fistula.
- Esophageal injury
- Tracheal fracture: causes stridor, managed by thoracotomy and repair.
- Great vessel injury or cardiac injury
  - Most pt. with aortic injury don’t reach ER (95%) only 5% reach with high risk of death during surgical intervention.
  - If aortic injury is small causing an aneurysm its presentation will be late and managed by elective thoracotomy and repair.
# General information

- It is closed drain.
- To isolate the atmospheric pressure from the pleural pressure the tube should be placed in an **underwater seal** of about 200-300 cc of normal saline, so the air can’t return back into the pleural cavity.
- We do under water seal and not emptying the pleura directly and completely to avoid rapid lung expansion.
- In aspiration and insertion of chest tube we should insert in the upper border of the rib to avoid injury to neurovascular bundle.

# Indications

- Complex pneumothorax
- Pneumothorax on positive-pressure ventilation
- Hemothorax
- Large plural Effusion
- Empyema
- Chylothorax

# Contraindications

- Bleeding diathesis
- Coagulopathy

# Site of insertion

- It is inserted in the **Triangle of safety** which has the following boundaries:
  1. Anteriorly → posterior border of pectoralis major muscle.
  2. Posteriorly → anterior border of latissimus dorssi.
  3. Inferiorly (base) → the 5th intercostal space.
  4. Superiorly (apex) → the base of axilla.
- A line is made in the triangle at the mid-axillary line and the tube is inserted at the level of this line in the 4th or 5th intercostal space.
#We should know the followings:

- Contents of the tube and bottle.
- Amount of the contents.
- If the chest tube is functioning or not:
  - Swinging movement of fluid in the tube, if not ask the patient to cough.
  - Air bubbles.

#when we should remove chest tube?

**A-In pneumothorax**

1. If there is no air bubbles or air leak.
2. If there is no swinging movement.

- Clump the tube for 24 hr. and do X-ray, if the lung expanded open the clump and ask pt. to cough if there are air bubbles leave the tube, if not, remove it.

**B-In hemothorax or chylothorax or pyothorax**

- No discharge for 24-48 hr.

**C-In effusion**

- If there is Small amount of fluid we can remove the tube (large amount → not remove it).
- Depend on the fluid collection in the bottle and the X-ray.
- Normal plural fluid is 50-100 cc.

#Complications

- bleeding
- Organ perforation
- Intercostal neuralgia
- Tube blockage
- Subcutaneous emphysema
- Re-expansion pulmonary edema
- Local infection and empyema

>> For more information see the following videos <<

http://www.muhadharaty.com/lecture/1677

http://www.muhadharaty.com/lecture/1678
Figure 55.7 Insertion of chest drain: (a) triangle of safety; (b) penetration of the skin, muscle and pleura; (c) blunt dissection of the parietal pleura; (d) suture placement; (e) gauging the distance of insertion; (f) digital examination along the tract into the pleural space; (g) withdrawal of central trochar and positioning of drain; (h) underwater seal chest drain bottle.
(Death in Chest Trauma)

Causes of early death in patient with chest trauma:

- Upper airway obstruction
- Massive hemothorax
- Tension pneumothorax
- Open pneumothorax
- Flail chest injury
- Pericardial tamponade

(1) Upper airway obstruction

#Causes

- Direct injury leads to edema, hematoma or blood clots obstructing the airways.
- Foreign body aspiration
- Secretions in unconscious patients
- Tongue swallowing
- External compression

#Management

- Position: left lateral position with traction of the angle of mandible anteriorly
- Sucking: any foreign body or secretion by the sucker
- High flow O2
- Endotracheal tube: placement from the mouth
- Tracheostomy with use of endotracheal tube: when approach from the mouth is not possible due to fascial trauma or other causes.
- Laryngoscope: sometimes used to open the upper airway.

Note:
Simple pneumothorax:
- Simple symptoms or may be asymptomatic
- Mostly occurs in patient with Marfan’s syndrome
- Normal vital sign

(2) Massive hemothorax

When 1000-2000ml (or 1.25-1.5 L in other reference) of blood is collected in the pleural cavity initially ➔ It is called massive hemothorax.

#Causes

- Laceration of the lung
- Injury of great blood vessels
• Injury to intercostal artery
• Injury to bronchial artery

#Management

• Give blood + i.v fluid.
• Put the chest tube.
• Do Thoracotomy ➔ done if there is continuous bleeding of 300 cc of blood in 3-4 hours, thoracotomy will stop the bleeding.

Note: 85% of all chest trauma ➔ need chest tube only.

15% of all chest trauma ➔ may need thoracotomy.

(3) Tension pneumothorax

Presence of air under tension (high pressure) in the plural cavity due to one way valve mechanism. It lead to lung collapse and pressure on the other lung and mediastinal structures and push them. It comprise inferior and superior vena cava (lead to shock) and pressure on right and left atrium (lead to hypotension).

#Causes

• Trauma
• Disease or (spontaneous)
  o Tuberculosis
  o Non-Tuberculous:
    a. Rupture of emphysematous bullae (diameter= 2 cm or more)
    b. Rupture of emphysematous bleb
    c. Rupture of solitary lung cyst
    d. Honeycomb lung or cystic lung
    e. Idiopathic in young smoker patient
    f. In patient with Marfan's syndrome (usually simple pneumothorax that progress to tension)

#Diagnosis:

• History:
  o The patient present with severe sudden dyspnea
  o Sometimes chest pain
  o Healthy young patient
  o Previous attack
• Clinical examination:
- Hyper-resonant on percussion.
- Asymmetrical chest movement.
- Tracheal deviation and mediastinal shifting toward opposite side.
- Vocal fremitus (tactile fremitus) is decreased or absent.
- Absence of breath sounds.
- Hypotension or shock (CVP is 10-15mmHg) and engorged neck veins due to compression of large vessels that impair venous return.

**#Management**

- Needle puncture or needle decompression (wide bore needle): in the 2nd intercostal space at the level of mid-clavicular line, converting it into open pneumothorax allowing air to escape into atmosphere thus temporarily relief the tension pneumothorax.
- Chest tube: with underwater seal is done after needle decompression.
- Thoracotomy: according to indication.

**Open pneumothorax**

Associated with external trauma (Sucking wound) the air enter through the defect in the chest wall during inspiration and go out with expiration. Patient presented with dyspnea.

