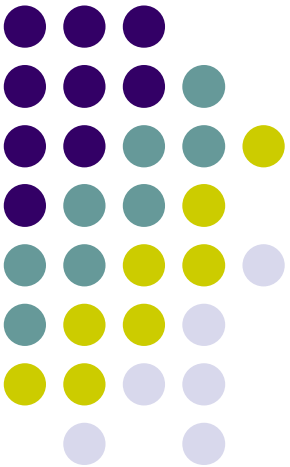
Understand first, then memorize and apply

ST. MATTHEW'S UNIVERSITY SCHOOL OF MEDICINE

ST. MATTHEW'S UNIVERSITY — IMPROVING LIFE BY DEGREES

100 must important GA conceptions



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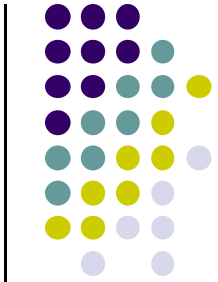

- *You can use this presentation like a guide during your preparing for final GA exam.*
- *It does NOT cover all the material of the Gross Anatomy course.*
- *To complete GA material you have to work with ALL professor's presentations.*
- *Good Luck and All the best!*

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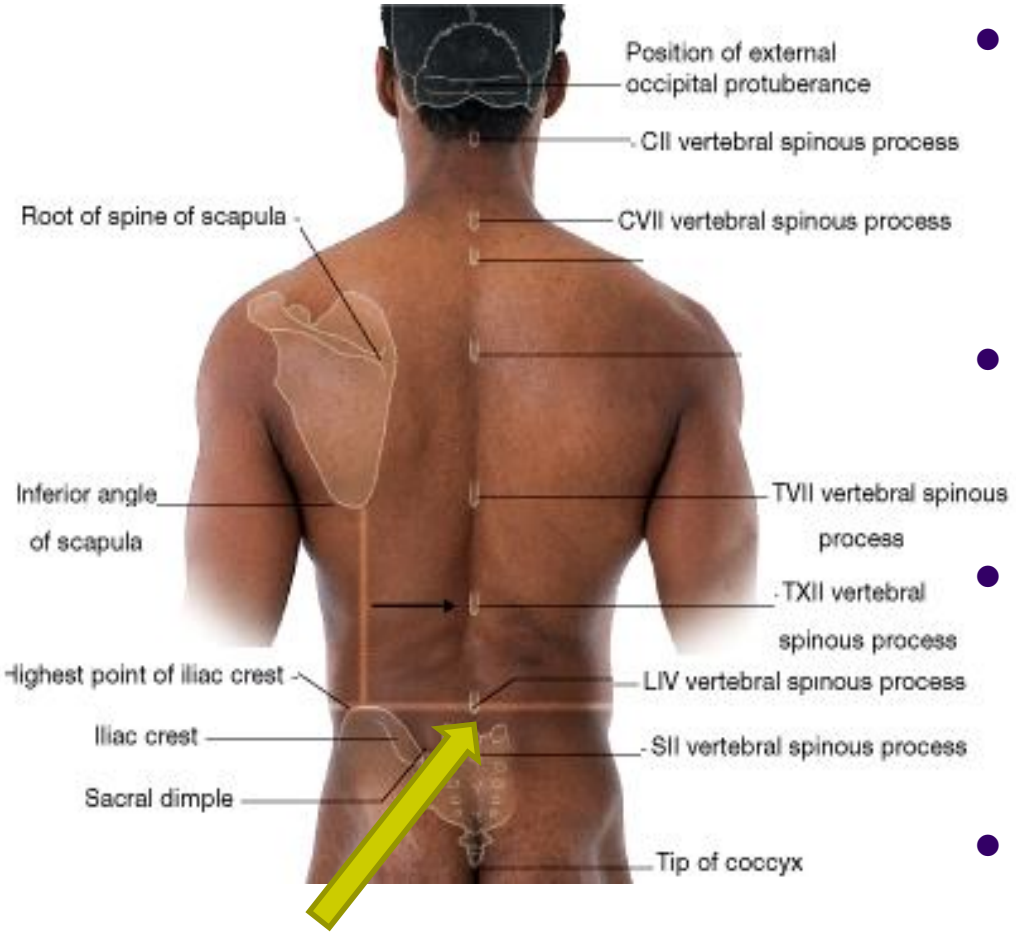
1. Lumbar puncture (tap) and Epidural anesthesia



- When a **lumbar puncture** is performed, the needle enters the subarachnoid space to extract cerebrospinal fluid (spinal tap) or to inject anesthetic (spinal block) or contrast material.
- The needle is usually inserted between **L3/L4** or L4/L5. Level of horizontal line through upper points of iliac crests.
- Remember, the spinal cord may end as low as **L2** in adults and does end at L3 in young children and dural sac extends caudally to level of **S2**.
- Before the procedure, the patient should be examined for signs of **increased intracranial pressure** because cerebellar tonsils may herniate through the foramen magnum.

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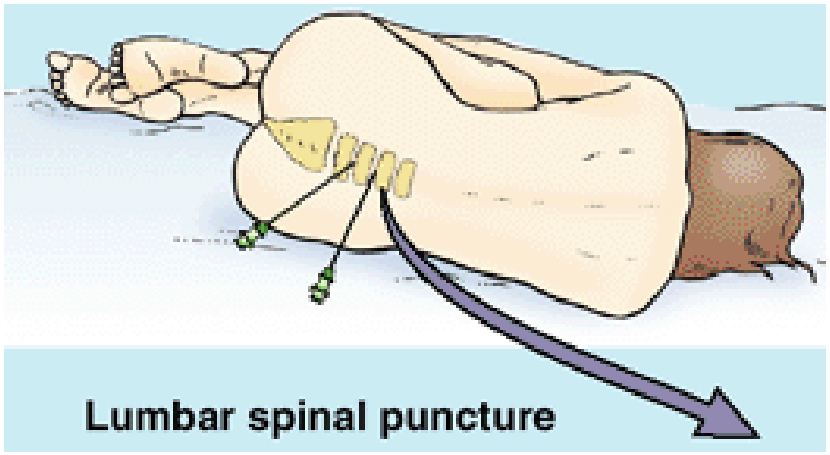

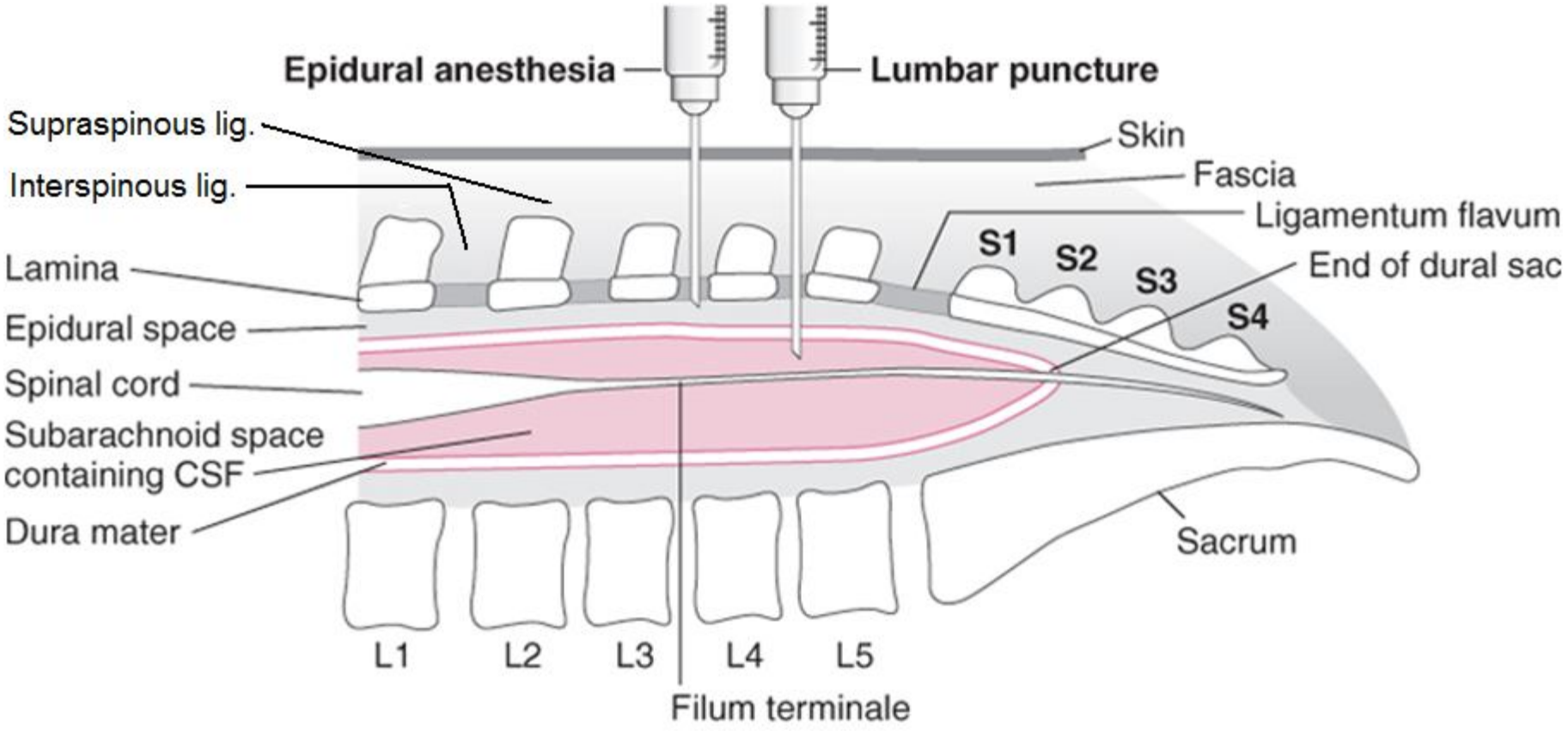

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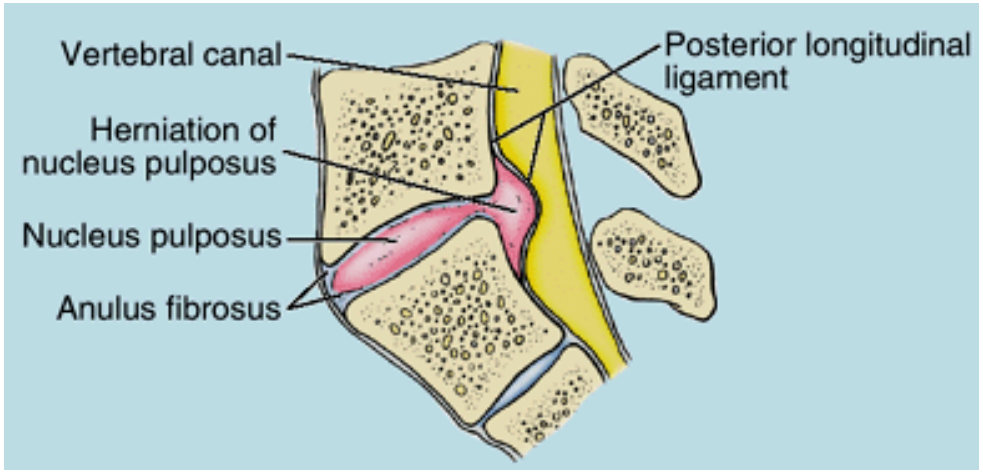
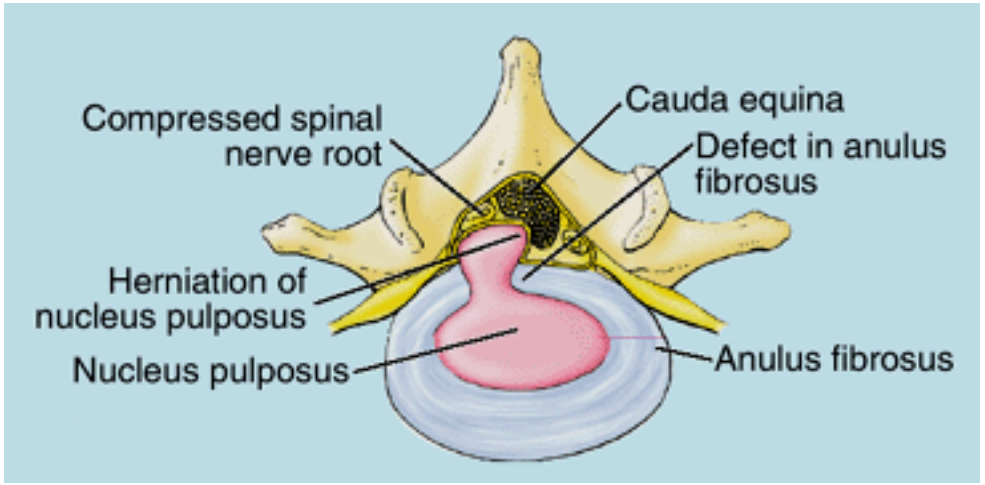
2. Herniated IV disc





- Herniated discs usually occur in lumbar (L4/L5 or L5/S1) or cervical regions (C5/C6 or C6/C7) of individuals **younger than age 50**.
- Herniations may follow **degenerative** changes in the anulus fibrosus and be caused by **sudden compression** of the nucleus pulposus.
- Herniated lumbar discs usually involve the nerve root **one number below** - traversing root (e.g., the herniation L4/L5 will compress L5 root).

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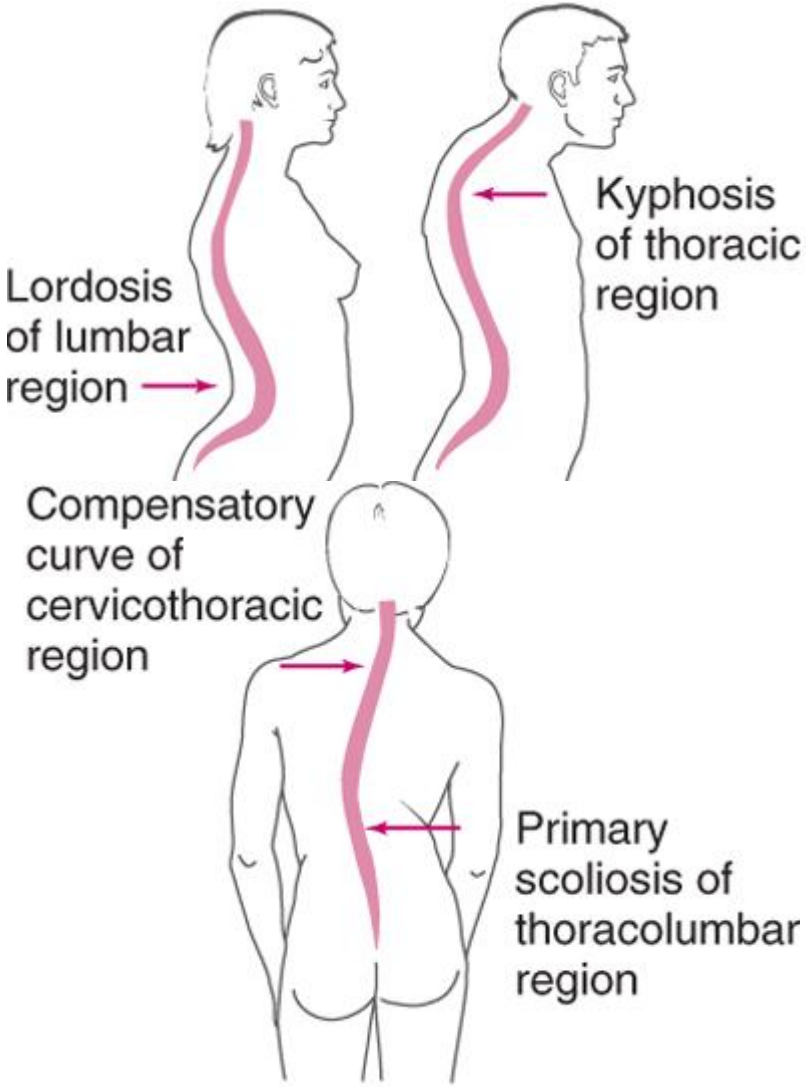
3. Abnormal curvatures of the spine



- **Kyphosis** is an exaggeration of the thoracic curvature that may occur in elderly persons as a result of **osteoporosis** (multiply compression fracture of vertebral bodies) or disk degeneration.
- **Lordosis** is an exaggeration of the lumbar curvature that may be temporary and occurs as a result of pregnancy, **spondylolisthesis** or potbelly.
- **Scoliosis** is a complex **lateral deviation**, or torsion, that is caused by poliomyelitis, a leg-length discrepancy, or hip disease.

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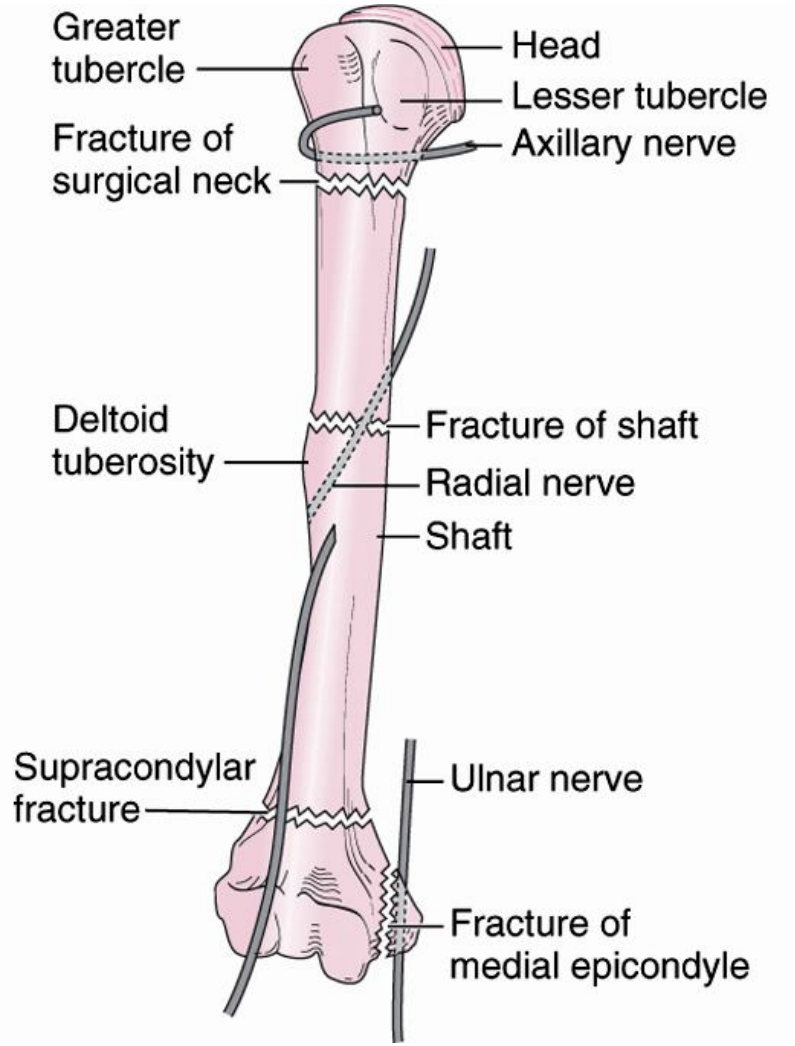
4. Upper limb fractures: Humerus fractures



Sites of potential injury to major nerves in fractures of the humerus:

1. **Axillary nerve** and posterior humeral circumflex artery at the **surgical neck**.
2. **Radial nerve** and profunda brachii artery at **midshaft**.
3. Brachial artery and **median nerve** at the **supracondylar region**.
4. **Ulnar nerve** at the **medial epicondyle**.