**#Management**

- Closure of the wound by either suturing or gauze
- Chest tube

**Flail chest injury**

- Characterized by paradoxical movement of segment of the chest with respiration:
  - In inspiration → the lung go in (collapse)
  - In expiration → the lung go out (expansion)

**#Cause:**

Blunt or penetrating trauma lead to Fracture of ribs:
1-Multiple (more than 3 ribs)
2-Successive
3-Fracture at least in two sites in each rib

**#Management**

- Rest and immobilization (no movement of the chest).
- Intubation may be needed with high flow oxygen.
• Fixation of the segment by:
  o Plaster
  o Traction
  o Suturing the ribs by using steel wire
  o Thoracotomy
• Chest tube
• Mechanical ventilation (IPPV) in severe cases (anesthesia + endotracheal tube).

#Flail chest may be accompanied by
• Interruption in respiration, leads to respiratory compromise.
• Lung contusion.
• Disease in the lung, mediastinum, pneumothorax, hemothorax.

(6) Pericardial tamponade
• It is characterized by presence of blood in the pericardium.
• Acute form of pericardial effusion clinically characterized by Becks triad:
  o Hypotension
  o Engorged neck veins (elevated JVP)
  o Muffled heart sounds
• To improve the diagnosis → do CXR Echo study of the heart

#Cause:
• Trauma.
• Infection mainly in Iraq due to TB, or other causes as uremia or hypoproteinemia.
• Disease (pericarditis, bacterial, inflammatory, malignant, TB) with presence of fluid in all of these diseases.

#Amount of blood:
• Acute tamponade → 100 cc of blood
• Chronic tamponade → 700-1000 cc of blood (chronic tamponade occur in pericarditis due to TB, renal failure, liver failure, heart failure, tumor)

#Management
• Pericardiocentesis with echo guidance. (using needle or catheter for few days)
• Thoracotomy if bleeding is continuous or if recur.
• In chronic case: do aspiration + continuous catheter in the pericardium → take blood for investigations (culture + chemical)
#General information

- The breasts are modified sweat glands.
- Composed from lobes → lobules → lactiferous duct
- Pigmented skin covers the areola and the nipple, which is erectile tissue.
- The openings of the lactiferous ducts are on the apex of the nipple.
- The nipple is in the fourth intercostal space in the mid-clavicular line, but accessory breast/nipple tissue may develop anywhere down the nipple line (axilla to groin).
- The adult breast is divided into the nipple, the areola and four quadrants, upper and lower, inner and outer, with an axillary tail projecting from the upper outer quadrant.
- upper lateral quadrant → the most quadrant that affect by malignancy
- 99% of breast cancer occur in female and only 1% in male (more aggressive in male)
- The breast is bounded by the clavicle superiorly, the lateral border of the latissimus muscle laterally, the sternum medially, and the infra-mammary fold inferiorly.
- Conservative breast surgery → radiotherapy + removal of the breast.
- If there is metastases to the spine there will be tenderness and pain on raising the leg and absent knee jerk due to damaging effects on the nerves.

#Lymph nodes

- Lymph drainage of the breast:
  - 70% to the axillary LN
  - 20% to the supraclavicular LN or along the internal mammary vessels
  - 10% to the abdominal LN
- Axillary L.N divided into five groups:
  - Anterior (Pectoral)
  - Posterior (Subscapular)
  - lateral
  - Medial (Sub-clavicular)
  - Central (intermediate)
- Surgical levels of axillary L.N:
  - Level I → bottom level, below the lower edge of the pectoralis minor muscle
  - Level II → lies underneath/posterior the pectoralis minor muscle
  - Level III → above/medial the pectoralis minor muscle
• When there is breast cancer and axillary L.N affected ➔ means metastatic and systemic disease.
• Sentinel L.N (first L.N adjacent to the cancer) ➔ to see if there is metastases make injection of methylene blue or radioactive substance then take biopsy and examine it.

#History

• **Questions:**
  o How long have symptoms been present?
  o What changes have occurred?
  o Is there any relationship to the menstrual cycle?
  o Does anything make it better or worse?

• **Age:**
  o young patient (15-25 years) ➔ fibro-adenoma
  o middle age (25-40 years) ➔ ANDI (Aberrations in the normal development and involution) due to hormonal changes like prolactin and sex hormones
  o old age (more than 40 years) ➔ cancer of the breast

• **Questions of lump** (Cause - first symptoms - onset - duration - associated symptoms – progression - multiplicity)

• **Presentation:** discharge – lump – skin changes

• **History of trauma:** lead to fat necrosis which appears as a mass

• **History of breast surgery and biopsy**

• **Family history:** 5-10% of breast cancer run in family

• **Risks** that increase the probability of breast cancer occurrence:
  o Number of menstruation (increased number ➔ more risk)
  o Nulliparous (more risk)
  o Unmarried (more risk)
  o Lactation (protective)

• **Drug history:** estrogen – progesterone

• **Obesity:** increase the level of estrogen

• **Sex related hereditary diseases**

• **Menstrual history:** Menarche, menopause, changes during the menstrual cycle, pregnancies, lactation.

• **Social history:** smoking – alcohol – diet (fat, animal meat, low fiber, pickles)

#We should examine the following for complete breast exam:

• Both breasts
• The axilla
• The supraclavicular LN
• The abdomen for a-Hepatomegaly b-Ascites
- Do PR to check Douglas pouch for metastasis
- Examine the spine for tenderness
- Do knee jerk and straight leg raising test

#Breast clinical examination

1. Settings:
   - Position: The patient must be undressed to the waist, resting comfortably at 45 degree. Ask her to rest her hands on her thighs to relax the pectoral muscles. Other positions: supine or setting 90 degree
   - Explain what to do to the patient
   - Always examine the patient with nurse or relatives
   - Clean your hand – good light – humidity – temperature

2. Inspection:
   - Face the patient and look at the breasts for: asymmetry, local swelling, dilated veins skin changes (lump, ulcer, puckering, peau d’orange, scar, fungation), nipple changes (discoloration, discharge, destruction, depression, deviation, displacement, duplication)
   - Nipple discharge: one or two breast, single or multiple duct, type of discharge (serous, blood, mixed)
   - Ask the patient to press her hands firmly on her hips to contract the pectoral muscles and inspect again for invisible lumps.
   - Ask her to raise her arms above her head and then lean forward to expose the whole breast and exacerbate skin dimpling.
   - Elevate the breast with your hand to uncover dimpling overlying a tumor which may not be obvious on inspection.
   - Examine the arm