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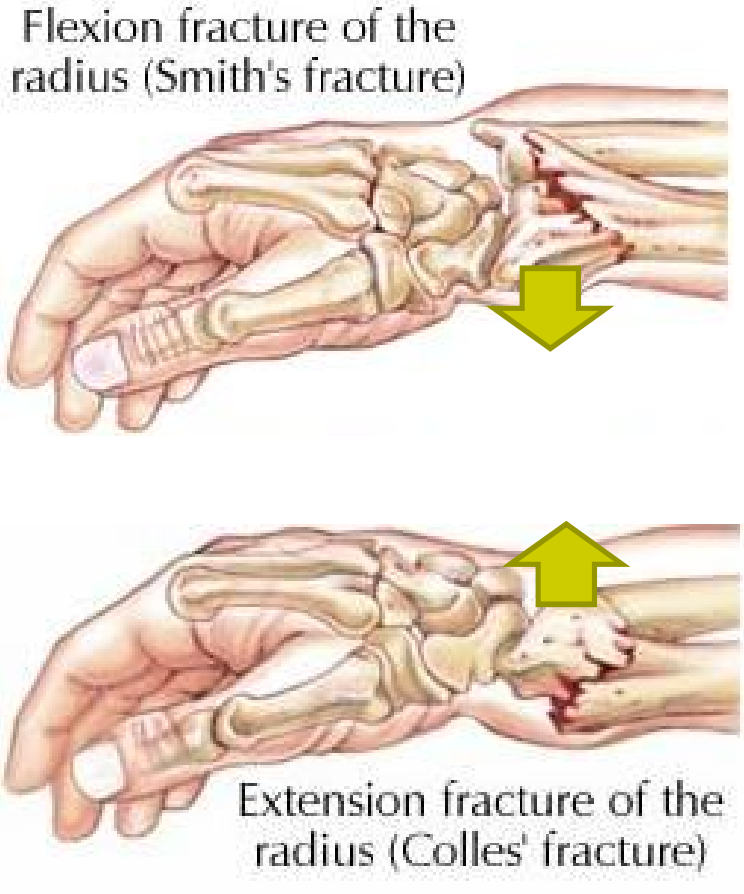
Fracture of distal radius:



- Transverse fracture within the **distal 2 cm** of the radius. Most **common** fracture of the forearm (after 50).
- **Smith's fracture** results from a fall or a blow on the **dorsal aspect** of the **flexed wrist** and produces a ventral angulation of the wrist. The distal fragment of the radius is **ANTERIORLY** displaced.
- **Colles' fracture** results from forced **extension** of the hand, usually as a result of **trying to ease** a fall by outstretching the upper limb. Distal fragment is **displaced DORSALLY** - "**dinner fork deformity**". Often the **ulnar styloid** process is **avulced** (broken off)

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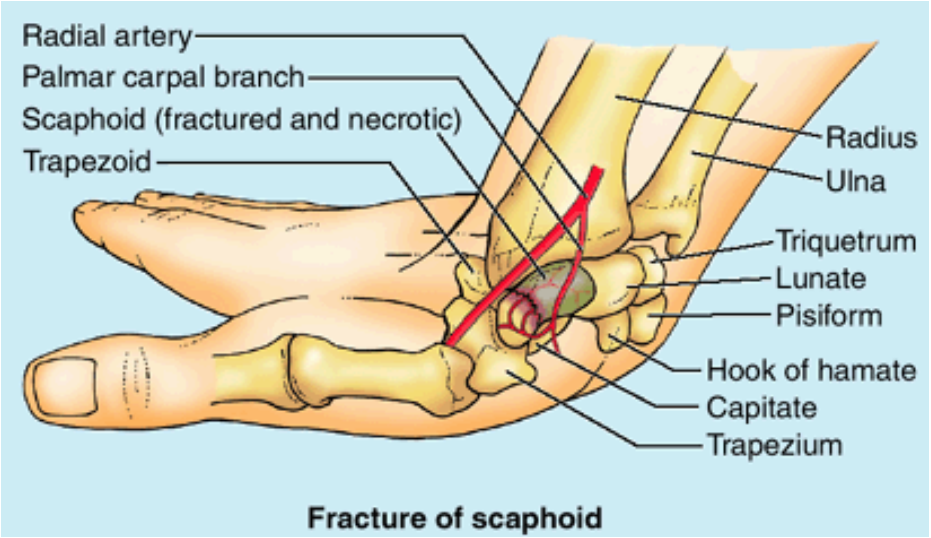
Scaphoid fracture

- Occurs as a result of a **fall onto the palm** when the hand is abducted
- Pain occurs primarily on the **lateral side** of the wrist, especially during wrist extension and abduction
- Scaphoid fracture may not show on X-ray films for 2 to 3 weeks, but a **deep tenderness** will be present in the **anatomical snuffbox.**
- The proximal fragment may undergo **avascular necrosis** because the blood supply is interrupted.



Fracture of scaphoid

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Boxer's fracture

- **Necks of the metacarpal bones** are **frequently fractured** during fistfights.
- Typically, fractured **2d** and **3d** metacarpals are seen in **professional** boxers, and fractured **5th** and sometimes **4th** metacarpals are seen in **unskilled** fighters.

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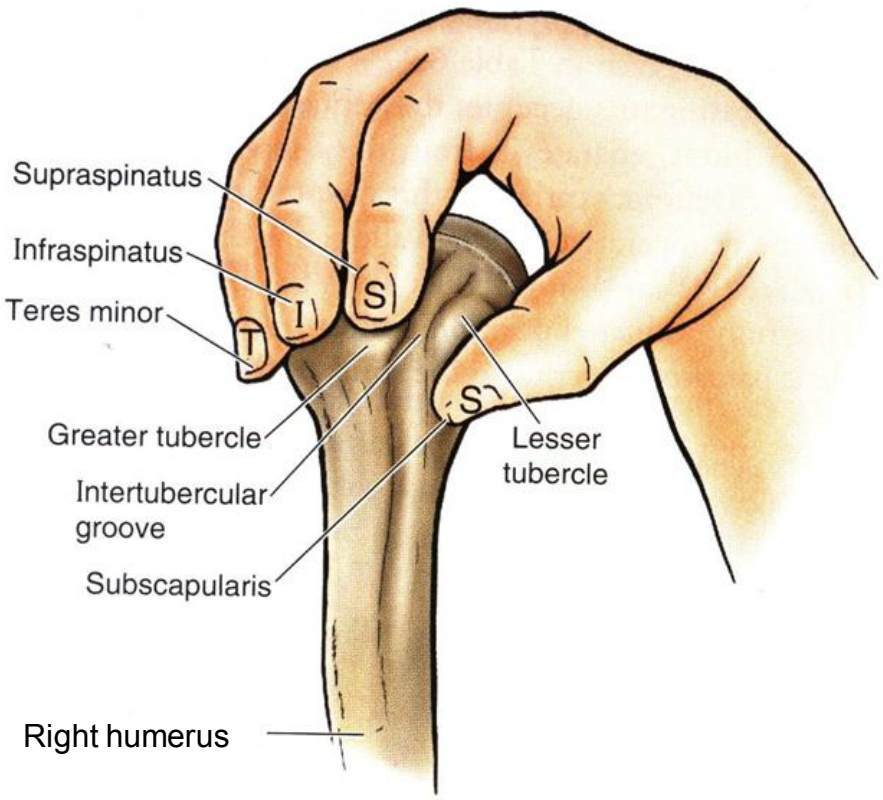
5 Rotator cuff muscles – SITS



- **Support** the shoulder joint by forming a musculotendinous rotator cuff around it
- **Reinforces joint** on all sides **except inferiorly**, where dislocation is most likely
- Rotator cuff muscles are Supraspinatus, Infraspinatus, Teres minor, Subscapularis: **SITS.**

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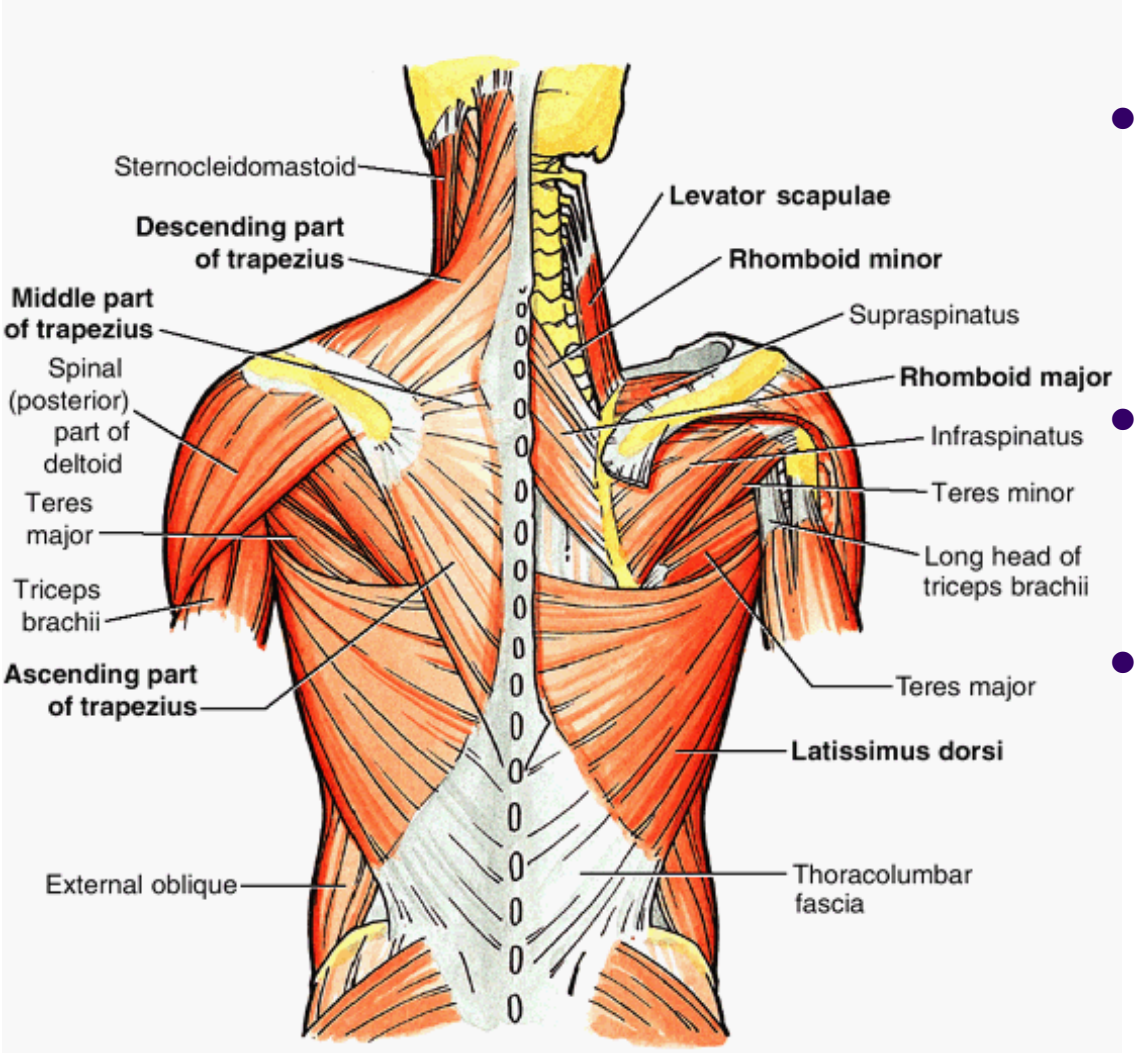
6. Abduction of the upper limb



- **(0°-15°)** Abduction of the upper extremity is initiated by the **supraspinatus muscle** (**suprascapular** nerve).
- **(15°-110º)** Further abduction to the horizontal position is a function of the **deltoid muscle** (**axillary** nerve).
- **(110°-180°)** Raising the extremity above the horizontal position requires scapular rotation by action of the **trapezius** (**accessory** nerve CNXI) and **serratus anterior** (**long thoracic** nerve).

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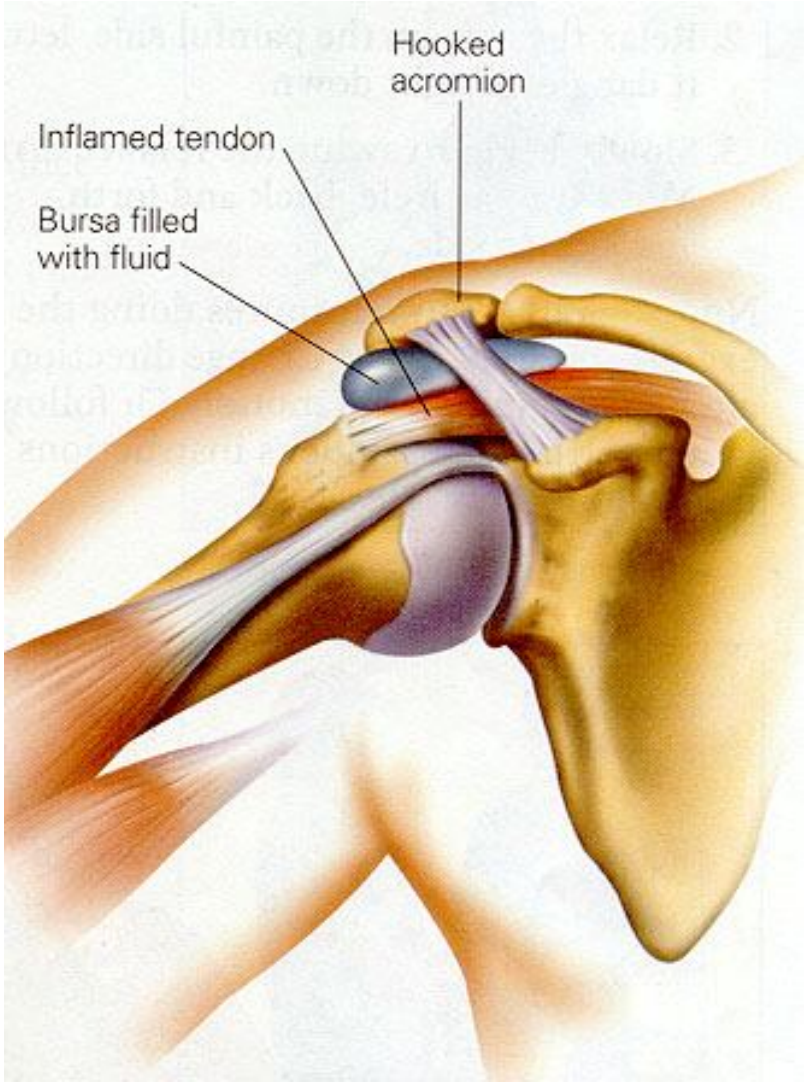
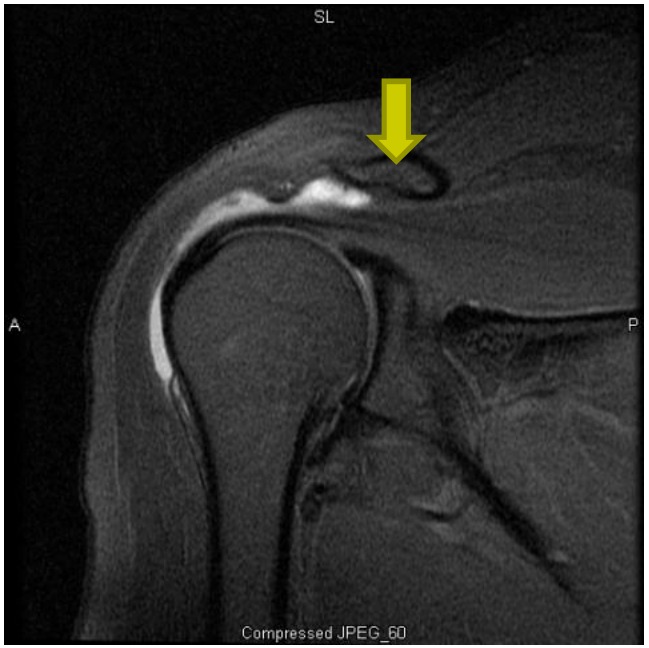
Subacromial bursitis



- **Subacromial bursitis** (influmution of the subacromial bursa**)** is often due to **calcific supraspinatus tendinitis,** causing a painful arc of of **abduction**.



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7. Medial (golfer's elbow) and lateral (tennis elbow) epicondylitis

- **Medial epicondylitis** is inflammation of the common **flexor tendon** of the wrist where it originates on the **medial epicondyle** of the humerus.