3. Palpation:
   - Ask her to lie with her head on one pillow and her hand under her head on the side to be examined.
   - Hold your hand flat to her skin and palpate the breast tissue, using the palmar surface of your fingers to compress the breast tissue firmly against her chest wall.
   - Begin with the symptomless side, or you can examine both sides simultaneously.
   - View the breast as a clock face. Examine each ‘hour of the clock’ from the outside towards the nipple, including under the nipple. Examine all the breast tissue.
   - Compare the texture of one breast with the other.
   - Define the characteristics of any mass:
o Characteristics: site, size, shape, surface, edge, pain, temperature (raised in inflammation)
o Content: Fibro-adenoma (rubbery) Cyst or glactocele (soft) Cancer (hard)
o Levels of the mass: attach to the muscle or skin (pinch the skin out), mobility, tethering (mass sometimes fixed and sometimes mobile or mass move separately from the skin)
o TNM staging (from lecture)

- Relations to structures beneath the breast is tested by holding the mass between your thumb and forefinger with the patient’s hands on her hips. Ask her to push her hands against her hips (contract pectoralis muscle) and then push the examiner’s shoulder (contract serratus anterior). If the lesion is less mobile, it is either fixed or tethered.
- **Examine the axillary tail** between your fingers and thumb as it extends towards the axilla.
- **Palpate the nipple** by holding it gently between your index finger and thumb. If the patient complains of discharge, try to express it by massaging the breast towards the nipple & gently pressing the nipple to uncover any discharge. Note the color and consistency of any discharge, along with the number and position of the affected ducts. Test any nipple discharge for blood using urine-testing sticks.

4. **Examine the supraclavicular fossa**, looking for any visual abnormality.
5. **Palpate the regional lymph nodes (axillary and neck)**
6. **Examination of axilla**: right axilla examine by left hand and vice versa (we should make relaxation of the patient hand)
7. **Examine site of malignancy**: back (spine tenderness) abdomen (hepatomegaly – ascites)
8. **Do P.R examination**: for krukenberg tumor
9. **Back examination**: metastasis of breast cancer to venous plexus

#Triple assessment of the mass

1- History and Examination
2- Radiology
   - Ultrasound: mass, cyst, abnormality
   - Mammography: it is X-ray, see soft tissue of the breast, do to 35 years old patient or older, if done to young patient it will make more dense tissue (less soft tissue), it has lateral view and medial oblique view, it used to see if there is malignancy in the breast
3- Biopsy: incisional biopsy, excisional biopsy, fine needle aspiration, whole organ biopsy
4- Extra: MRI, CBC, Others
Clinical presentation of breast symptoms:
1. Painful lump (Abscess (postpartum or lactational), cyst, periductal mastitis (duct ectasia), fibroadenosis, very rarely Ca)
2. Painless lump (Carcinoma, cyst, fibro-adenoma, fibroadenosis)
3. Pain without lump (mastalgia) cyclical or non-cyclical breast pain, very rarely carcinoma.

Causes of Inversion or retraction:
1. Cancer slit like inversion of the nipple
2. Genetic
3. Puberty
4. Fungal infection

Retraction: circumference (benign or congenital) slit like retraction (cancer)

MOST common cause of nipple discharge is lactation

Discharge could be either:
1. Milky or serous (normal)
2. Bloody or pinkish in papilloma (most common cause) or carcinoma.
3. Purulent due to infection
4. Greenish, brownish or black in duct ectasia.

Question-Difference between fixity and tethering?
1. Fixity: When a lesion is fixed to the skin, it has spread into the skin and cannot be moved or separated from it.
2. Tethering: A tethered lesion is one which is more deeply situated and distorts the fibrous septa (the ligaments of Astley Cooper) that separate the lobules of breast tissue. This puckers the skin, but the lesion remains separate from it and can be moved independently.
Revision panel 13.5

The breast changes of pregnancy
Fullness and prickling sensations
Enlargement
Distended subcutaneous veins
Increased nipple and areolar pigmentation
Circumareolar pigmentation
Hypertrophy of the subareolar sebaceous glands (Montgomery’s tubercles)
A clear, expressible secretion (colostrum)

Revision panel 13.2

The changes that can occur in the nipple
Destruction
Depression (retraction or inversion)
Discolouration
Displacement
Deviation
Discharge
Duplication

>> For more information see the following video <<
http://www.muhadharaty.com/lecture/1679
(Vascular Trauma)

#General information

- Vascular trauma → trauma to the arteries or veins
- Consequence → ischemia or bleeding
- Bleeding:
  - Arterial: jetting + bright color
  - Venous: continuous + dark color
  - Concealed: internal → in the cavities like pleura, peritoneum, pericardium
  - Revealed: external
- Unrecognized and untreated bleeding → lead to loss of organ (death) or gangrene
- Ischemia:
  - Convert aerobic respiration to anaerobic lead to metabolic disturbances lead to inflammatory response (SIRS)
  - Signs of ischemia (5Ps) Pain – Pale – Paralysis – Paresthesia – Pulseless
  - Acute ischemic limb is due to trauma, thrombus, embolus
  - Chronic ischemia is due to ischemic disease like atherosclerosis lead to some symptoms like claudication
- Unrecognized and untreated ischemia → lead to limb lose, stroke, bowel necrosis, multiple organ failure
- Clot (outside the vessel) Thrombus (inside the vessel)
- Source of embolus:
  - Heart (in atrial myxoma, septic embolus from infected endocarditis)
  - Fat embolus
  - Air embolus
  - Tumor
- Virchow’s triad:
  - Endothelial dysfunction or damage
  - Stasis
  - Hypercoagulability
- Venous injury, leading to bleeding and thrombosis.

#Mechanism of vascular trauma

1- Laceration:

- As bullet or shell or stab wound.
- Could be complete or partial cutting of the vessel.
2-Blunt:

- As crush injury
- Lead to thrombosis → ischemia → acute ischemia of the limb.
- A blunt trauma to the artery cause injury to the intima that can end in:
  - Exposure of the sub-endothelial collagen lead to activation of clotting mechanism and thrombosis that lead to obstruction of blood flow lead to ischemia of the distal tissues.
  - The intima itself my flap and act as a valve in the artery, obstructing blood flow.

- Pseudo-aneurysm: it is a pulsatile mass of clot surrounded by membrane or surrounding tissue, it result from arterial hemorrhage within contained hematoma.
- Arterio-venous fistula:
  - result from injury to adjacent artery and vein
  - which may lead to subsequent rapture or cardiovascular compromise
  - lead to dilated veins and thick wall veins and increase venous pressure
  - lead to thrill and bruit

#Diagnosis of vascular trauma

1- Clinical diagnosis:
- Hard sign of vascular injury:
  - Pulsatile bleeding
  - Expanding hematoma
  - Absent distal pulses
  - Cold, pale limb
  - Palpable thrill
  - Audible bruit
• Absence of hard sign of vascular injury virtually excludes the presence of vascular trauma.
• Sometimes there is no hard signs but the patient has ischemia ((risk of old age, history of bleeding))
• Presence of hard signs mandates immediate operative intervention ((Time is only 6 hours)) if late lead to irreversible ischemia.
• Signs that mean the limb is not dead yet: capillary refill + movement of the limb.

2- Investigations:
• Doppler US (called duplex Doppler)
• Angiography (done by catheterization)
• CT angiography (less invasive, give I.V contrast)

#Management of vascular trauma

1- Arrest bleeding:
• Pressure: especially venous bleeding.
• Position: depend on the site of bleeding specific positions will reduce bleeding.
• Packing: by using our hands or fingers! Or by using bandages or tourniquet, in areas where bandage or tourniquet can’t be used as below the angle of mandible we can use folly’s catheter, by inserting it in the wound as deep as possible then inflate its balloon which will provide pressure on the bleeding vessel.
*** Time limit for tourniquet is 30-45 min, to prevent ischemia, and also we have to write the time of application of the tourniquet so when the pt. reach the hospital or special center, the doctor who will receive him will know the time of its application.

2- I.V line:
• Sample (blood group, cross matching).
• Assessment of vital signs (PR, BP, urine output).
• Volume replacement (give amount of fluid that keep blood pressure between 90 and 100 mmHg to avoid ischemia and hypertension.
• Give normal saline or ringer lactate
• Give blood and cloting factor as necessary are administered to correct hypothermia, acidosis, coagulopathy, restore perfusion
• Not give large amount of fluid to avoid:
  o increase blood pressure
  o dislodgment of clot or thrombus lead to bleeding
  o hemodilution (affect clotting mechanism)
  o hypothermia
  o electrolyte dilution
3- Surgical treatment:
- Vascular clamp: We apply tourniquet proximal to the arterial injury, then we close the proximal and distal ends of the injured artery and stop bleeding, after this we remove the tourniquet to allow blood flow through collateral vessels to the distal tissue.
- Trimming of the artery.
- Saphenous vein graft: if there is gap, and we should reverse the direction of saphenous vein because it contain valves, use saphenous vein because it is available without infection and low complications.
- End to end anastomosis: use prolyn (non-absorbable monofilament suture).
- Not do anastomosis to irreversible ischemia to avoid ischemia perfusion syndrome:
  - Activation of cellular and humeral immunity
  - Collection of toxic material like lactic acid and potassium
  - Lead to cell edema

#Compartment syndrome:
- Ischemia leads to cell membrane dysfunction and thus causes efflux of electrolytes (mainly potassium) from the cells into surrounding tissues, thus increases the osmolarity extracellularly leading to shifting of fluid into the interstitium, which lead to formation of edema which compress the vessels more and causing more ischemia.
- Clinical features:
  - Severe pain
  - Tenderness
  - Weak or no pulse
  - Tense calf area
  - Homan's sign
- Diagnosis:
  - Clinically
  - Probe: to measure the pressure in the compartment (30 mmHg)
- Management:
  - Opening the compartment by fasciotomy if the intracompartment pressure more than 30mmHg, but we do it prophylactically regardless of the pressure inside it.

#Reperfusion Syndrome:
- Ischemia leads to accumulation of the following:
  1-Potassium (efflux from cells due to membrane dysfunction)
  2-Lactic acid (due to anaerobic metabolism)
  3-Free radicals
After restoring perfusion the above will enter into the systemic circulation and affects the body tissues and mainly the heart and it may cause:
1- Cardiac Arrhythmia or Arrest
2- Metabolic acidosis
Sometimes it is asymptomatic and these changes will reverse by physiological mechanisms of the body.
Treatment: Steroids to prevent SIRS, NaHCO3 to prevent acidosis, Ca gluconate to reverse the effect of potassium.

#History of ischemic limb

- History of claudication
  - Intermittent pain on waking or exercise for distinct distance (differ from patient to other)
  - Relieved by rest
  - Occur in the calf, thigh, buttock, may occur in the arm
  - Leriche's syndrome (claudication in the buttock)
- Color changes (dusky, bluish, reddish, black)
- Pain, Pale, Paresthesia, Paralysis
- Night pain
- Previous amputation or loss of limb

#Vascular examination
Steps of assessment of arterial circulation:

1- Inspection

- Check pressure area (heel, medial and lateral malleolus, tips of toes, below calf muscles)
- Check hidden area (popliteal fossa, between toes → see laceration, cracks)
- Skin changes (color, bleeding disorders)
- Wasting and deformities
- Hair distribution and loss
- Gangrene and ulcers
- Amputation and loss of toes
- Guttering vein (groove)

2- Palpation

- Skin temperature (in ischemia → cold limb, in infection → warm limb)
- Tenderness
- Edema (pitting, non-pitting)
- Thrill (in vascular lesion or mass)
- Capillary filling test (more than 2 sec → ischemia, test in the tips of finger nail)
- Burger's angle or vascular angle (patient lie supine and elevate his leg 90 degree then it will become pale if there is ischemia) (The angle decrease in severe disease)
- Capillary refilling time (done after burger's test → the limb become purple dusky in color)
- Ulcer examination
- Mass examination
- Amputation → levels of amputation:
  - Toe and head of metatarsal (Ray excision)
  - Trans-metatarsal
  - Through ankle
  - Below knee
  - Through knee
  - Above Knee
  - Head of femur (called disarticulation)
- Palpate peripheral pulses
- Allen's test: To determine which artery is not dominant, so we can remove it and put it in the heart if needed.

3- Auscultation
- Listen for bruits
- Measure the blood pressure and index

4- Do investigations
- Random glucose
- Blood urea and nitrogen
- Lipid profile
- Bilirubin level
- Doppler or Duplex

#Examination of arterial pulses
- When examining any pulse, we should know:
  1-Rate
  2-Rhythm
  3-Volume
  4-Character
  5-Consistency of arterial wall
- Lower limb pulses:
  1-Femoral pulse; can be felt in the midinguinal point midway between symphysis

Causes of Radio-femoral delay:
1- Coarctation of aorta
2- Aortic aneurysm
3- Aortic dissection
pubis and anterior superior iliac spine, just below the inguinal ligament.