- **Lateral epicondylitis:** repeated forceful flexion and extension of the wrist resulting strain attachment of **common extensor tendon** and inflammation of periosteum of **lateral epicondyle.** Pain felt **over** lateral epicondyle **and radiates down** posterior aspect of forearm. Pain often felt when **opening a door** or **lifting a glass**

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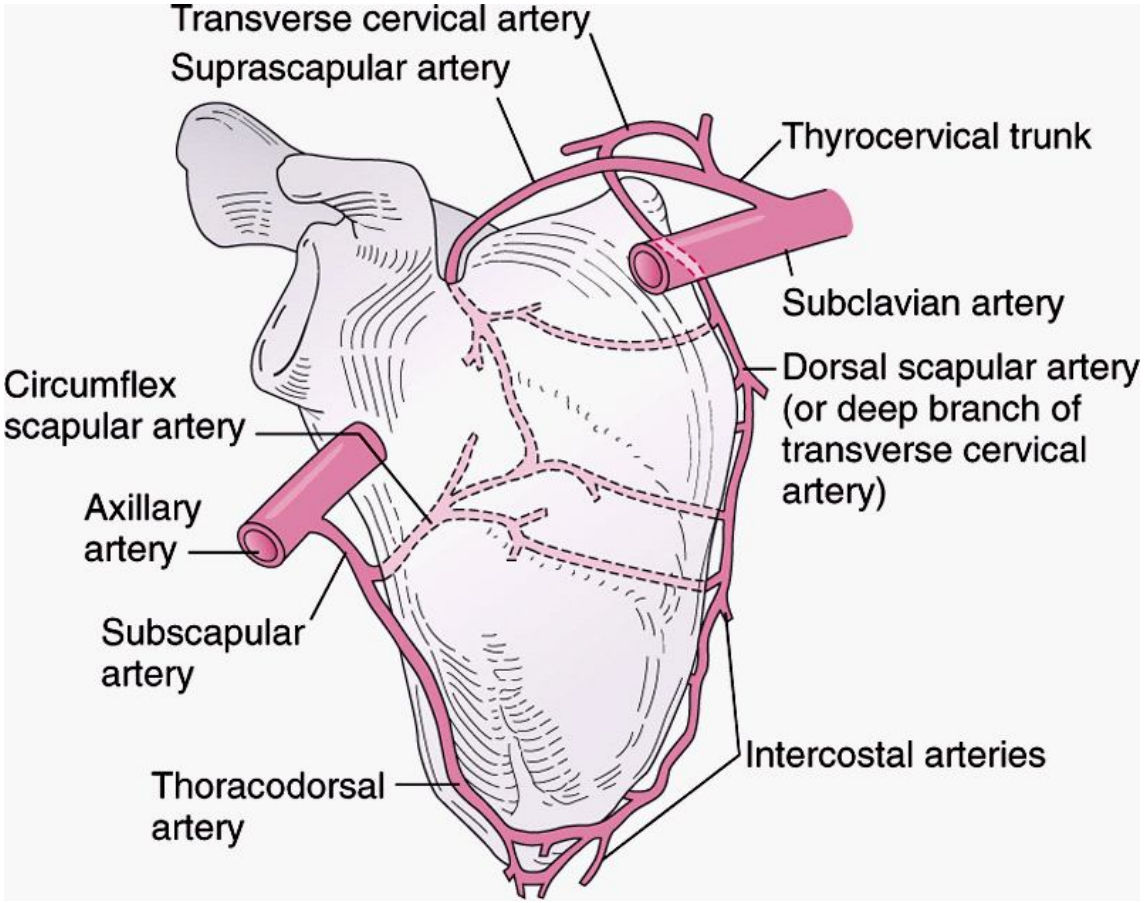
8. Arterial anastomoses around the scapula



- **Blockage of** the **Subclavian** or **Axillary artery** can be bypassed by anastomoses between branches of the **Thyrocervical** and **Subscapular** arteries:
  - **Transverse cervical**
  - **Suprascapular**
  - **Subscapular**
  - **Circumflex scapular**

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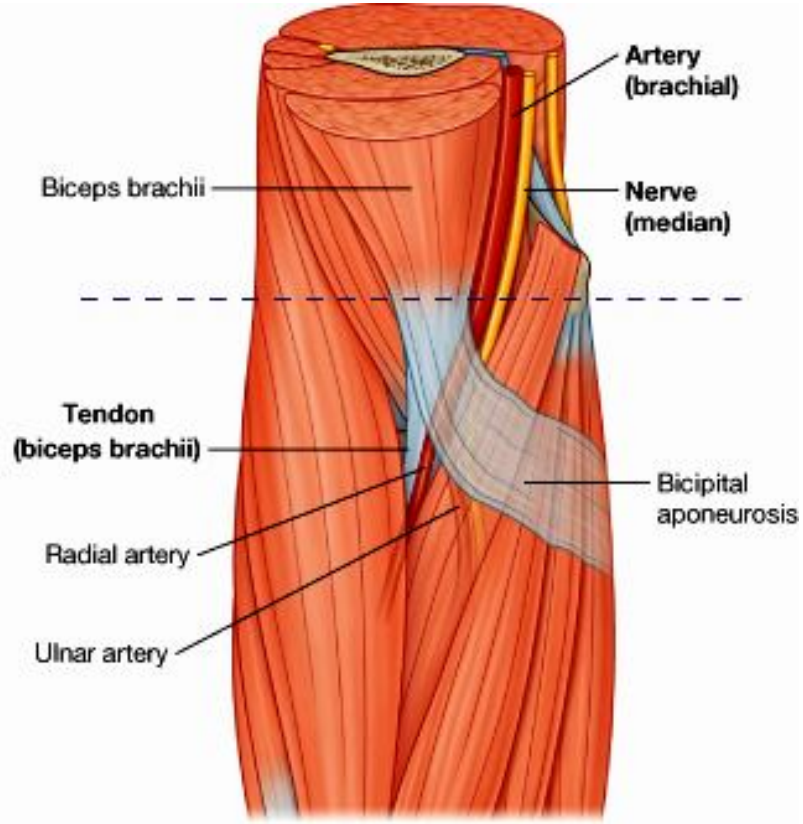
9. Cubital fossa



- Contents from **lateral to medial:**
  1. **Biceps brachii tendon**
  2. **Brachial artery**
  3. **Median nerve**

TAN

- Subcutaneos structures from **lateral to medial:**
  1. **Cephalic vein**
  2. **Median cubital vein**: joins cephalic and basilic veins
  3. **Basilic vein**

- Sites of venipuncture is usually **median cubital vein** because:
  - Overlies bicipital aponeurosis, so deep structure protected
  - Not accompanied by nerves

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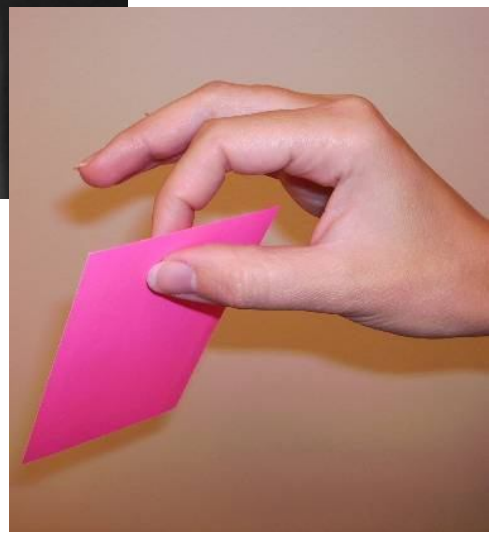
10. Carpal Tunnel Syndrome



- Results from a lesion that **reduces** the size of the carpal tunnel (fluid retention, infection, **dislocation of lunate bone**)
- **Median** nerve – most sensitive structure in the carpal tunnel and is the most affected
- **Clinical manifestations**:
  - Pins and needles or anesthesia of the **lateral 3.5 digits**
  - **palm** sensation **is not affected** because superficial palmar cutaneous branch passes superficially to carpal tunnel
  - **Apehand deformity - absent of OPPOSITION**

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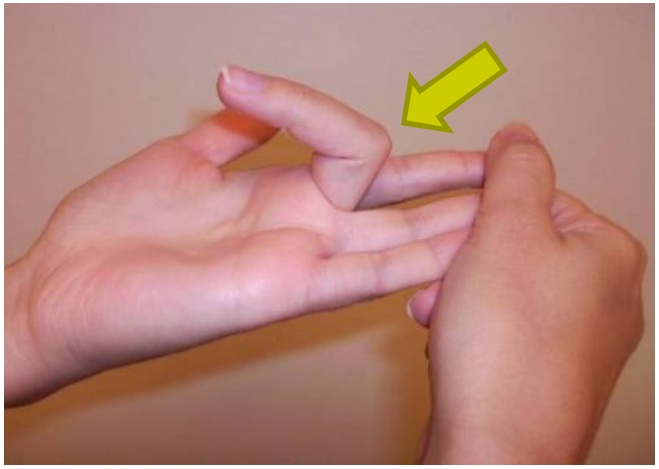
11. Test of the proximal and distal interphalangeal joints



- PIP – FDS

- DID - FDP

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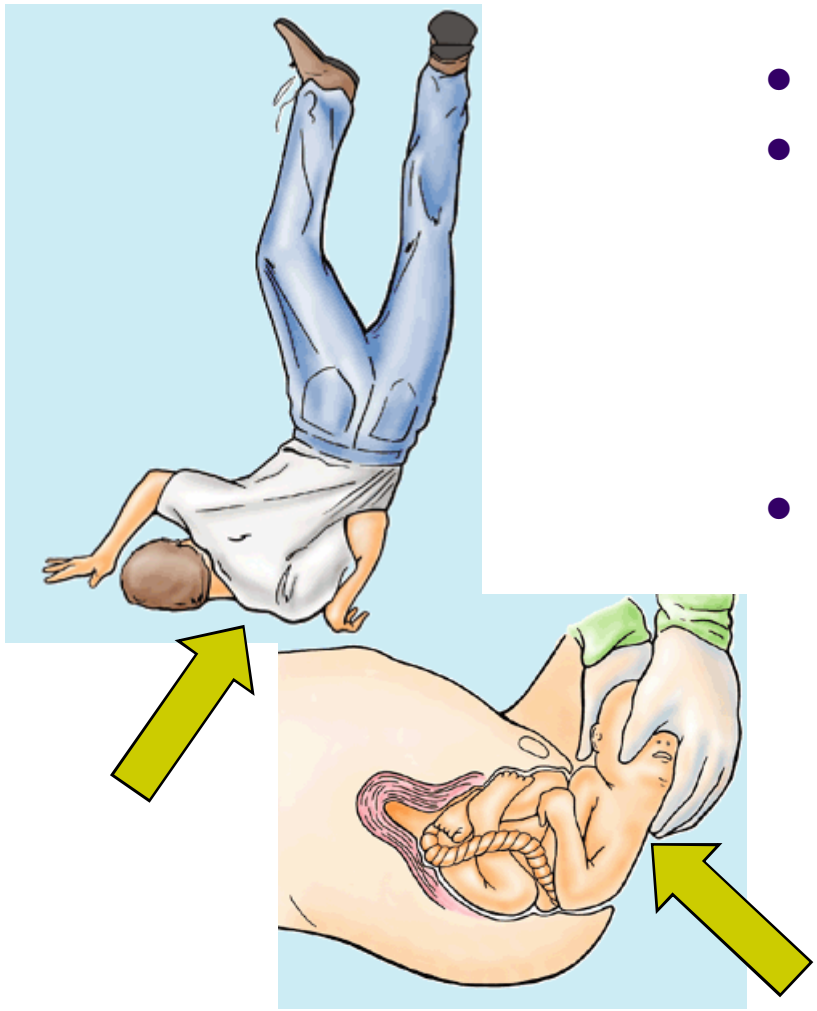
12. Lesion of UL nerves Upper Brachial Palsy



- **Injury of upper roots and trunk**
- Usually results from excessive **increase in the angle** between the neck and the shoulder stretching or tearing of the superior parts of the brachial plexus (**C5** and **C6** roots or **superior trunk**)
- May occur as **birth injury** from forceful pulling on infant's head during difficult delivery

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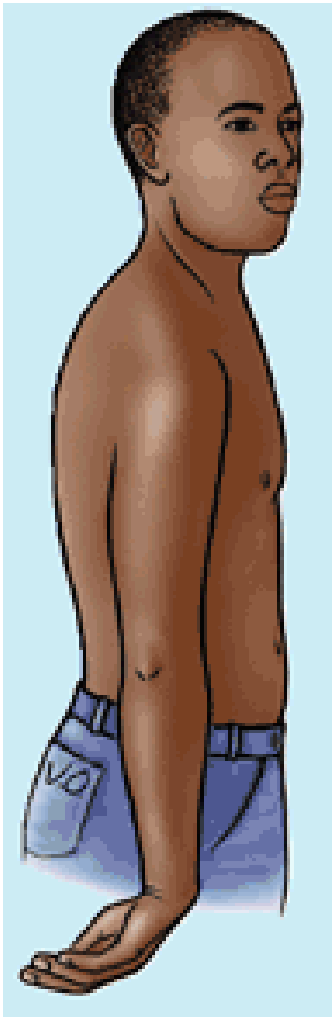
Upper Brachial Palsy (Erb-Duchenne palsy)



- In all cases, paralysis of the muscles of the shoulder and arm supplied by **C5** and **C6** spinal nerves (roots) of the upper trunk.
- Combination lesions of **axillary**, **suprascapular** and **musculocutaneous** nerves with loss of the shoulder mm and anterior arm.
- As result patient have **"waiter's tip"** hand:
  - **adducted** shoulder
  - **medially rotated** arm
  - **extended** elbow
  - loss of sensation in the **lateral aspect** of the upper limb

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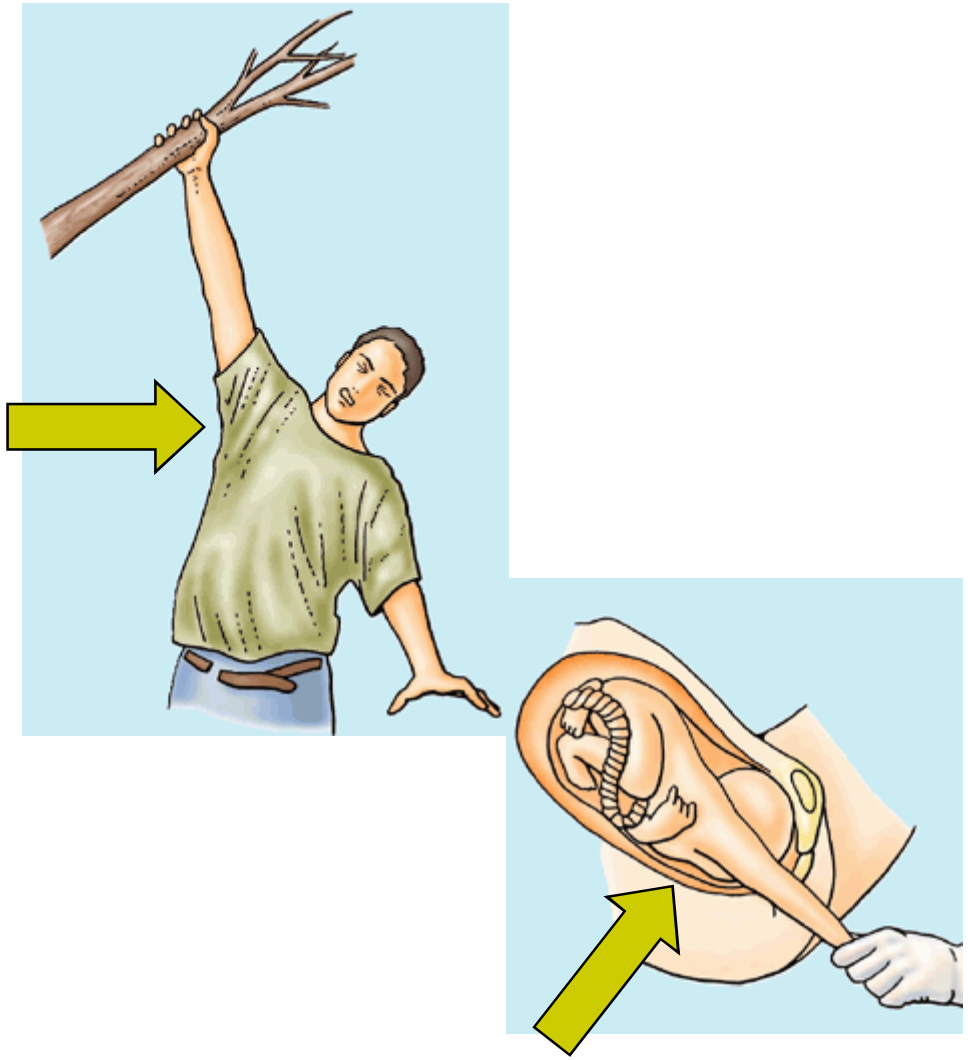
Lower Brachial Palsy (Klumpke paralysis)



- **Injury of lower roots and trunk**
- May occur when the upper limb is suddenly **pulled superiorly**: stretching or tearing of the inferior parts of the brachial plexus (**C8** and **T1** roots or **inferior trunk**)
- E.g., **grabbing** support during **fall from height** or as a **birth injury,** or **TOS –** thoracic outlet syndrome

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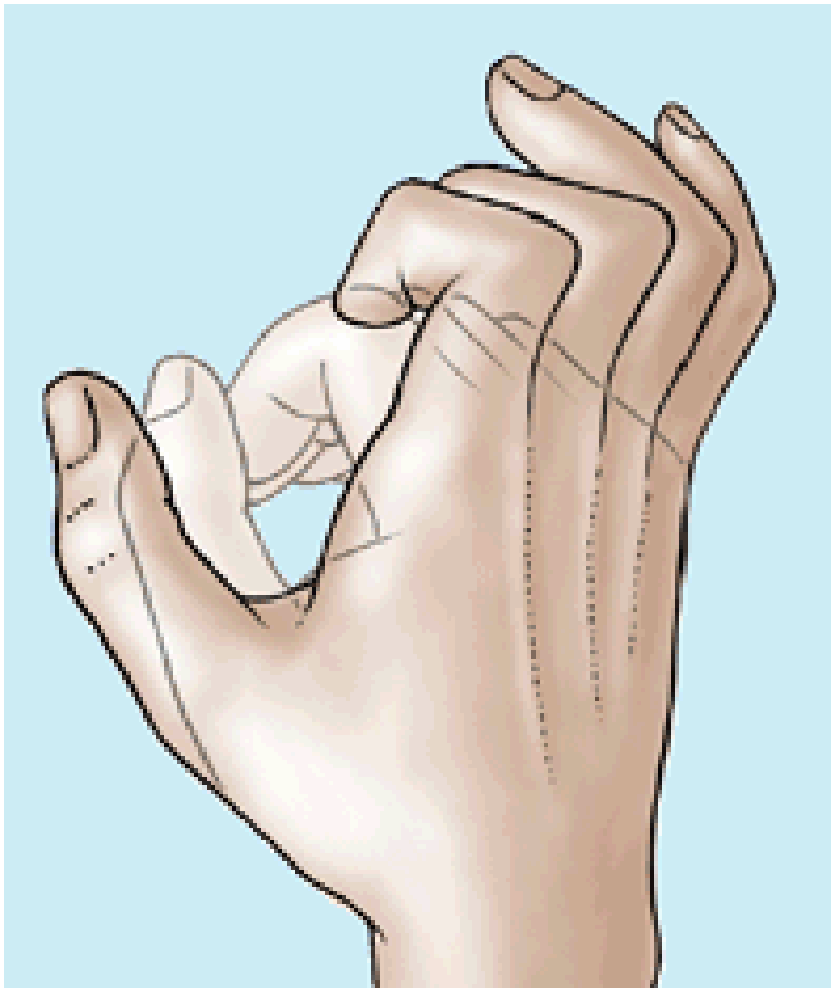
Lower Brachial Palsy (Klumpke paralysis)



- All **intrinsic muscles** of the **hand** supplied by the **C8** and **T1** roots of the **lower trunk** affected.
- Combination lesions of **ulnar** nerve ("**claw hand**") and **median** nerve ("**ape hand**")
- Loss of sensation in the **medial aspect** of the upper limb and medial 1,5 fingers.
- May include a **Horner** syndrome

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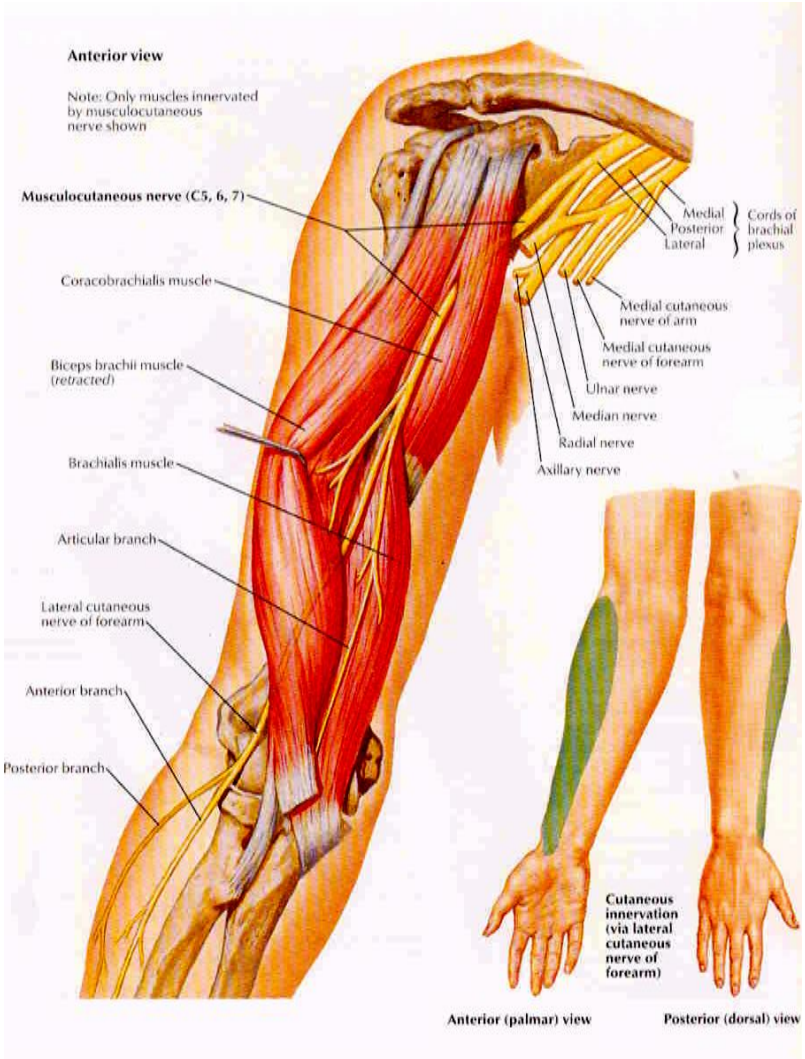
Injury to musculocutaneous nerve