2-**Popliteal pulse**; you can feel it by three maneuvers:
A- On supine position: either by flexion of knee joint 120 degree and by putting our thumbs of the two hands on the tibial tuberosity and using other fingers palpating deeply in the popliteal fossa. Or by hyperextension of the leg at knee joint and pushing by one hand over the knee and palpating by the other hand.
B- On prone position.
C- Sitting position: by placing one leg over the other and look for leg movement from pulsation (May be seen in popliteal aneurysm or in normal variant).

(Popliteal pulse usually it is hard to feel but if it is easily felt always suspect popliteal artery aneurysm).

3- **Posterior tibial artery**; 2cm below the medial malleolus or midway between the heel and medial malleolus.

4- **Anterior tibial artery**; at the ankle joint, midway between the medial and lateral malleolus.

5- **Dorsalis pedis artery**; lies lateral the tendon of extensor hallucis longus muscle or between the 1st and 2nd metatarsal bones.

- Upper limb pulses:
  1- **Brachial pulse**; you can feel it by asking the pt. to contract his biceps and locate its tendon, the artery lies medial to the tendon.
  2- **Radial pulse**; lies lateral to tendon of flexor carpi radialis muscle.

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**#Examination of varicose veins**

When there is suspected sapheno-femoral varix or perforating varices we can differentiate between them by one of the following tests:

1- **Trendelenberg test**:
The patient is in supine position and the his/her legs above the level of the heart and pressure is applied at the saphenofemoral junction and then ask the patient to stand up and inspect if there is :

a- Refilling within 3-5 sec, this is normal
b- Refilling after 20 sec or no filling this indicate incompetent superficial veins
c- If there is rapid filling of the veins this indicate non-competent valves of the communicating branches.

2- **Tourniquet test**:
Same as above, but the tourniquet is applied instead of the pressure and the same findings are presented to determine whether the incompetency site:

1- above the knee, incompetence in the perforators of the thigh
2- below the knee, incompetence between the short saphenous and popliteal veins.
Part 4: Head & Neck

(Head injury)

- Primary injuries: at accident (fracture, hematoma, hemorrhage).
- Secondary injuries: later on:
  1. Hyperthermia → increase intracranial pressure.
  2. Hypotension → hypovolemia.
  3. Seizure → increase brain demand.
  4. Hypoxemia.
  5. Hypoglycemia.
- Head injury → bleeding hematoma → closed space → compression of brain → secondary brain insult → we must do decompression.
- Do the following examinations:
  1. Glasgow coma scale.
  2. Focal neurological signs.
  3. Examination of pupil.
  4. Signs of fracture at base of skull.

**Glasgow coma scale:**
- From 0 to 3 → dead person.
- From 3 to 8 → Severe.
- From 8 to 13 → moderate.
- 13 → minimal.
- 14 and 15 → normal.
- 8 or less → patient need definitive airway management.

**Focal neurological signs:**
- Sensory examination.
- Motor examination.
- Reflexes examination.

**Examination of pupil:**
- Dilatation of pupil in 3rd CN palsy.
- Reactivity to the light.

**Signs of fracture at base of skull:**
- Raccoon eye.
- Bat sign.
- Rhinorrhea and otorrhea.
- Hemotympanum.
# Vital signs ➔ hypertension & bradycardia ➔ do CT scan ➔ see hematoma.
# Trait of increased intra-cranial pressure ➔ vomiting, hypertension, bradycardia.

# Indication of CT scan in head injury: (box in baily)
- Low Glasgow coma scale.
- Features of fracture of base of skull.
- Focal neurological sings.
- Deterioration of conscious level.
- Age above 65.
- Ante-grade amnesia.
- Coagulopathy.
- Seizure.
- Alcoholic.

# Management:
- First do primary and secondary survey of ATLS (ABCD).
- High O2 flow.
- Anticonvulsant foe seizure.
- Glucose.
- Fluid and electrolyte (but not give glucose water).
- Correction of hyperthermia.

# Types of cranial hematomas:
- Intra-axial hemorrhage: bleeding within the brain itself, or cerebral hemorrhage.
- Extra-axial hemorrhage: bleeding that occurs within the skull but outside of the brain tissue, falls into three subtypes:
  - Epidural hematoma: rapidly accumulating hematoma between the dura mater and the cranium.
  - Subdural hematoma: occurs when there is tearing of the bridging vein between the cerebral cortex and a draining venous sinus.
  - Subarachnoid hemorrhage: is bleeding into the subarachnoid space (the area between the arachnoid membrane and the pia mater surrounding the brain)

# Severity of head injury
- Severe head injury (Glasgow Coma Scale score 3–8).
- Moderate injury (Glasgow Coma Scale score 9–14).
- Minor head injury (Glasgow Coma Scale score 15).
(Neck swellings)

<table>
<thead>
<tr>
<th>Midline swelling</th>
<th>Lateral swelling</th>
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</thead>
<tbody>
<tr>
<td>Thyroid enlargement</td>
<td>Branchial cyst</td>
</tr>
<tr>
<td>Thyroglossal cyst</td>
<td>Cystic hygroma</td>
</tr>
<tr>
<td>Peri-tracheal L.N enlargement</td>
<td>Sternocephalomastoid tumor</td>
</tr>
<tr>
<td>Single nodule in isthmus</td>
<td>Pharyngeal pouch</td>
</tr>
<tr>
<td>Chondroma of thyroid gland</td>
<td>Cervical lymphadenopathy</td>
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<tr>
<td>Sebaceous cyst</td>
<td>Lipofibroma</td>
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<tr>
<td>Thyroid cyst</td>
<td>Carotid body tumor</td>
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<tr>
<td>Mass related to skin</td>
<td>Thyroid enlargement</td>
</tr>
<tr>
<td>Dermoid cyst</td>
<td>Dermoid cyst</td>
</tr>
<tr>
<td>Lipoma</td>
<td>Sebaceous cyst, lipoma</td>
</tr>
<tr>
<td>Sub-hyoid bursa</td>
<td>Early stage of SCC</td>
</tr>
</tbody>
</table>

#History of neck swelling:
- Onset, Duration, Possible cause, First symptom, Associated symptoms, Progression, Persistent, Multiplicity
- Pain (10S), fever, weight change
- Dysphagia, odynophagia, dysphonia, dyspnea, cough, hemoptysis
- Pain in the mouth, discomfort on eating, sore throats or ulceration, nasal discharge, pain or blockage of the airway, pain in the throat or neck, changes in voice and difficulty with breathing.
- Family history, Personal history (Smoking, alcohol), Travel history

- Symptoms such as general malaise, fever and rigors and contact with people with infectious diseases may indicate an **infective cause** of the swelling.
- Loss of appetite, loss of weight and pulmonary, alimentary or skeletal symptoms may suggest a **malignant cause**.
- Irritation of the skin associated with enlarged cervical lymph glands is often seen with **lymphoma**.

#Examination of neck swelling:

**Inspection**
Site (midline, anterior triangle, posterior triangle), Size, Shape, Surface, Skin over, Surrounding, Scar, Other masses.

**Palpation**
- Put gel on your hands.
- Ask about pain.
- Start away from the mass.
- Examine: temperature, fluctuation, consistency, margin, overlying skin, attachment to underlying tissue (fixity), fluctuation, reducibility, compressibility, cough impulse (in pharyngeal pouch), pulsation (carotid), translumination (cystic hygroma, thyroid cyst, thyroglossal cyst).

**Percussion**
In retrosternal extension of goiter (percuss on sternum) → become dull.

**Auscultation**
Thyroid bruit → in thyroid tumor for example.
#Neck lymph nodes:

**Information:**
- Lymph nodes in the neck are divided into anterior and posterior cervical groups:
  - Anterior cervical triangle is limited by the midline anteriorly, the clavicle below, and the sternocleidomastoid muscle. It includes the submental, submandibular, jugular, scalene, and supraclavicular lymph node groups.
  - Posterior cervical triangle is limited by midline, sternocleidomastoid, and trapezius muscle. It includes the posterior cervical, post-auricular and the occipital groups.

Enlarged lymph nodes are examined for:
- The lymph node areas involved.
- Whether they are discrete or matted.
- Approximate size of the lymph nodes.
- Tender or not.
- Consistency (Soft, rubbery, hard).
- Mobile or fixed.
- Abnormality of the overlying skin,

**Levels of L.N:**
- Level 1 ➔ submental (1A) and submandibular (1B).
- Level 2 ➔ Upper third of sternocleidomastoid.
- Level 3 ➔ middle third of sternocleidomastoid.
- Level 4 ➔ lower third of sternocleidomastoid.
- Level 5 ➔ posterior triangle.
- Level 6 ➔ peritracheal L.N.

**Notes:**
- The anterior group is better examined from behind while the patient is sitting, and the posterior group is examined from the front.
- Examine the scalp if you find enlarged occipital and auricular L.N.
- If the cervical L.N are enlarged, the axillary and inguinal L.N should be examined.
- 80% of enlarged L.N in adult is malignant.
- Biopsy: used in case of solid mass or uncertain diagnosis.
- Use FNA for diagnosis:
  - If you find benign condition then do excisional biopsy.
  - If you find limited malignant condition then do excisional biopsy.
  - If you find extensive malignant condition then do radio or chemotherapy.

**Causes of cervical lymphadenopathy:**
- Infection: Non-specific, Glandular fever, Tuberculosis, Syphilis, Toxoplasmosis, Cat-scratch fever (Rochalimaea henselae)
- Metastatic tumor: From the head, neck, chest and abdomen
- Primary reticuloses: Lymphoma, Lymphosarcoma, Reticulosarcoma
- Sarcoidosis
(Thyroid gland)

#Information:
- Changes in hormone activity can be assessed by:
  - Clinical examination.
  - Measuring circulating tri-iodothyronine (T3) and thyroxine (T4) levels.
  - Measuring the rate and quantity of radioactive iodine taken up by the gland.
- Hormone secretion can be suppressed by:
  - Iodine, which inhibits hormone release.
  - Potassium perchlorate, which interferes with iodine trapping.
  - Carbimazole and propylthiouracil, which inhibit the iodination of tyrosine and the coupling of tyrosines to make thyronines.
  - Destroying the gland surgically or with radiotherapy.

#Diagnosis of swellings in the neck:

**History:**
- Is there one or more than one lump?
- Where is the lump?
- Is it solid or cystic?
- Does it move with swallowing?

**Multiple lumps:** are invariably lymph glands.

**A single lump:**
- In the anterior triangle that does not move with swallowing:
  - Solid: Lymph gland, Carotid body tumor.
  - Cystic: Cold abscess, Branchial cyst.
- In the posterior triangle that does not move with swallowing:
  - Solid: Lymph gland.
  - Cystic: Cystic hygroma, Pharyngeal pouch, occasionally a secondary deposit of a papillary thyroid carcinoma
  - Pulsatile: Subclavian aneurysm.
- In the anterior triangle that moves with swallowing:
  - Solid: Thyroid gland, Thyroid isthmus lymph gland.
  - Cystic: Thyroglossal cyst.

#Symptoms of thyroid disease:
The thyroid gland can cause two groups of symptoms and signs: those connected with the swelling in the neck, and those related to the endocrine activity of the gland.

- **Neck symptoms:**
  - A lump in the neck: The majority of thyroid swellings grow slowly and painlessly.
  - Discomfort during swallowing: This is not true dysphagia.
- **Dyspnea**: The whistling sound of air rushing through a narrowed trachea is stridor.
- **Pain**: occur in thyroiditis, Hashimoto’s disease, anaplastic carcinoma.
- **Hoarseness**: caused by a paralysis of one of the recurrent laryngeal nerves.

### Symptoms and signs of hyperthyroidism/thyrotoxicosis:
- **Nervous system**: nervousness, irritability, insomnia, nervous instability, tremor of the hands, full-blown thyrotoxic psychosis.
- **Cardiovascular system**: palpitations, breathlessness on exertion, swelling of the ankles, chest pain, tachycardia, atrial fibrillation, dyspnea, peripheral swelling.
- **Metabolic and alimentary systems**: increase in appetite but loss of weight, diarrhea, proximal muscle myopathies, preference for cold weather, excessive sweating, intolerance of hot weather, amenorrhea.

### Symptoms and signs of hypothyroidism/myxedema:
- **Increase in weight, and constipation.**
- **Deposition of fat across the back of the neck and shoulders**
- **Slow thought, speech and action.**
- **Intolerance of cold weather.**
- **Loss of hair, especially the outer third of the eyebrows.**
- **Muscle fatigue.**
- **Dry skin and ‘peaches and cream’ complexion.**
#History of thyroid gland:
- Age, Sex, Geography, Diet, cause.
- Local and general symptoms.
- Duration of symptoms.
- Family history.
- Ask about: cold intolerance, sweating, appetite, sleep, menstrual problems.
- Symptoms associated with malignancy: dyspnea, odynophagia, dysphagia, pain, paresthesia, weight loss.