- Usually results from **lesions of lateral cord**
- Greatly weakens **flexion of elbow** (biceps and brachialis muscles) and **supination of forearm** (biceps muscle)
- May be accompanied by **anesthesia over lateral** aspect of **forearm**

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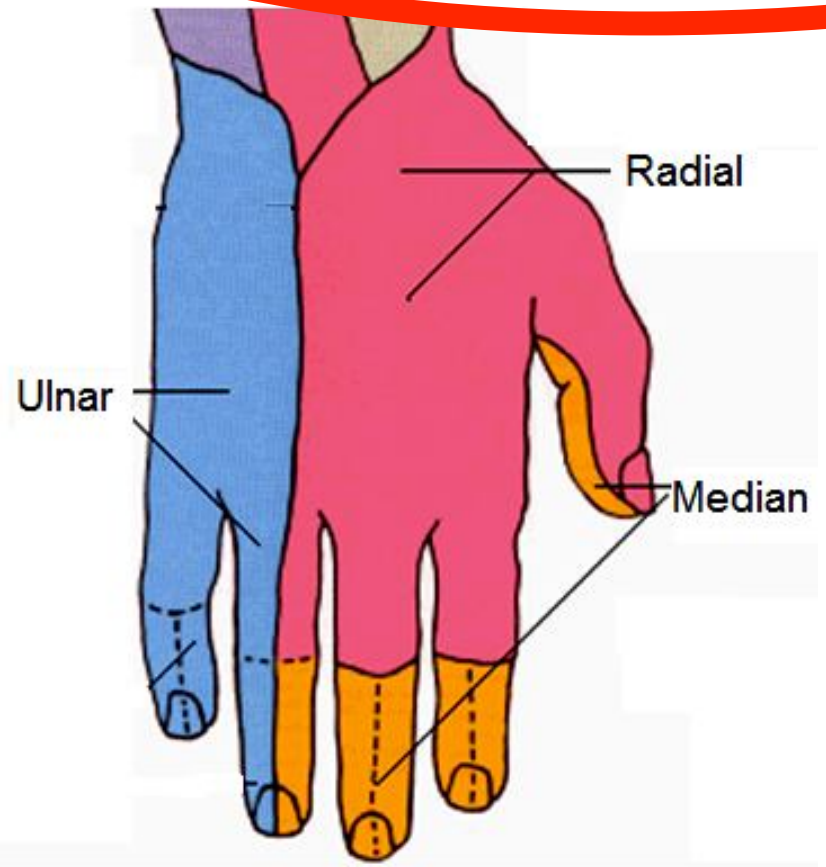
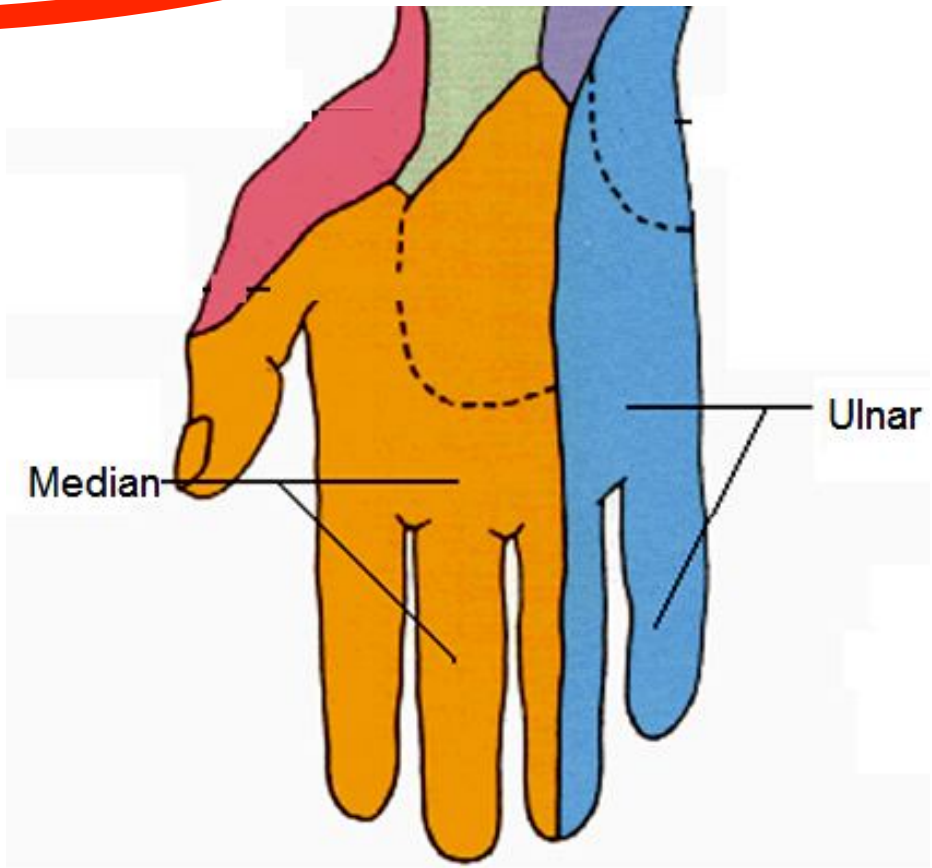
Cutaneous innervation of the hand





Dorsum: 1,5-U and 3,5 R

Palm: 1,5-U and 3,5 M

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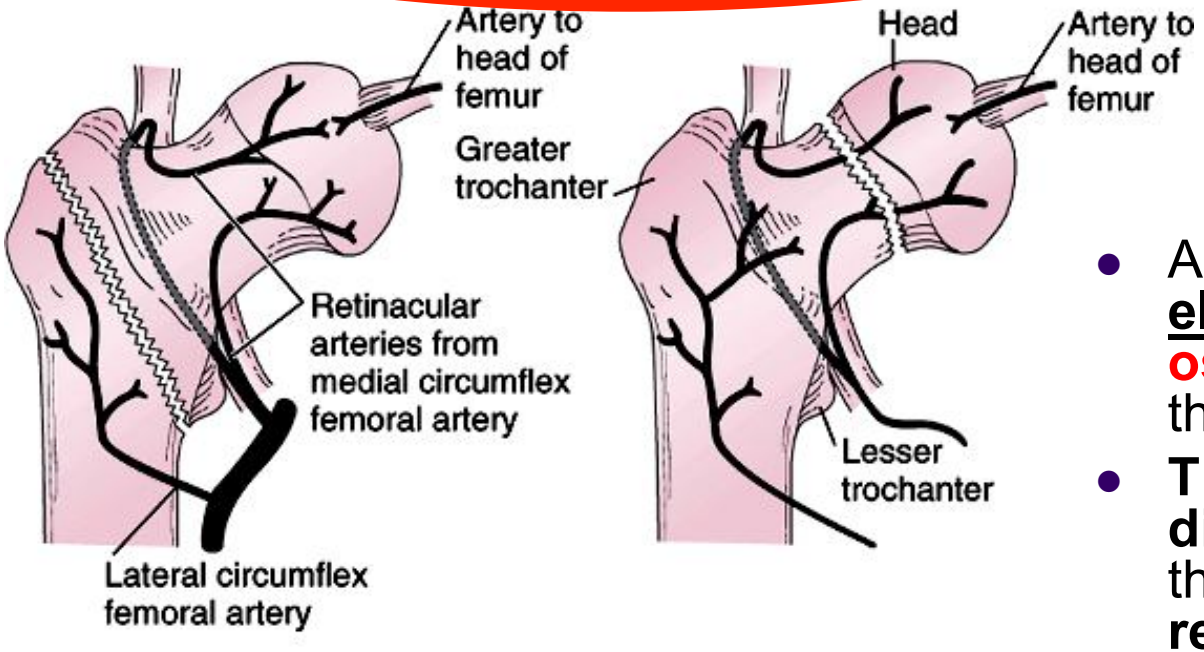
13. Avascular necrosis of femoral head



- A common fracture in **elderly women** with **osteoporosis** is fracture of the **femoral neck.**
- **Transcervical** fracture **disrupts blood supply** to the head of the femur via **retinacular arteries** (from **medial circumflex femoral artery**) and may cause **avascular necrosis** of the **femoral head** if blood supply through the ligament to the head is inadequate.

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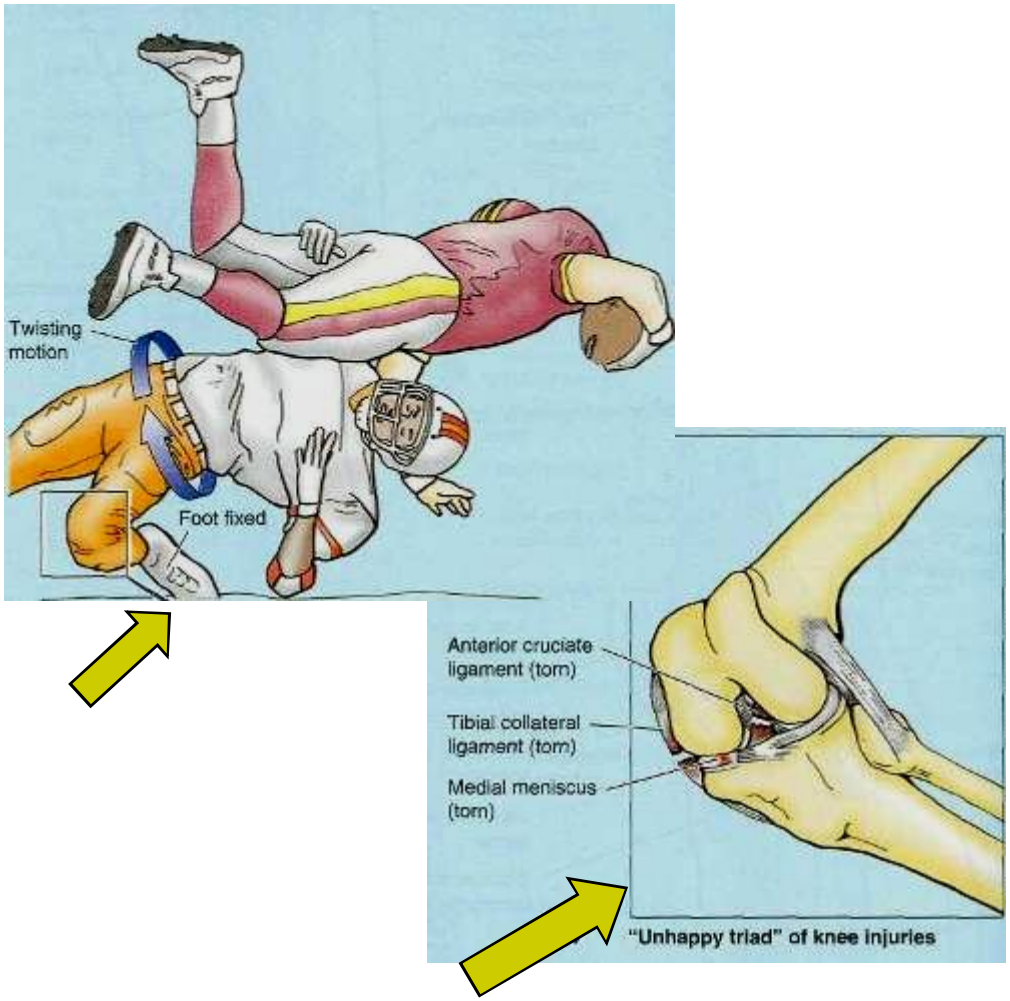
14. Knee joint injury: Unhappy triad



- Because the lateral side of the knee is struck more often (e.g., in a football tackle), the **tibial collateral ligament** is the **most frequently torn** ligament at the knee.
- The **unhappy triad** of athletic knee injuries involves:

1. **Tibial collateral ligament** medial
2. **Medial meniscus**
3. **Anterior cruciate ligament**

MMA

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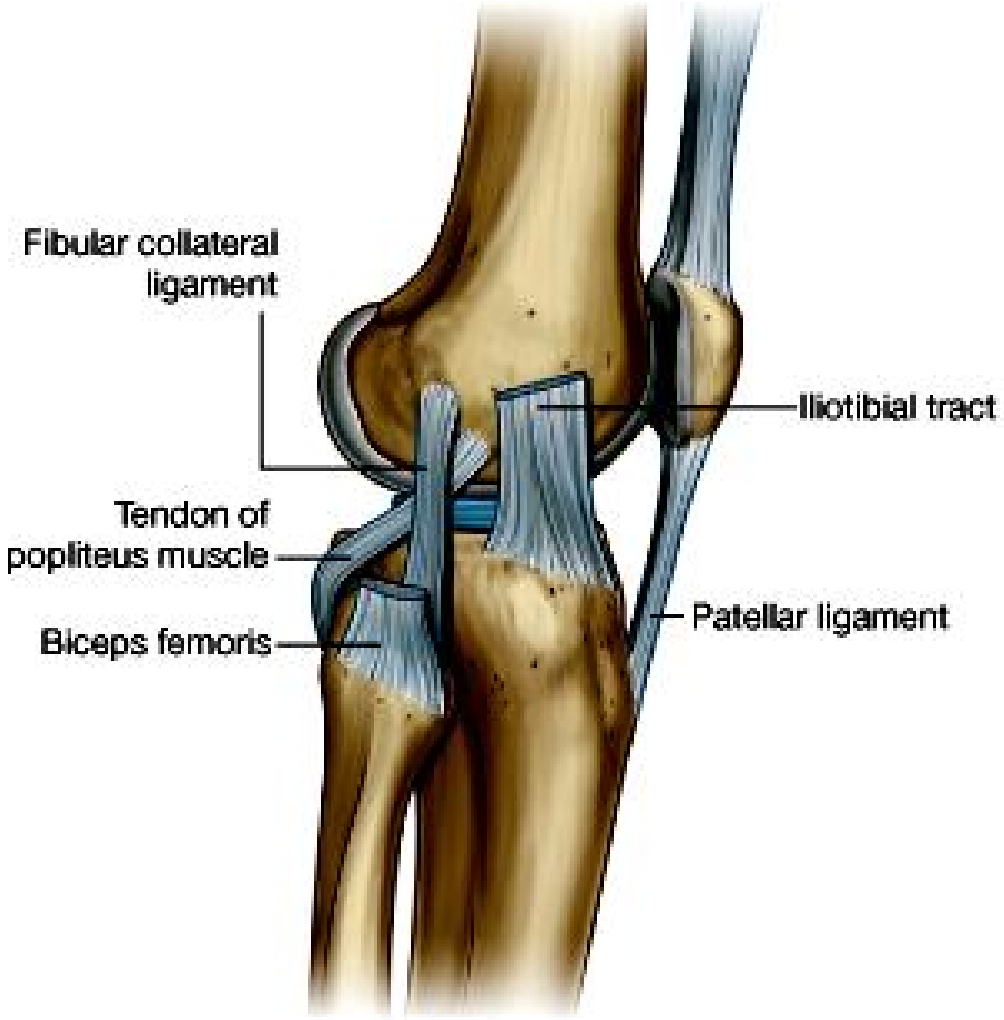
Fibular collateral ligament (lateral collateral ligament)



- Rounded cord between **lateral epicondyle of femur** and **head of fibula**
- Does **NOT** blend with joint capsule and **does NOT attach to lateral meniscus**
- **Limits** extension and **adduction of leg** at knee

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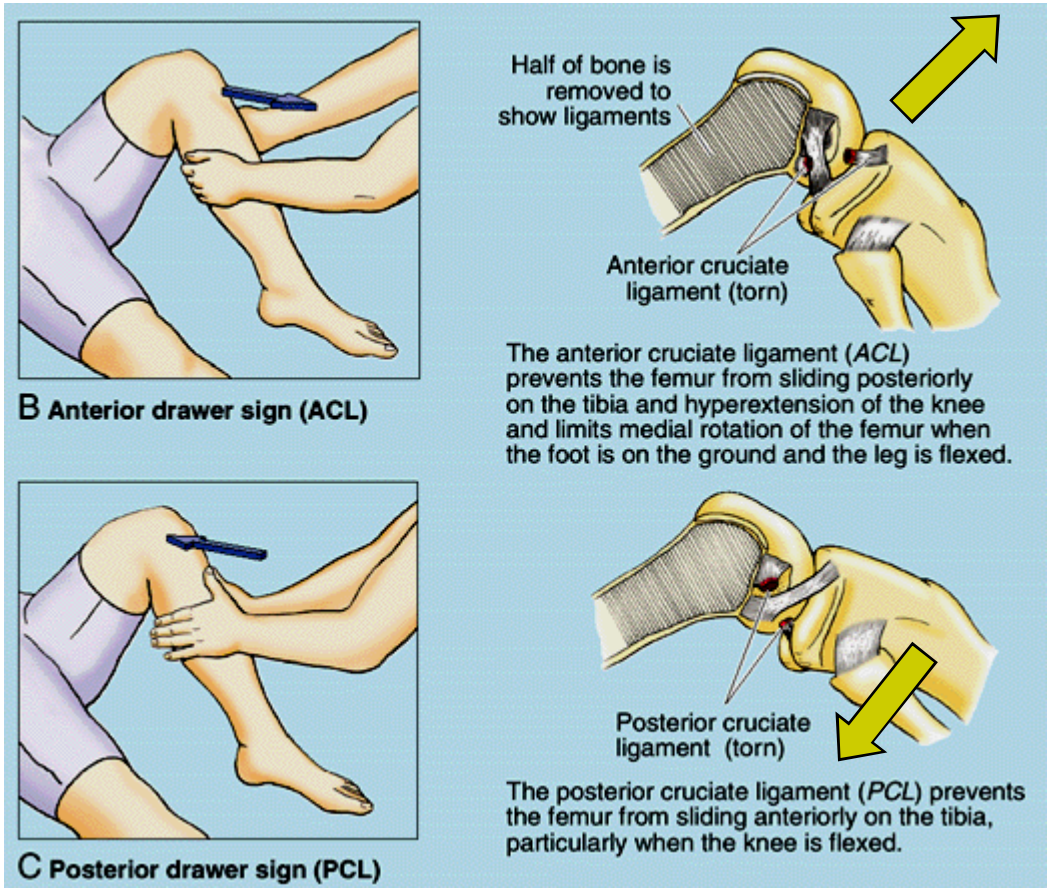
Rupture of the cruciate ligaments



- With **rupture of the anterior cruciate ligament,** the tibia can be pulled forward excessively on the femur, exhibiting **anterior drawer sign.**
- In the less common rupture of the **posterior cruciate ligament,** the tibia can be pulled backward excessively on the femur, exhibiting **posterior drawer sign.**

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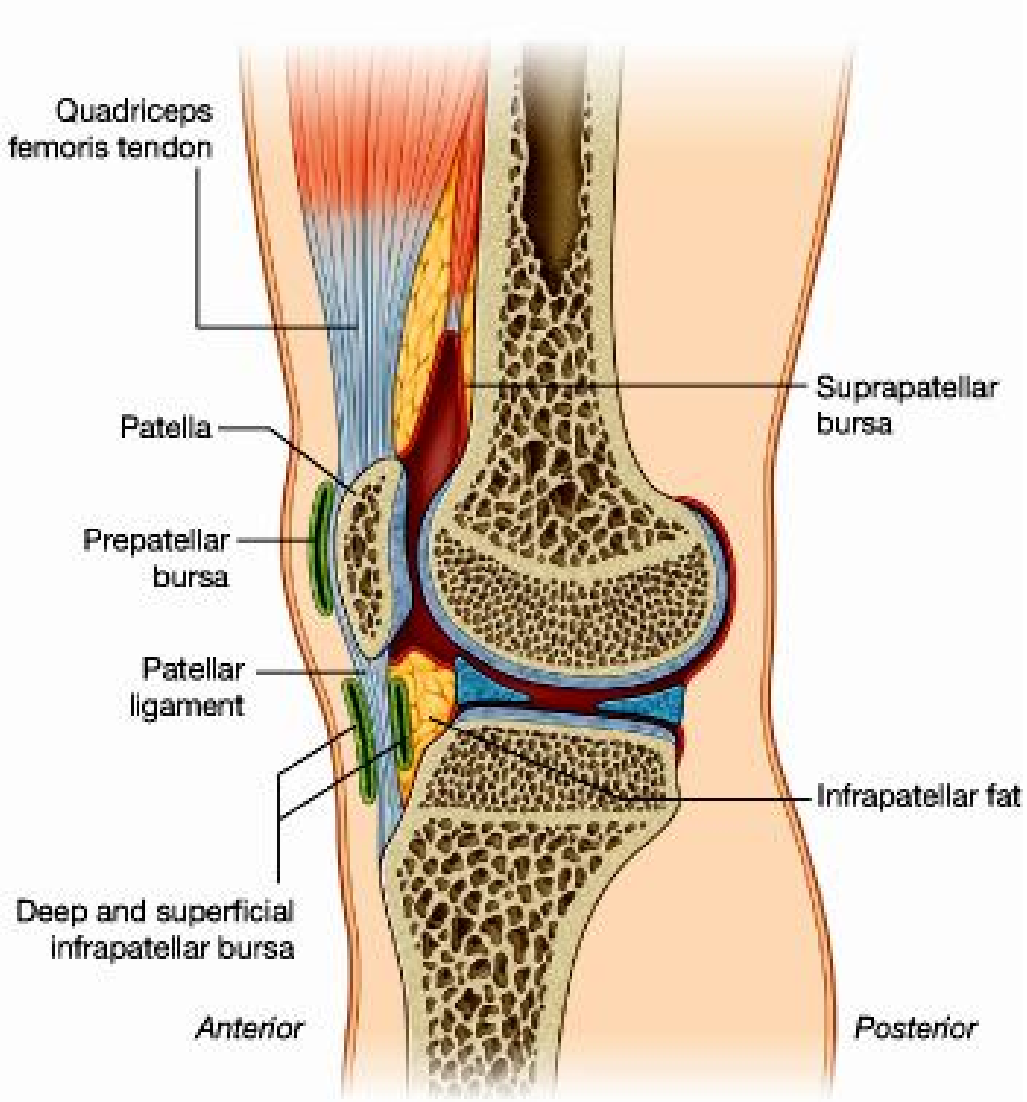
Prepatellar bursa
Suprapatellar bursa



- **Prepatellar bursa:** between superficial surface of patella and skin. May become inflamed and swollen (**prepatellar bursitis**)

- **Suprapatellar bursa:** superior extension of synovial cavity between distal end of **femur** and **quadriceps** muscle and tendon. **Usual** place for **intra-articular injections**

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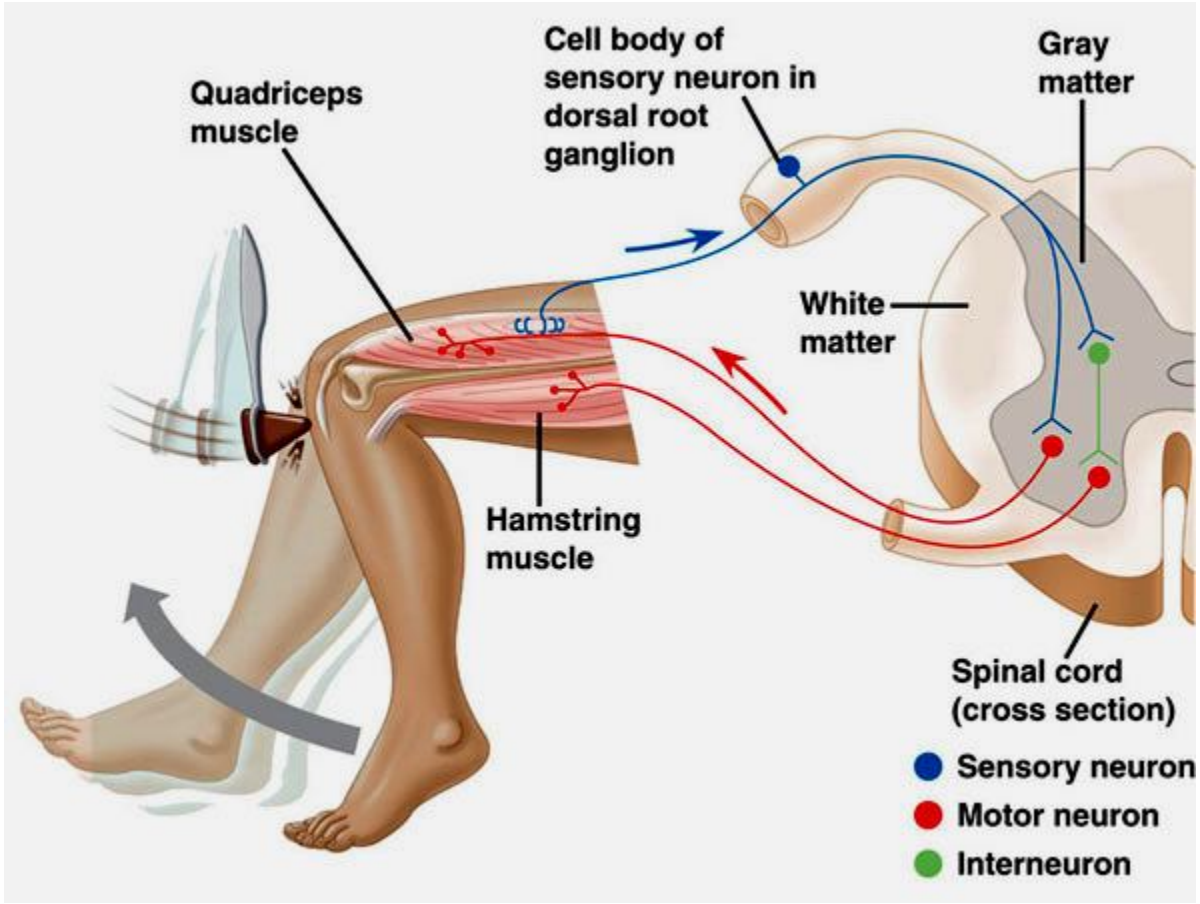
Knee jerk reflex



- The **patellar reflex** is tested by tapping the patellar ligament with a reflex hammer to elicit extension at the knee joint. Both afferent and efferent limbs of the reflex arch **are** in the **femoral nerve (L2-L4).**
- **Knee jerk reflex:** tests spinal nerves **L2-L4.**

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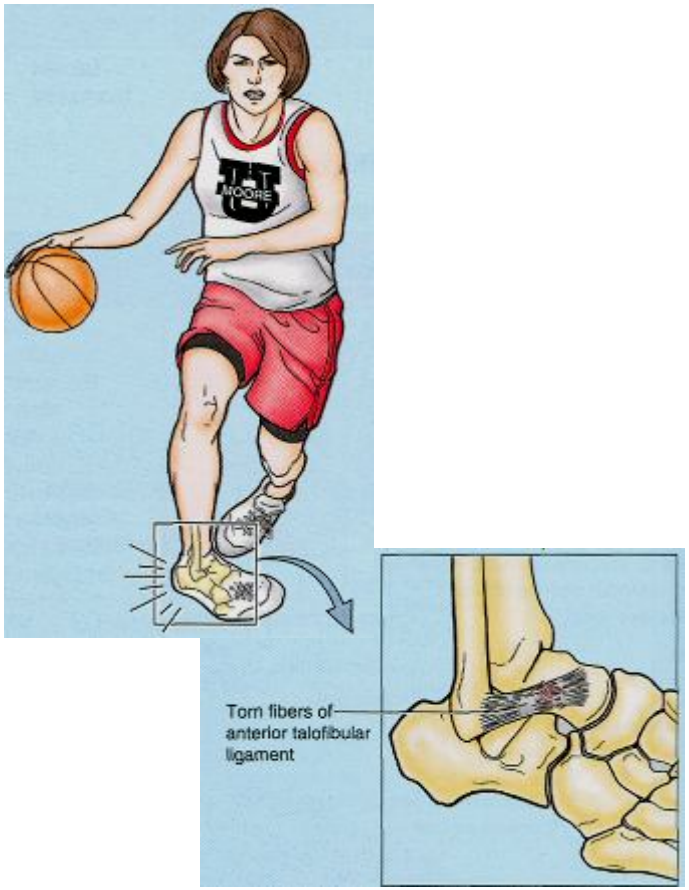
15. Ankle joint injury: Ankle sprains



- **Sprains** are the **most common** ankle injuries
- A sprained ankle is nearly always an **inversion injury**, involving twisting of the weight-bearing **plantarflexed** foot.
- The **lateral ligament** ***(anterior talofibular ligament)*** is injured because it is much weaker than the medial ligament.
- In severe sprains, the **lateral malleolus** of the fibula may be **fractured**.

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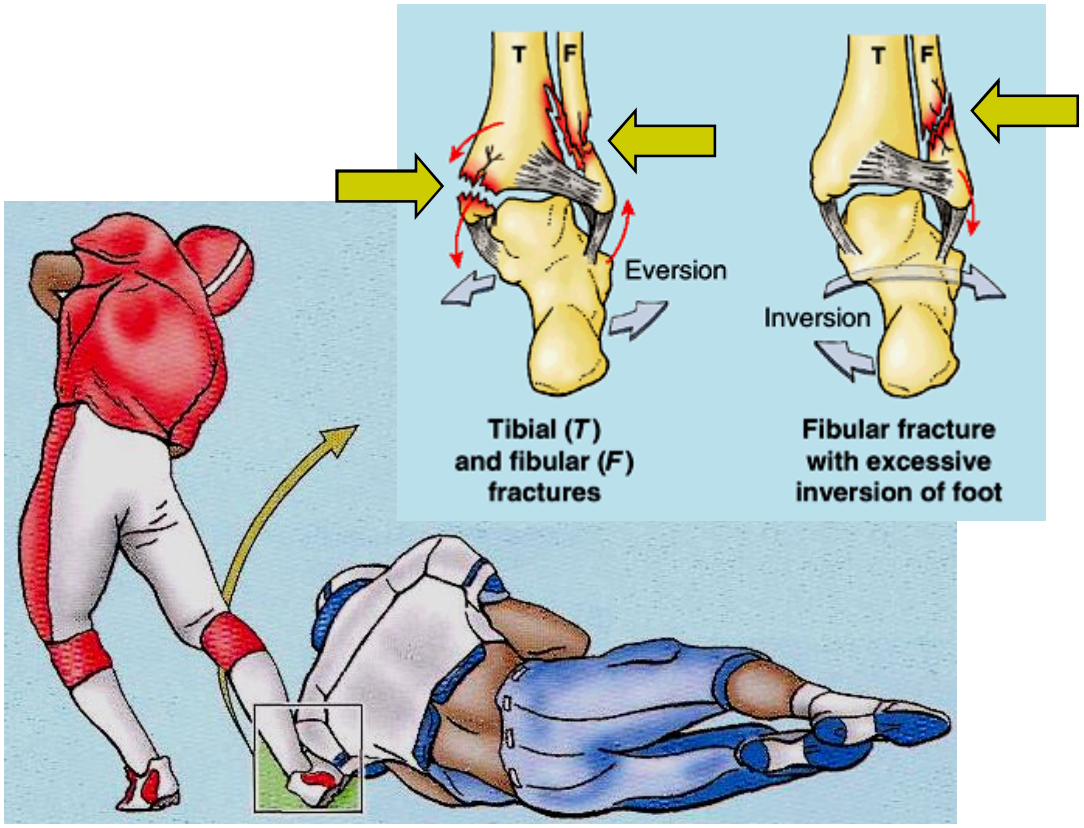
Pott's fracture



Pott's fracture

- **Fracture-dislocations of the ankle** (**Pott's fracture**):
  - Forced **eversion** (**abduction**) of the foot
  - The medial ligament avulses the **medial malleolus** or the **medial ligament tears**, and **fibula fractures** at a higher level
- Forced **inversion** (**adduction**) avulses the **lateral malleolus** of fibula or tears the **lateral ligament**

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Ankle jerk reflex

- **Achilles tendon reflex** is tested by **tapping** the **calcaneal tendon** to elicit plantar flexion at the ankle joint.
- Both afferent and efferent limbs of the reflex arc are carried in the **tibial nerve** (S1, S2).
- **Ankle jerk reflex**: tests spinal nerves **S1-S2**.

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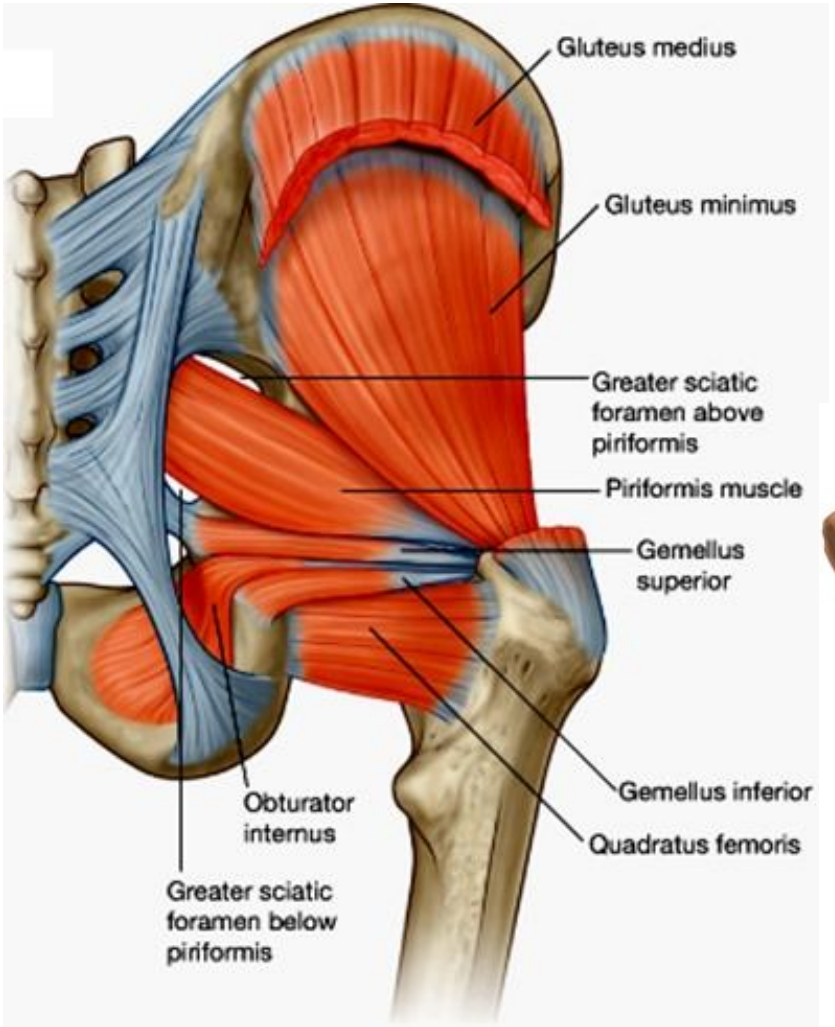
16. Injury of the gluteal region: Piriformis syndrome



- **Inflammation or spasm of the piriformis muscle** may produce pain similar to that caused by **sciatica** ("piriformis syndrome").