#Examination of thyroid gland:
- **Look at the whole patient:**
  - First confirm that the swelling in the neck is in the thyroid gland (move with swallowing).
  - Fast or slow movements and expressions, nervous and agitated.
  - Thin or fat patient.
  - What is the distribution of any wasting or fattening?
  - Looks at thickness of cloths, sweating, feeling hot or cold.
  - Pale or yellow lemon color occur in hypothyroidism.
  - Loss of hair (in the outer third of the eyebrows) in hypothyroidism.
- **Look at the hands:**
  - Feel the pulse: Tachycardia (hyperthyroidism), bradycardia (hypothyroidism), atrial fibrillation (thyrotoxicosis in middle or old age patient).
  - Are the palms moist and sweaty?
  - Is there a tremor? Thyrotoxicosis causes a fine, fast tremor.
  - Look for finger clubbing, koilonychia, ecchymosis, wasting.
  - Palmer erythema (hyperthyroidism) carpal tunnel syndrome (hypothyroidism).
- **Examine the eyes:**
  - Eye symptoms: double vision, pain in the eye if the cornea ulcerates.
  - Eye signs: ecchymosis, bruises, sub-conjunctival hemorrhage, diversion sequence.
  - Lid retraction and lid lag:
    - This sign is caused by over activity of the involuntary (smooth muscle) part of the levator palpebrae superioris muscle.
    - Upper lid raised, Lower lid normal.
    - This is not exophthalmos.
  - Exophthalmos:
    - The eyeball is pushed forwards by an increase in vetro-orbital fat, edema and cellular infiltration.
    - Both lids moved away from center with sclera visible below or all-round the iris.
    - Because the eyes are pushed forwards, the patient can look up without wrinkling the forehead.
    - In severe exophthalmos, the patient cannot close their eyelids and may develop corneal ulceration.
  - Ophthalmoplegia:
    - It is weakness of the ocular muscles.
Caused by edema and cellular infiltration of the muscles themselves and of the oculomotor nerves.
Particularly of the superior rectus and inferior oblique muscles (cannot look up and out)
- Chemosis:
  - It is edema of the conjunctiva.
  - Caused by the obstruction of normal venous and lymphatic drainage of the conjunctiva by the increased retro-orbital pressure.

- **Inspect the neck:**
  - Ask the patient to swallow: give a sip of water, all thyroid swellings ascend during swallowing.
  - Observe the general contours and surface of the swelling: the skin can be puckered, tethered and pulled up by swallowing.
  - Ask the patient to open their mouth and then to put out their tongue: If the lump moves up as the tongue comes out, it is thyroglossal cyst.
  - The neck veins will be distended if there is a mass obstructing the thoracic inlet.
  - Is thyroid cartilage in the center of the neck or deviated to one side?
  - See if there is scar (surgical or radiation scar).

- **Palpate the neck from the front:**
  - Confirm your visual impression of thyroid size, shape and surface, and to find out if it is tender.
  - Note the number, size, site, shape, nodularity, fixity, texture, consistency, temperature, overlying skin for swelling.
  - Can get below it or not? (Retrosternal extension).
  - Check fixity by contraction of sternocleidomastoid muscle.
  - Check the position of the trachea.
  - Examine the position of thyroid cartilage.

- **Palpate the neck from behind the patient:**
  - Place your thumbs on the ligamentum nuchae and tilt the patient’s head slightly forwards to relax the anterior neck muscles.
  - Ask the patient to swallow while you are palpating the gland.
  - With a retrosternal extension of the thyroid, it is important to assess whether you can feel the lower border of the gland on swallowing or whether there is still a significant extension lying behind the sternum.
  - Feel the tenderness, shape, size, surface, consistency of thyroid gland or neck lump.
  - Palpate the whole of the neck for any cervical and supraclavicular lymphadenopathy.

- **Percussion:**
  - Used to define the lower extent of a swelling that extend below the suprasternal notch.
  - Percuss along the clavicles and over the sternum and upper chest wall.
  - This can be done when standing in front of or behind the patient.

- **Auscultation:**
  - Listen over the swelling.
Thyrotoxic and vascular glands and lumps may have a systolic bruit.

- **General examination:**
  - Examination of cardiovascular and nervous systems for any evidence of hyperthyroidism or hypothyroidism.
  - Examination of submental, submandibular, cervical, supraclavicular L.N.
  - Reflexes: hyper reflexia (hyperthyroidism), slow relaxation phase (hypothyroidism).

#Examination of a patient with a goiter:
- Look at the whole patient for agitation, nervousness or lethargy.
- Examine the hands for sweating, tremor and tachycardia.
- Examine the eyes for exophthalmos, lid lag, ophthalmoplegia and chemosis.
- Examine the neck: always check that the lump moves with swallowing.
- Palpate the cervical lymph glands.

<table>
<thead>
<tr>
<th>Clinical state</th>
<th>Hypothyroid</th>
<th>Euthyroid</th>
<th>Hyperthyroid</th>
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<tbody>
<tr>
<td>Diffuse enlargement</td>
<td>Thyroiditis</td>
<td>Iodine deficiency</td>
<td>Primary hyperthyroidism (Graves' disease)</td>
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<td></td>
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<td>Enzyme defects</td>
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<td></td>
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<td>Goitrogens</td>
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<td>Thyroiditis</td>
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<td>Amyloid</td>
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<td></td>
<td></td>
<td>(pregnancy, puberty)</td>
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<tr>
<td>Multinodular enlargement</td>
<td>Multinodular goitre with gross degeneration</td>
<td>Multinodular goitre</td>
<td>Secondary hyperthyroidism (Plummer's syndrome)</td>
</tr>
<tr>
<td>Solitary nodule</td>
<td>Coincidental nodule with myxoedema</td>
<td>Cyst</td>
<td>Autonomous toxic nodule</td>
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<td></td>
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<td>Dominant nodule</td>
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<td>Adenoma</td>
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<td>Follicular or papillary carcinoma</td>
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<tr>
<td>No palpable goitre</td>
<td>Thyroiditis</td>
<td>Normal gland</td>
<td>Primary hyperthyroidism</td>
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<tr>
<td></td>
<td>Primary myxoedema</td>
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<td>Thyroxine overdose</td>
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<td></td>
<td>Post-thyroidectomy or postradioactive iodine</td>
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</tr>
</tbody>
</table>