Piriformis "Landmark" of the **gluteal region**: provides key to understanding relationships in the gluteal region; determines names of blood vessels and nerves

- action: **supination** of hip joint

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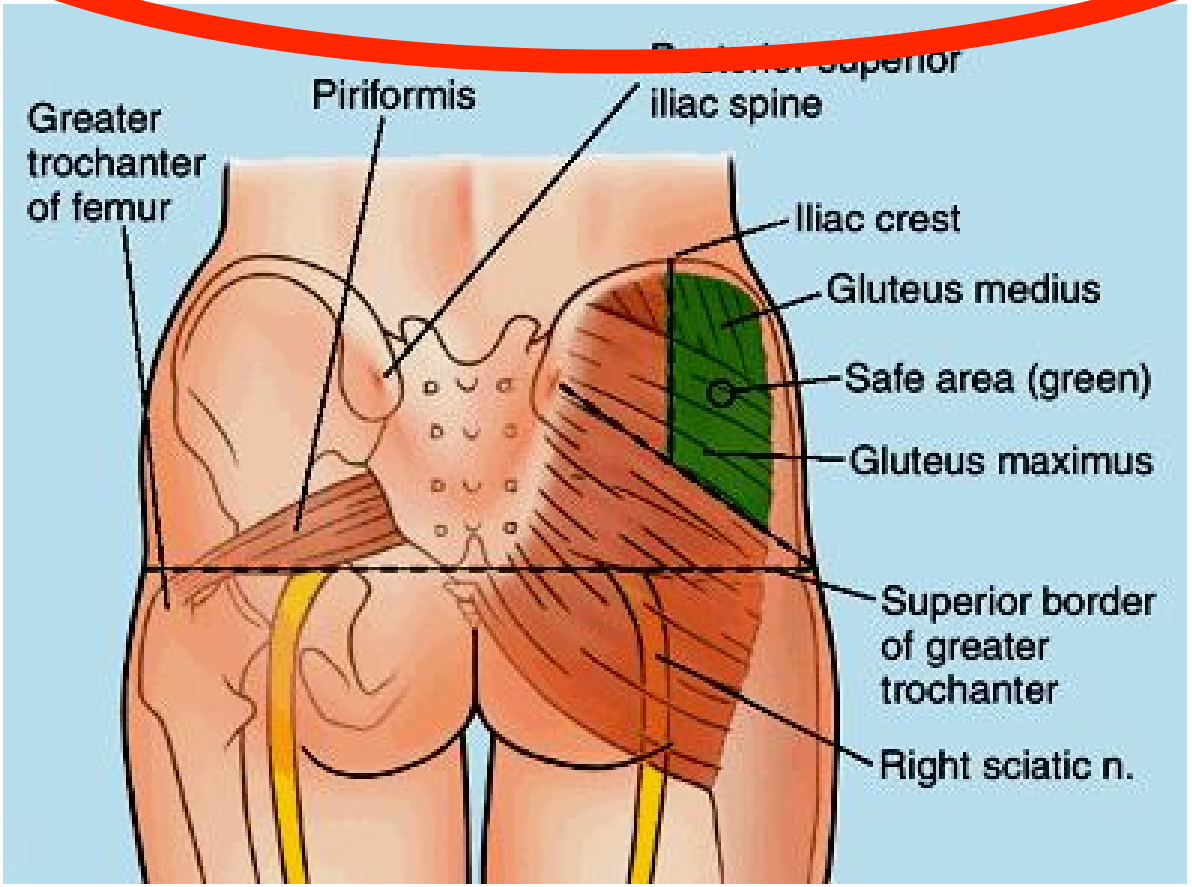
Injury to sciatic nerve



- **Weakened hip extension** and **knee flexion**
- **Footdrop** (lack of dorsiflexion)
- **Flail foot** (lack of both dorsiflexion and plantar flexion)

- **Cause of injury:** caused by **improperly placed gluteal injections** but may result from posterior hip dislocation

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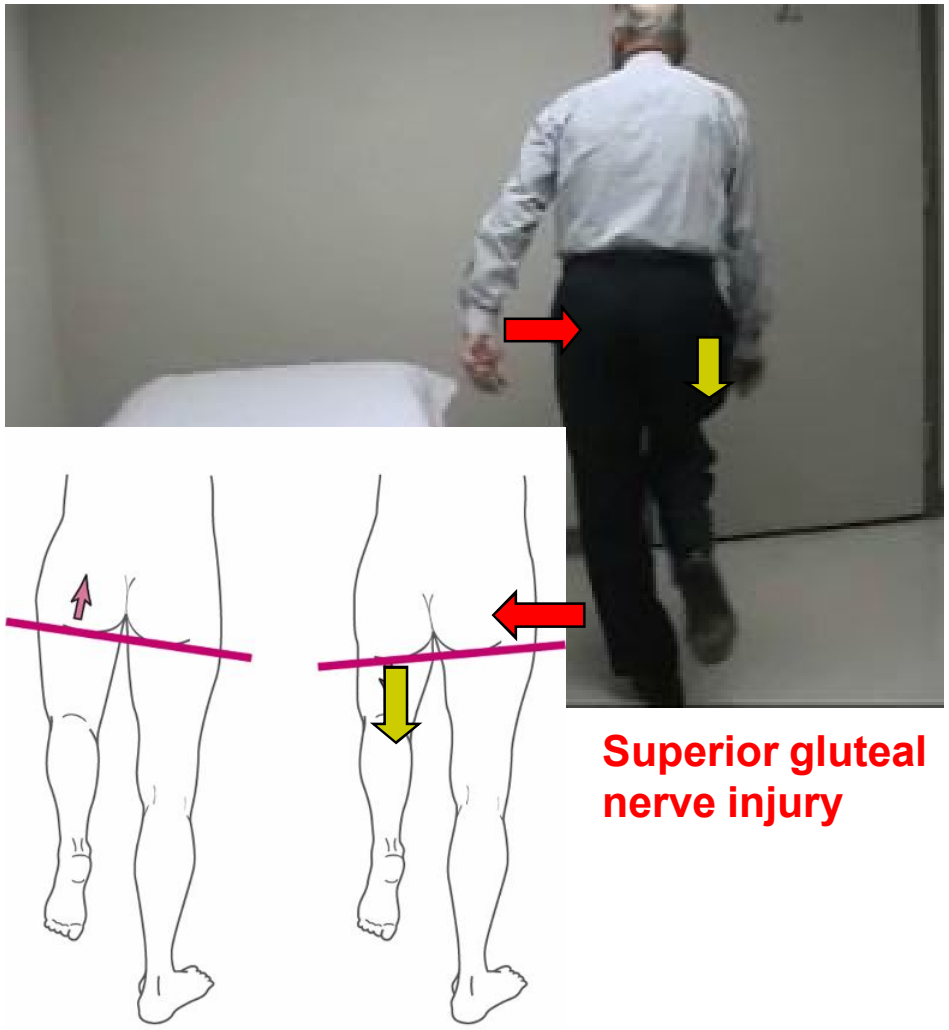
Superior gluteal nerve injury



Superior gluteal nerve injury

- The superior gluteal nerve may be injured during surgery, **posterior dislocation** of the hip or poliomyelitis.
- **Paralysis** of the **gluteus medius** and gluteus **minimus** muscles occurs so that the **ability to pull the pelvis up and abduction of the thigh are lost**.
- If the **superior gluteal** nerve on the **left** side is injured, the **right pelvis falls downward** when the patient raises the right foot off the ground.
- Note that it is the side **contralateral** to the nerve injury that is affected.

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Injury to inferior gluteal nerve

- Weakened **hip extension** (gluteus maximus), most noticeable when **climbing stairs** or **standing from a seated position**
- **Cause of injury:** posterior hip dislocation, surgery in this region

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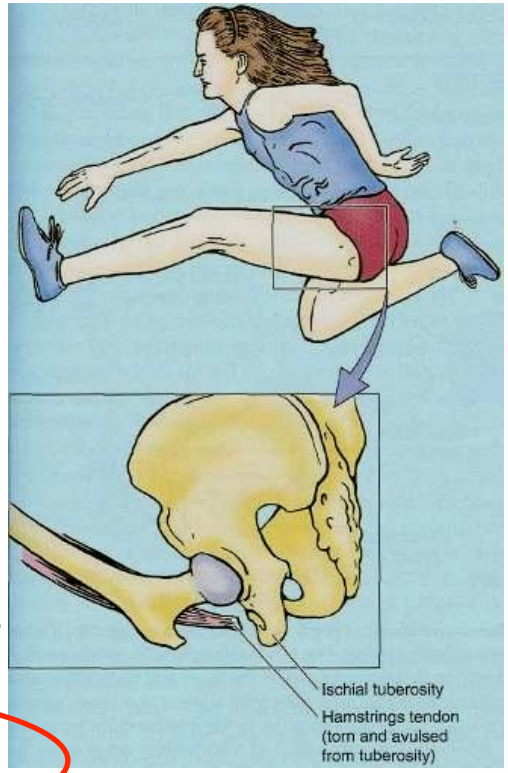
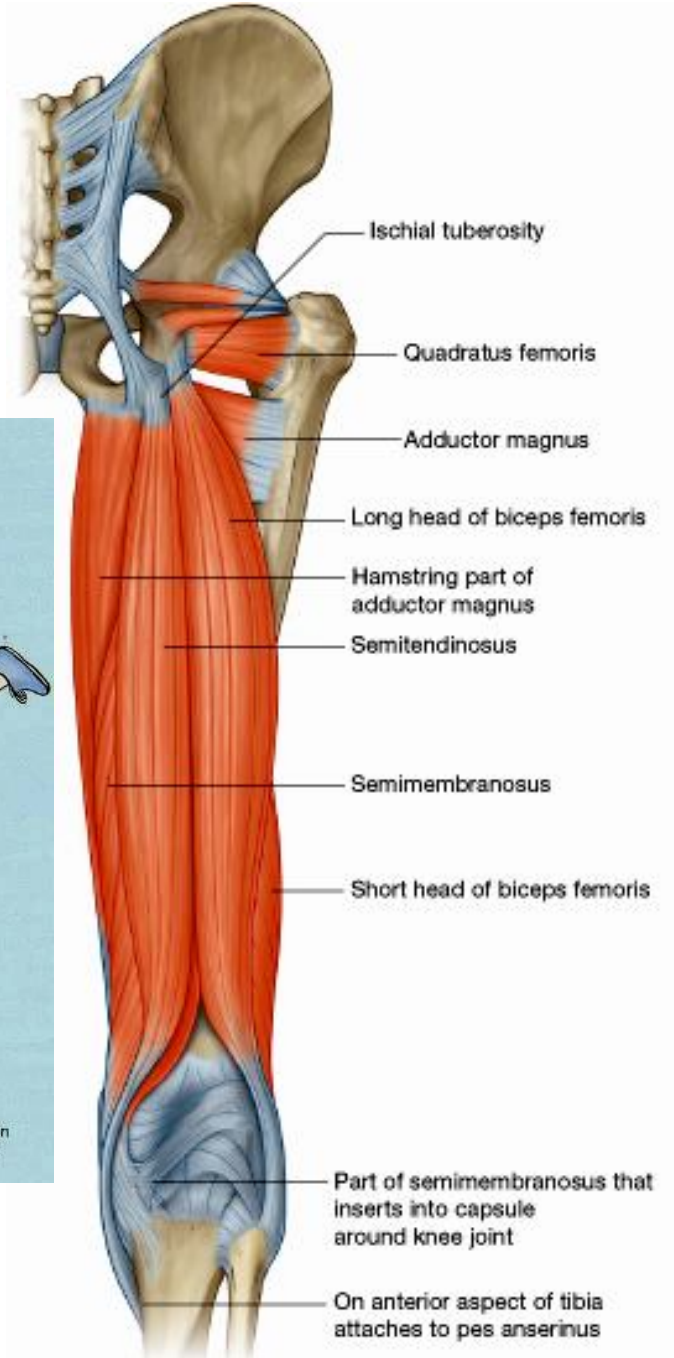
17. Avulsion fractures of the hip bone and hamstrings muscles

- Avulsion fractures occur **where muscles** are **attached - <u>ischial tuberosities</u>**





Hamstrings muscles:

1. **Biceps femoris**
2. **Semitendinosus**
3. **Semimembranosus**

- Action: **extension** of hip joint and **flexion** of knee joint
- Nerve supply – **Tibial nerve** (short head of biceps femoris is supplied by the **common fibular** nerve)

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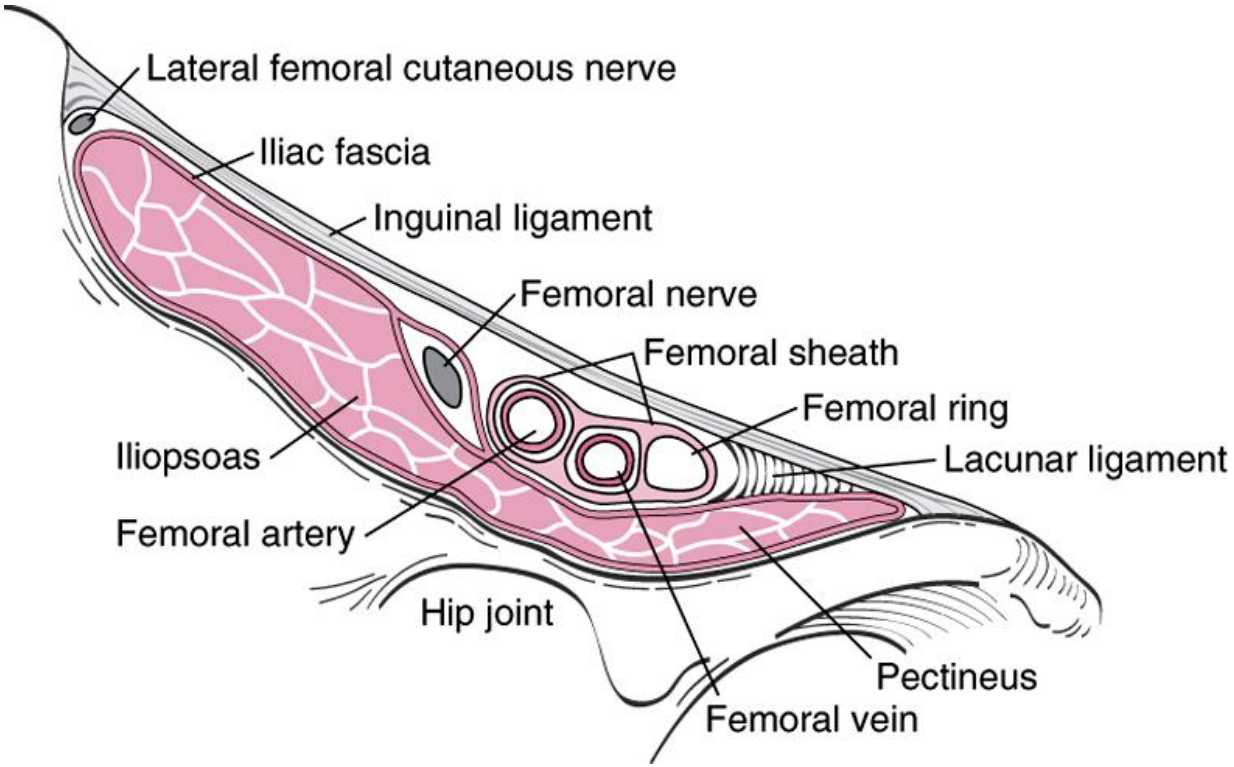
18. Femoral sheath & femoral hernia



- Extension of **transversalis fascia** and **iliacus fascia** that enters thigh deep to inguinal ligament
- Divided into three compartments from lateral to medial enclosing:
  - **Femoral artery**
  - **Femoral vein**
  - **Femoral canal**

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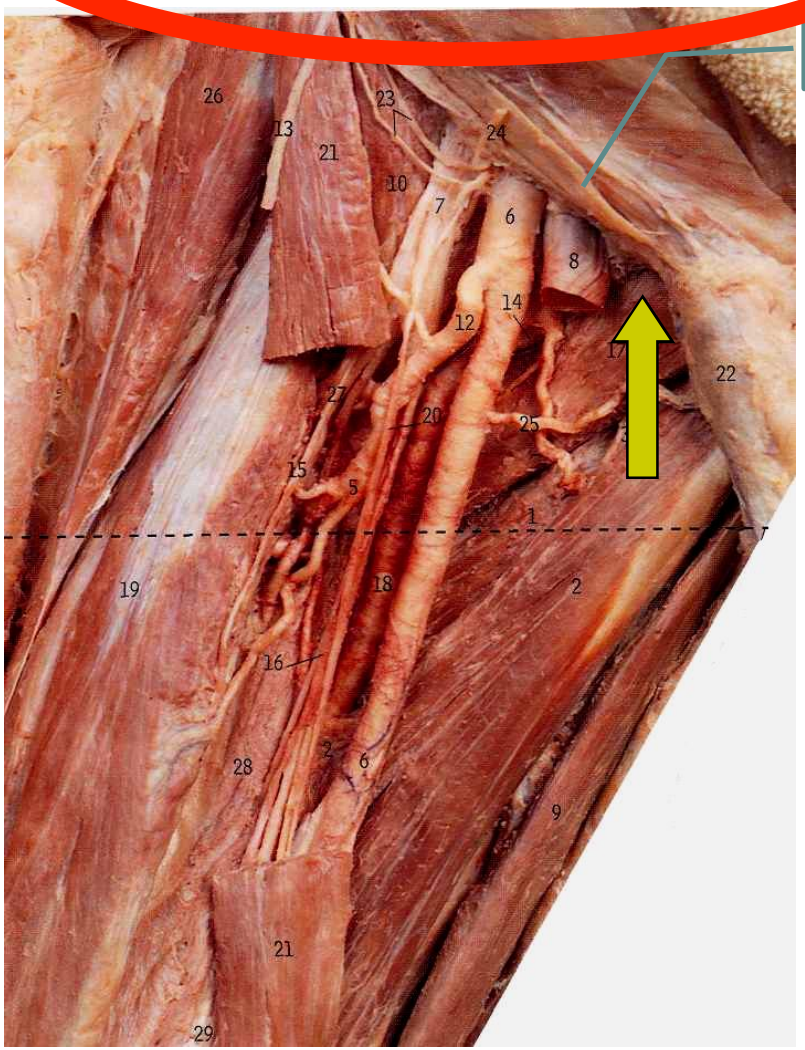
Femoral hernia



- **A femoral hernia** passes through the **femoral ring** into the femoral canal to form a swelling in the upper thigh inferior and lateral to the pubic tubercle
- The hernial sac may protrude through the **saphenous hiatus** into the superficial fascia
- A femoral hernia occurs more frequently **in females** and is dangerous because the hernial sac may become **strangulated**
- An **aberrant obturator artery** is vulnerable during surgical repair

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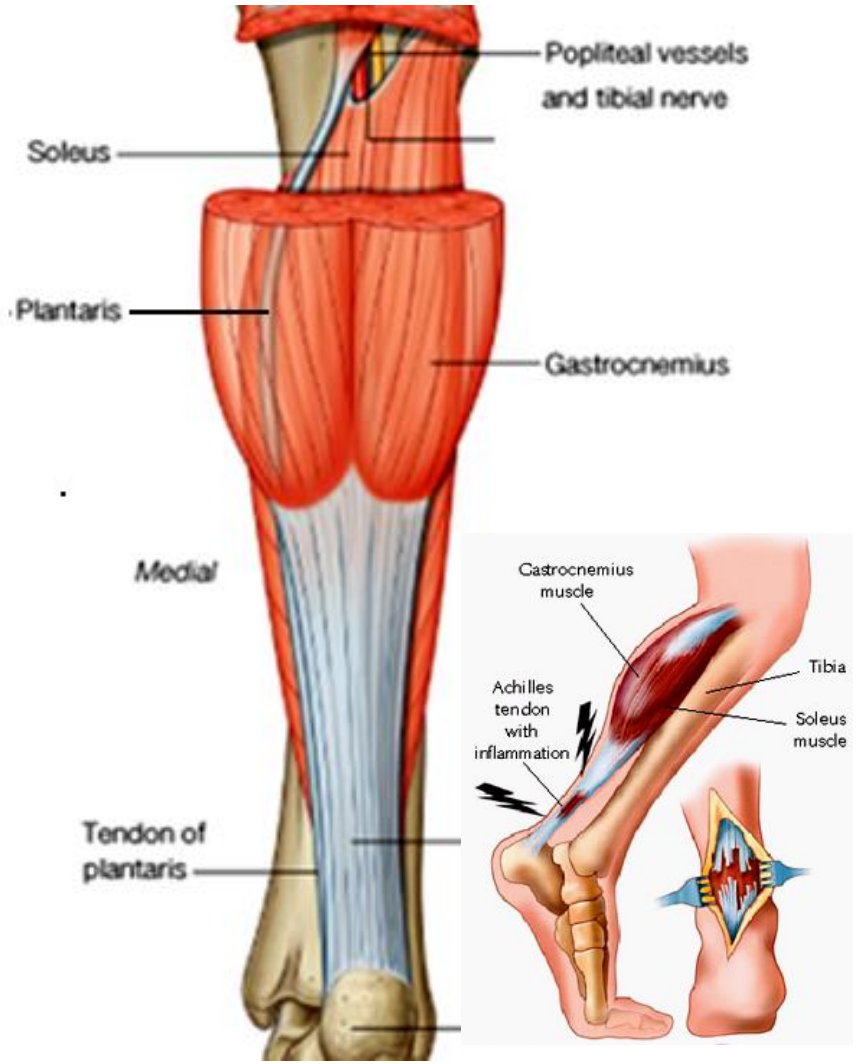
19. Rupture of the Achilles tendon and Triceps surae muscle



- **Avulsion or rupture of** the **calcaneal** (**Achilles**) **tendon** disables the triceps sure muscle (gastrocnemius & soleus) so that the patient cannot **plantar flex** the foot.

Triceps surae muscle:

- 2 Heads of **Gastrocnemius** m.
- 1 Head - **Soleus** muscle
- **Plantaris**
  - small fusiform belly with long thin tendon; **may be absent**
  - sometimes may become **hypertrophy**

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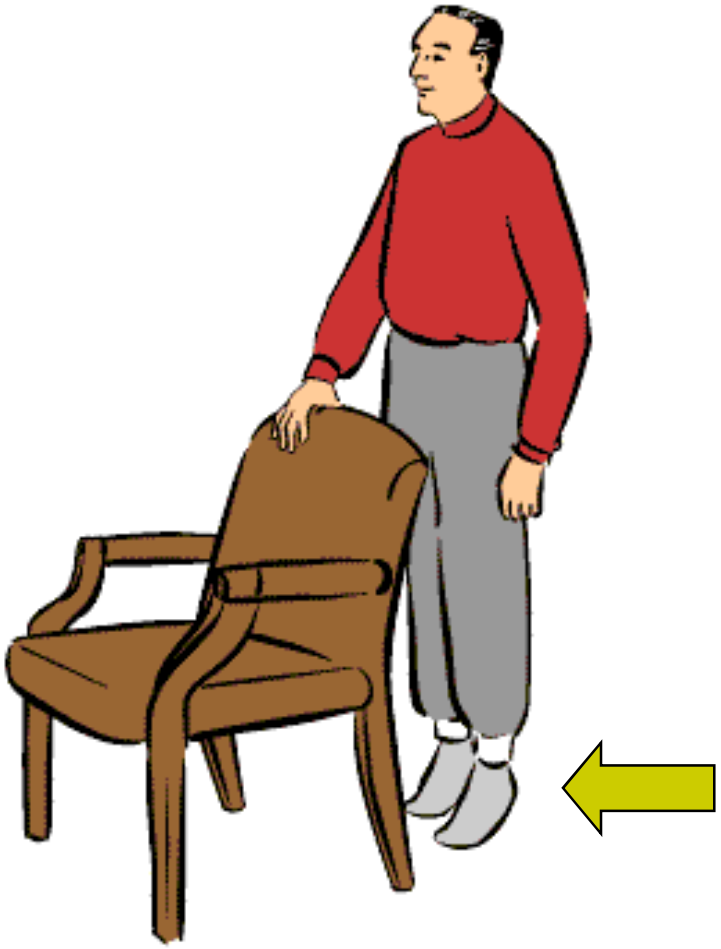
Injury to tibial nerve



- **In popliteal fossa: loss of plantar flexion** of foot (mainly **gastrocnernius** and soleus muscles) and **weakened inversion** (tibialis posterior muscle), causing **calcaneovalgus.**
- **Inability to stand on toes**

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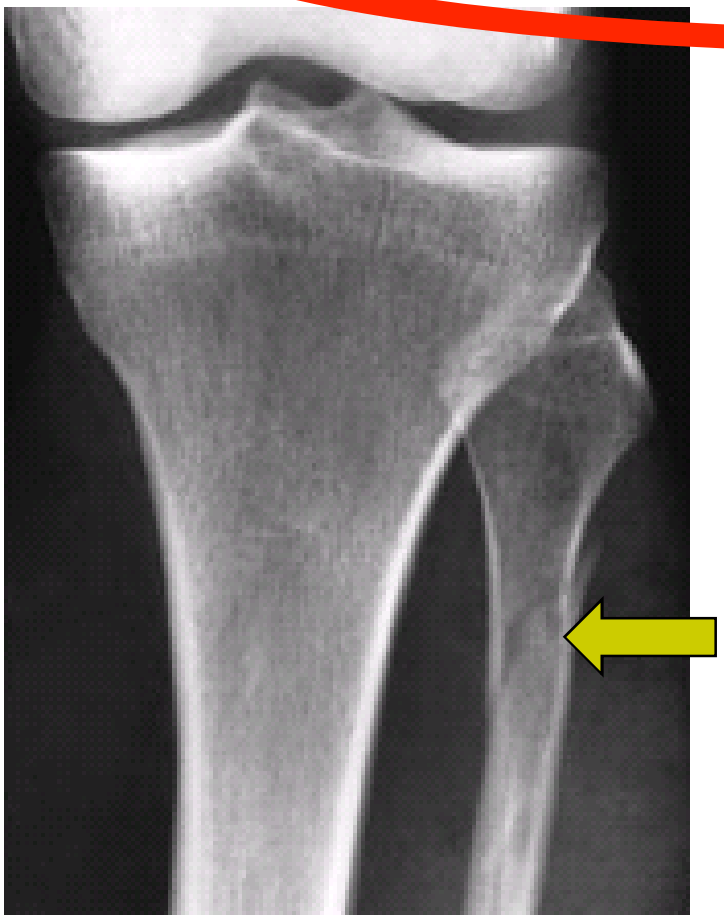
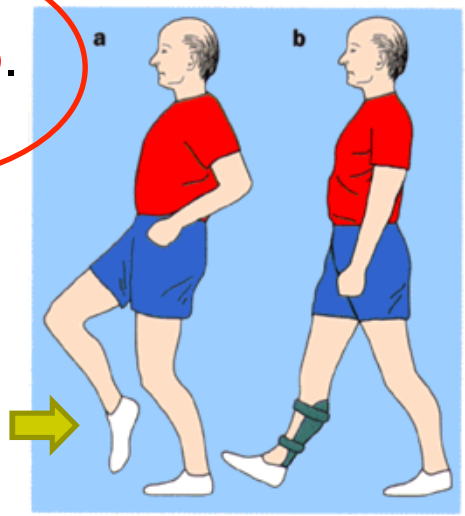
20. Fracture of the fibular neck



- May cause an injury to the **common peroneal nerve**, which winds laterally around the neck of the fibula.
- This injury results in **paralysis** of all muscles in the **anterior** and **lateral compartments** of the **leg** (dorsiflexors and evertors of the foot)
- Causing **foot drop**.



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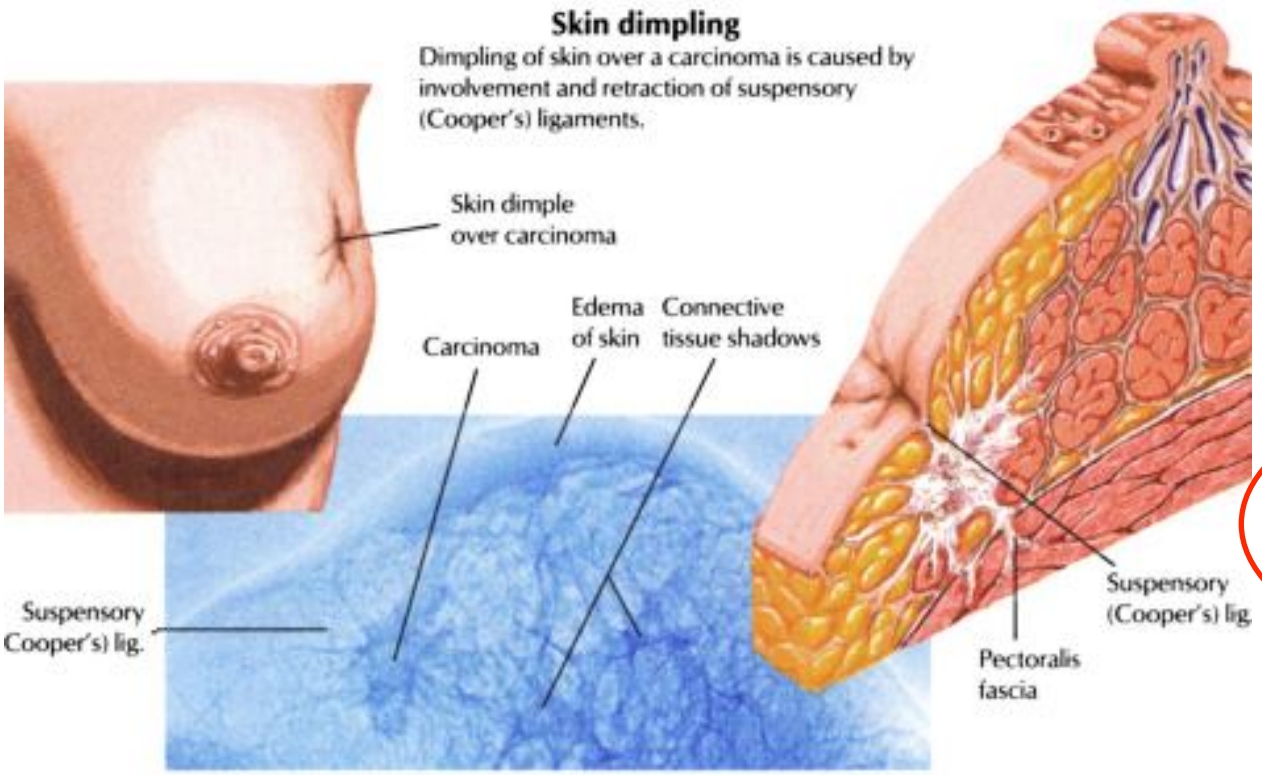
21. Breast: Carcinoma of the Breast



- Carcinomas of the breast are **malignant tumors**, usually adenocarcinomas arising from the epithelial cells of the lactiferous ducts in the mammary gland lobules
- 1. It enlarges, attaches to **suspensory** (**Cooper's**) **ligaments**, and produces shortening of the ligaments, causing depression or **dimpling** of the overlying **skin.**

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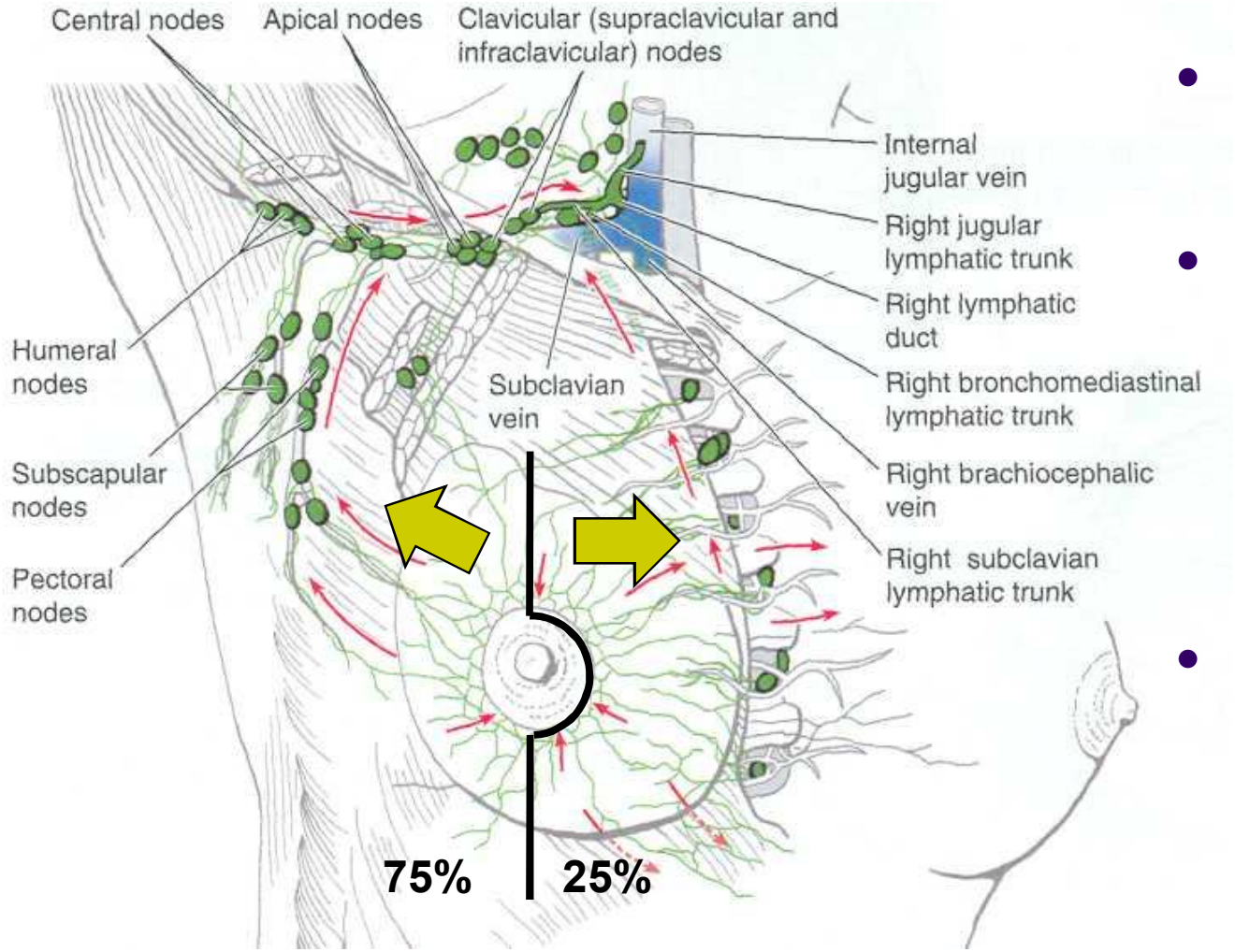
Lymphatic drainage of the breast



- It is important because of its role in the **metastasis of cancer cells**.
- Most lymph (> 75%), especially from the **lateral breast quadrants**, drains to the **axillary lymph** nodes, initially to the **anterior (pectoral) nodes** for the most part.
- Most of the remaining lymph, particularly from the **medial breast** quadrants, drains to the **parasternal lymph** nodes or to the **opposite breast.**

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Mastectomy

- **Radical mastectomy**, a more extensive surgical procedure, involves removal of the breast, pectoral muscles, fat, fascia, and as many lymph nodes as possible in the axilla and pectoral region.
- During a radical mastectomy, **the long thoracic nerve** may be lesioned during ligation of the lateral thoracic artery. A few weeks after surgery, the female may present with a **winged scapula** and weakness in **abduction** of the arm **above 90°** because **serratus anterior m.** paralysis**.**
- **The intercostobrachial nerve** may also be damaged during mastectomy, resulting in numbness of the **skin of the medial arm**.

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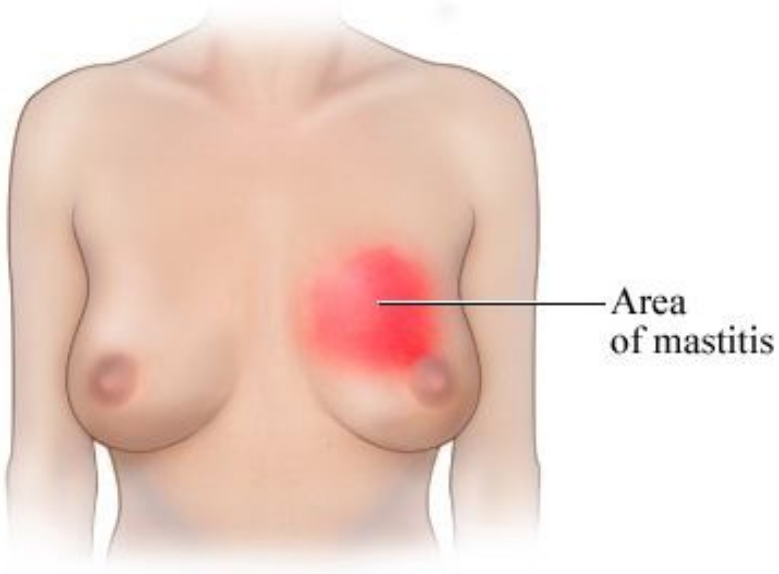
Breast infection



- **Mastitis** is an **infection of the tissue** of the breast that occurs most frequently during the time of **breastfeeding** (1 to 3months after the delivery of a baby).
- This infection causes **pain**, **swelling**, **redness**, and **increased** **temperature** of the breast.
- It can occur when bacteria, often from the baby's mouth, enter a milk duct through a crack in the nipple.
- It can occur in women who have not recently delivered as well as in women after menopause.

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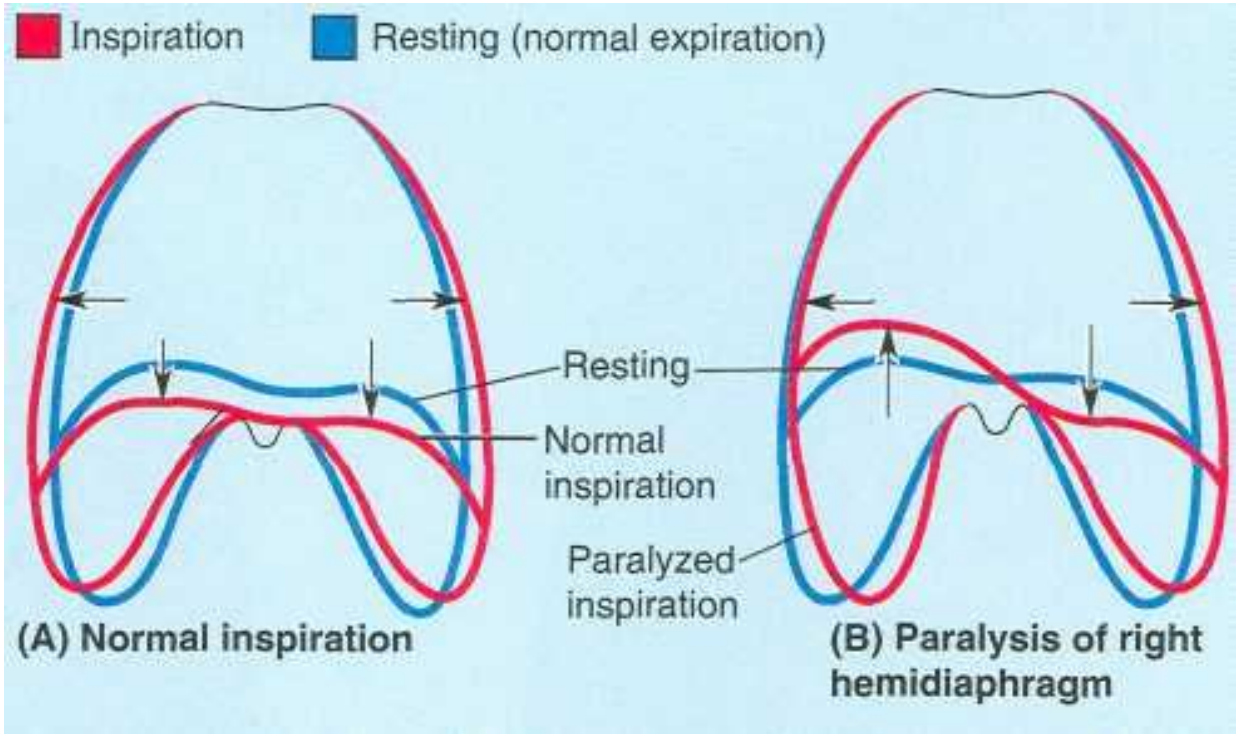
22. Diaphragm: Paralysis of Half and ruptures



- **Paralysis of the half of the Diaphragm** may result from injury or operative division of the **phrenic nerve** of same side
- It can be detected **radiologically**.
- **Paradoxical movement:** dome of diaphragm of injured side pushed superiorly by abdominal viscera during inspiration instead of descending