Notes:
- The only disease that move with protrusion of tongue is thyroglossal duct.
- Cystic lesion with positive trans-lamination test is Branchial cyst.
- Diffuse physiological thyroid enlargement: in growth, puberty, pregnancy ➔ need of thyroxin increase so TSH level increase.
- Previously doctors said that there is congenital ectopic thyroid tissue, but now they say that this condition is not present, and there is acquired metastatic papillary carcinoma instead of it.
- Pretibial myxedema ➔ in grave's disease.
- Proximal myopathy ➔ in hyperthyroidism.
- Myxedema coma ➔ loss of consciousness due to hypoglycemia in the end stage of hypothyroidism.
- Berry's sign: In goiter, the carotid artery may be pushed posteriorly by the enlarged thyroid and this is called displacement. When the infiltration of the carotid by the tumor, the carotid pulse will be absent on that side. This is absent carotid pulse is called Berry's sign. (examine it by palpation).
Investigations in thyroid gland diseases:

- Ultrasound of the neck: state of thyroid gland, calcifications, nodularity, L.N.
- Radio-active iodine: diagnostic and therapeutic, detect hyperactive nodules.
- X-ray: shifting of the trachea, widening of the mediastinum.
- CT & MRI.
- Thyroid function test: TSH, T3, T4, Thyroglobulin.
  - Patient take thyroxin $\Rightarrow$ T4 high, T3 normal, TSH low.
  - Hypothyroidism $\Rightarrow$ T4 low, T3 low, TSH high.
  - Primary hyperthyroidism $\Rightarrow$ T4 high, T3 high, TSH low.
  - Secondary hyperthyroidism $\Rightarrow$ T4 high, T3 high, TSH high.
- Auto-antibody titers.
- Blood test: serum calcium, blood count, ESR, CRP, CBC.
- FNA, core biopsy, lobectomy (incisional or excisional biopsy).
- Laryngoscope.
- ECG: for atrial fibrillation.
Salivary glands

#Causes of swelling of a salivary gland:
- Acute infection: Viral (e.g. mumps), Bacterial (e.g. Staphylococcus).
- Duct obstruction
- Sialectasis (chronic infection)
- Tumour: Benign, Malignant.
- Sarcoidosis (Mikulicz’s syndrome)
- Sjogren’s syndrome

#Examination of Salivary gland swellings:

1- Approach
- Sit/kneel to be at the same level as the patient's face
- Examine as for any lump

2- Inspect
- Swelling in the region of the parotid gland (lies wedged between the sternocleidomastoid and the mandible) and the submandibular gland (at the angle of the jaw, wedged between the mandible and mylohyoid)
- Look for scars and the opening of a fistula (can follow parotidectomy or long-standing parotid traumatic injury)
- Stand back and look for facial asymmetry which occurs if the VIIth nerve is involved with a parotid lesion.

3- Palpate from behind
- Walk behind the patient and enquire about tenderness before palpating the swelling
- Unilateral or bilateral?
- Fixity? - ask patient to clench teeth
- examine for other features as for any lump
- check cervical lymphadenopathy

4- Other tests
- Look inside mouth with pen torch at opening of parotid duct (Stensen's duct): opposite upper 2nd molar and opening of submandibular duct (Wharton's duct)
- Look for inflammation and pus, or the presence of a stone
- Palpate the parotid duct and submandibular duct openings wearing a pair of gloves
- Palpate the submandibular gland bimanually with a finger in the mouth and another finger below the angle of the jaw

5- Completion
- Test the facial nerve
- Perform a full ENT examination

#Parotid gland:

History:
• Age: more common in the elderly and the debilitated.
• Symptoms: pain, swelling, fever, rigor, others.
• Systematic questions.
• Previous history.

**Examination:**
• Inspection: site, size, shape, surface, skin over, surrounding, scar.
• Palpation: Tenderness, temperature, other features of swelling.
• Mouth examination:
  o Inspection: The orifice of Stensen's duct is opposite the second upper molar tooth (color, pus, edematous).
  o Palpation Feel the mouth of the duct (any thickening, swelling, tenderness).
• Facial nerve examination:
  o Facial deviation (as neurological exam).
  o Corneal reflex.
  o Special sensation to anterior 2/3 of the tongue.
• Fixity: tension of masseter muscle, vertical and horizontal fixity, fixity to underlying tissue.
• Scar: searching for scar of previous surgery by elevating the ear.
• Tonsillitis: open the mouth and see the tonsils.

**Notes:**
• The parotid gland cannot be palpated bimanually because it lies behind the anterior edge of the masseter muscle and the vertical ramus of the mandible.
• Gentle pressure on the gland may produce a purulent discharge from the orifice of the duct.
• Why stones in submandibular gland is more than in parotid gland? The duct of submandibular gland is more vertical and its secretion is mucous.

**Submandibular gland:**

**History:**
• Age: most common in young to middle-aged adults.
• Sex: Males and females are equally afflicted.
• Symptoms: pain and swelling beneath the jaw, caused by obstruction of Wharton’s duct.
• Development: The symptoms may recur and remit for periods of a few days or weeks if the stone moves about in the duct, sometimes obstructing it, sometimes not.
• Previous history.

**Examination:**
• Inspection: site, size, shape, surface, skin over, surrounding, scar.
• Palpation:
  o Ballotable (finger below the tongue and finger from neck).
  o Examine wharton's duct below the tongue.
• Percussion.
• Auscultation.
• Nerves examination:
  o Hypoglossal nerve: motor to the tongue \(\Rightarrow\) examine tongue movement.
  o Lingual nerve: sensation of posterior 1/3 of tongue.
  o Marginal mandibular nerve.
• Important structures of submandibular surgery: LDH Lingual nerve, Duct, Hypoglossal nerve.

#Sublingual gland:
• Ranula: caused by trauma or fibrosis that close the duct.
• Ranula (unilateral), Ranging Ranula (bilateral).
• Treatment: excision from mouth.

#Notes:
• Stones: cause pain when see or eat food.
• Fixity of mass:
  o Contraction \(\Rightarrow\) become more prominent (more movable) \(\Rightarrow\) mass in the kin
  o Contraction \(\Rightarrow\) become more prominent (more fixed) \(\Rightarrow\) mass in the fascia of muscles.
  o Contraction \(\Rightarrow\) become less prominent \(\Rightarrow\) mass deep to muscles.
• Injury to hypoglossal nerve during surgery \(\Rightarrow\) lead to atrophy of tongue in the ipsilateral side.