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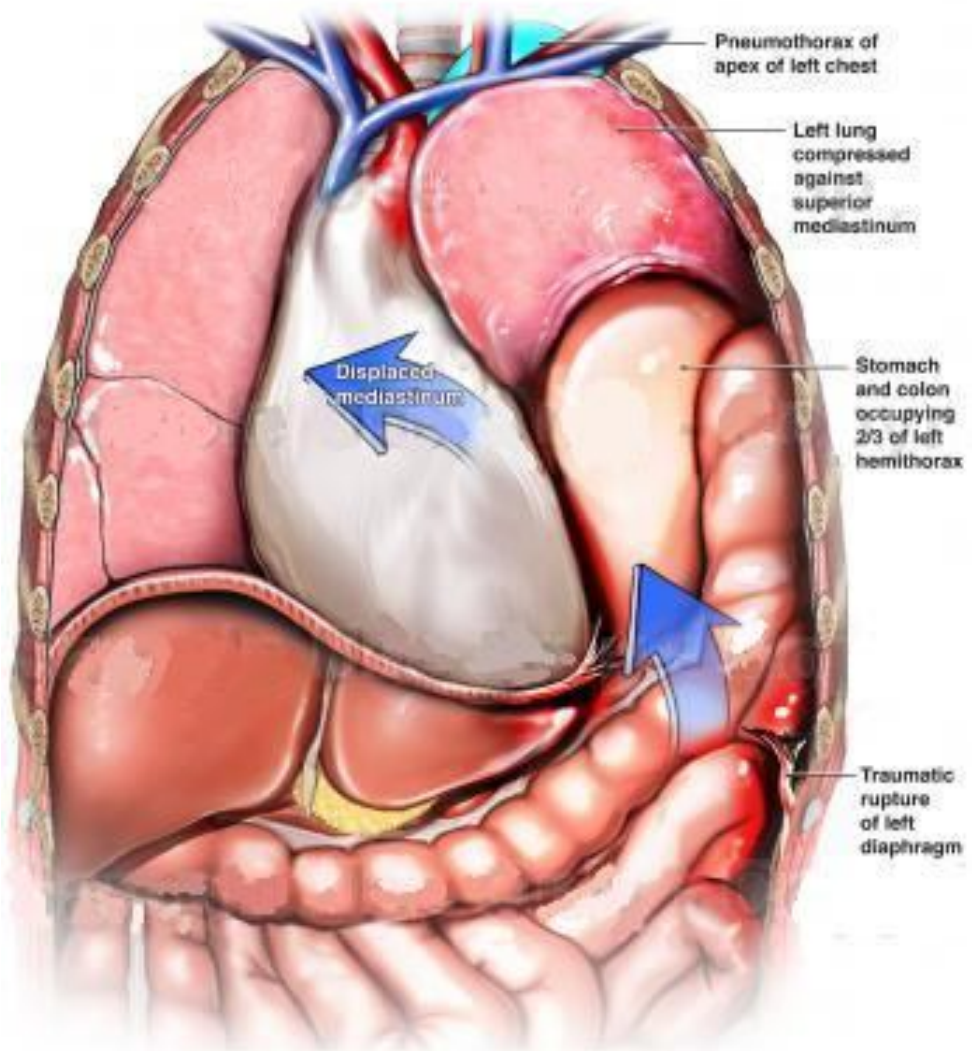
Diaphragmatic ruptures

- Diaphragmatic injuries are relatively rare and result from either **blunt** trauma **or penetrating trauma**.
- Presently, 80-90% of blunt diaphragmatic ruptures **result** from **motor vehicle** crashes.
- The majority (80-90%) of blunt diaphragmatic ruptures have occurred on the **left side**.
- Blunt trauma typically produces large radial tears measuring 5-15 cm, most often at the **posterolateral aspect** of the diaphragm.



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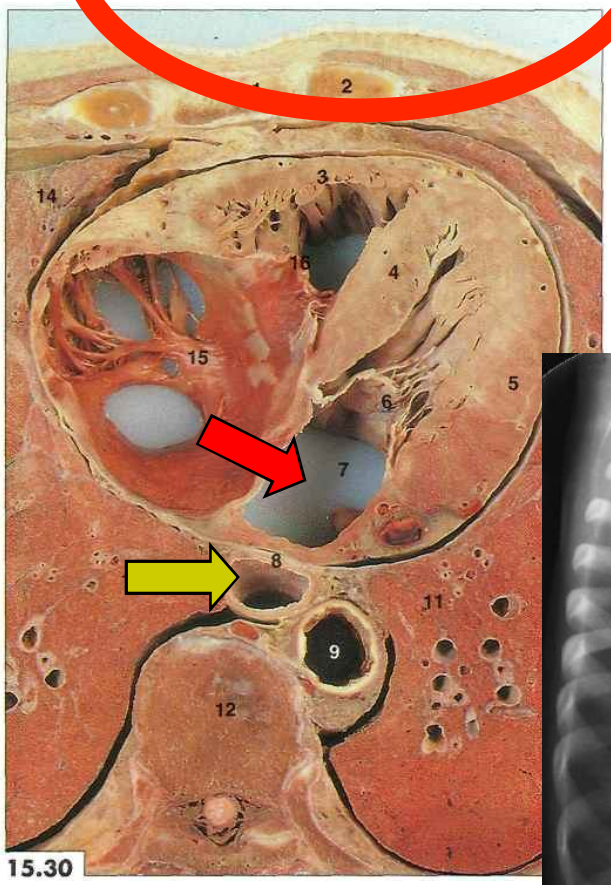
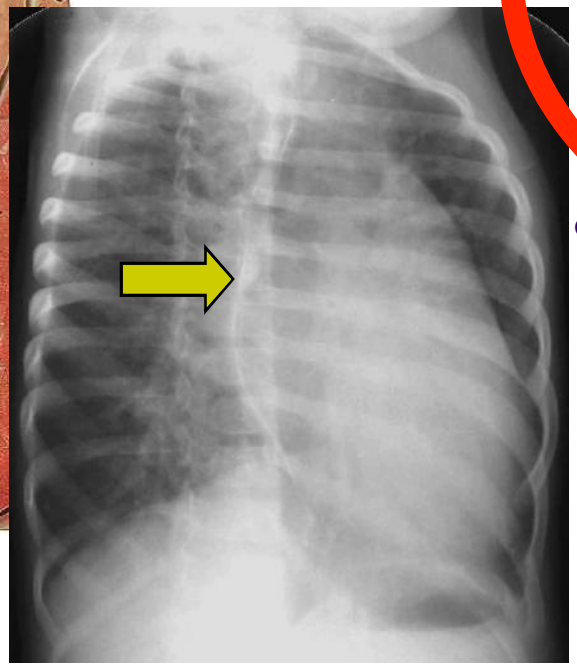
23. Cardiac hypertrophy





- **Left atrial enlargement** (hypertrophy) secondary to **mitral valve** failure may **compress** on the **esophagus** and manifest as dysphagia (difficulty in swallowing).
- It may be observed as a filling defect in the esophagus by **barium swallow on the lateral thoracic X-Ray**

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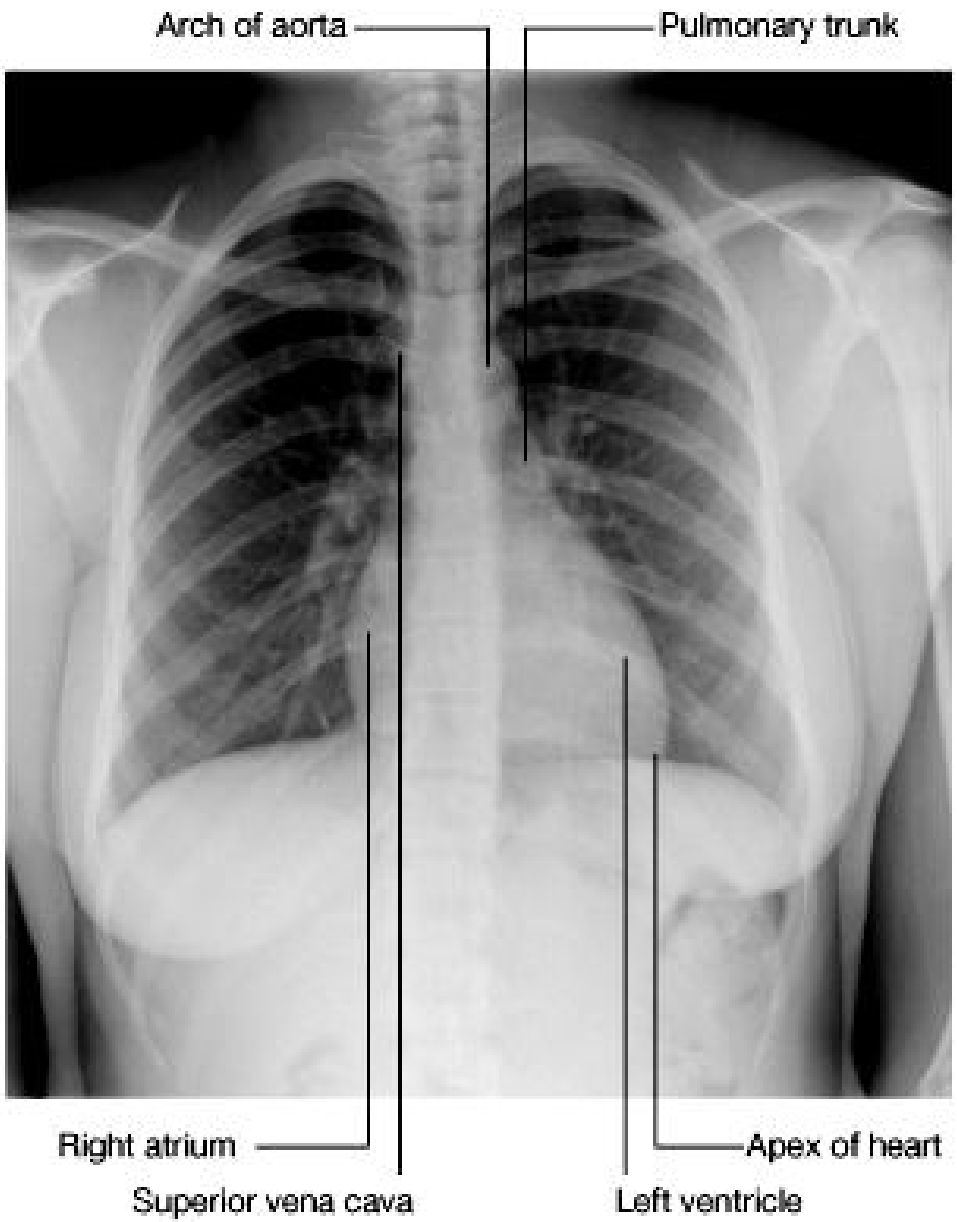
P-A projection



Cardiac Shadow

Right border is formed by:

1. **SVC,**
2. **Right atrium**

Left border is formed by:

1. **Aortic arch**
2. **Pulmonary trunk**
3. **Left auricle**
4. **Left ventricle**

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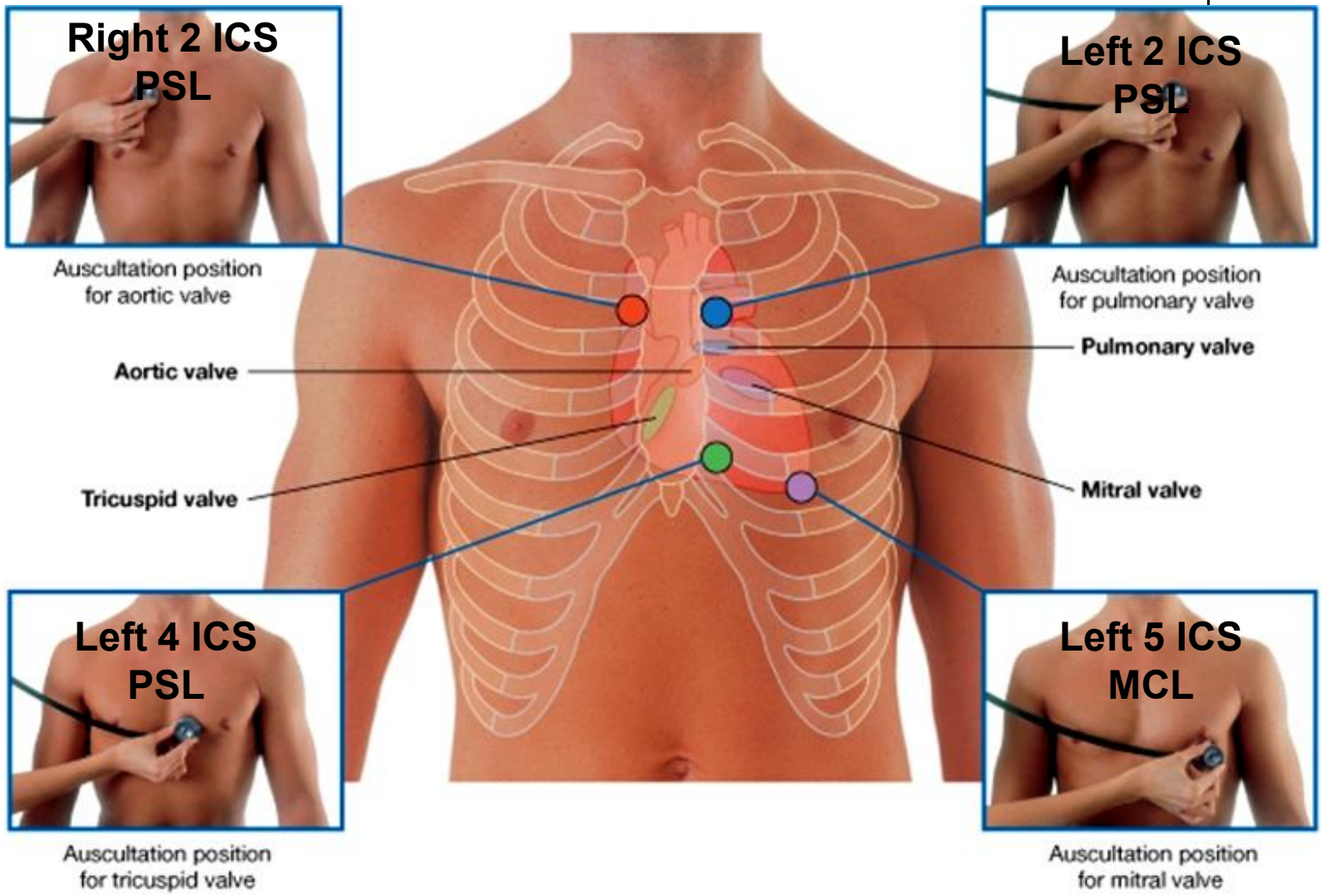
24. Auscultation of Heart Valves



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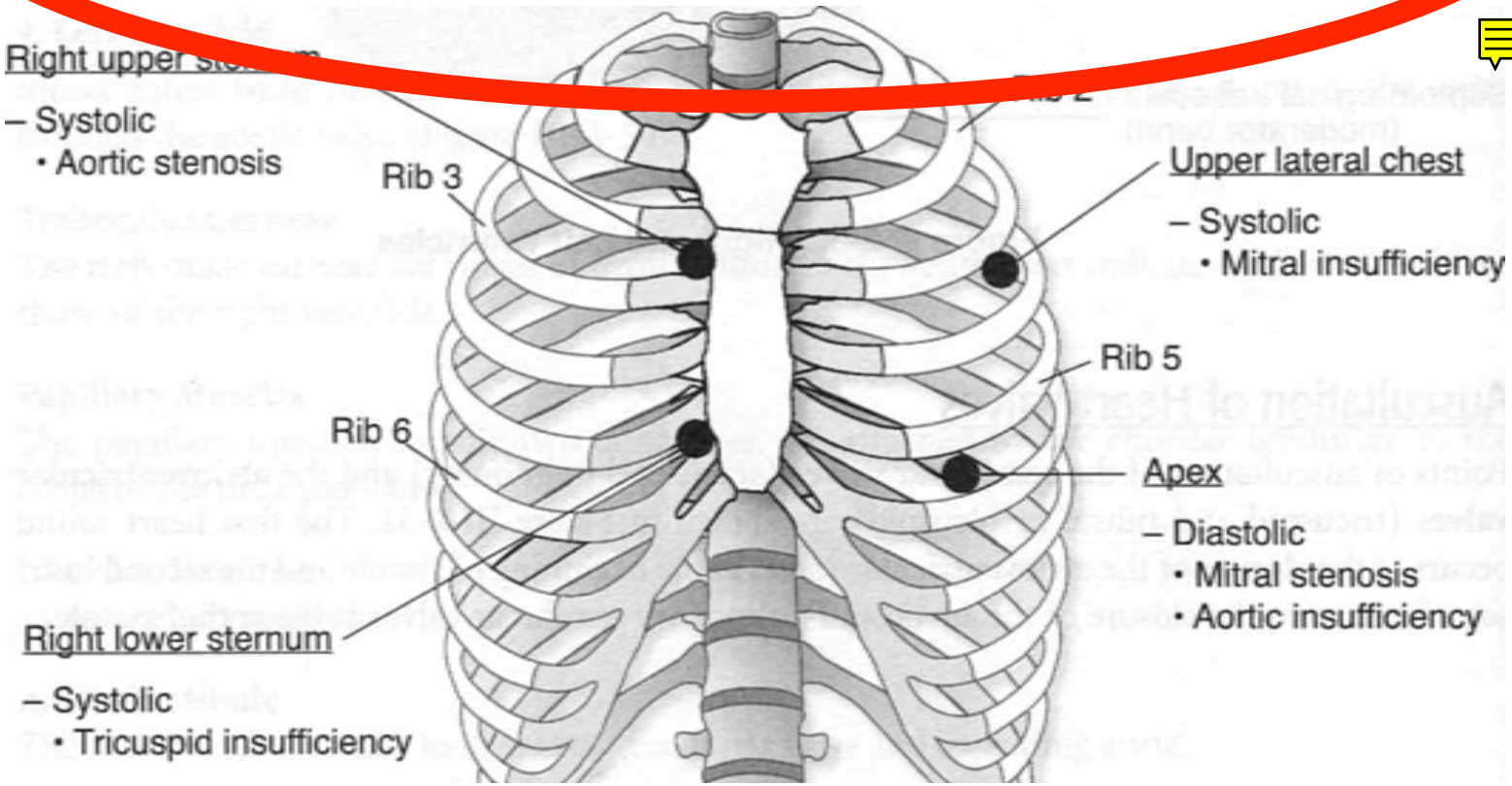
Auscultation sites for mitral and aortic murmurs



A heart murmur is heard **downstream from the valve**:

- **stenosis** is **orthograde** direction from valve
- **insufficiency** is **retrograde** direction from valve

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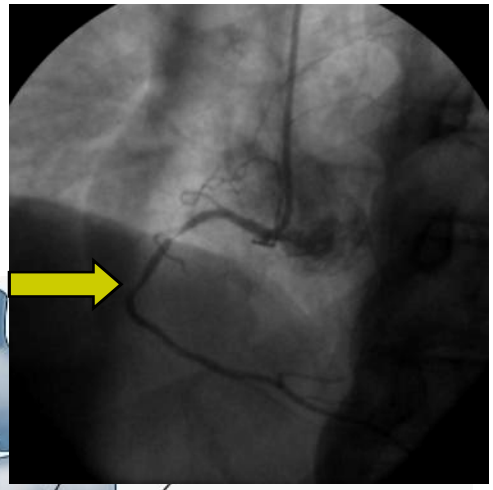
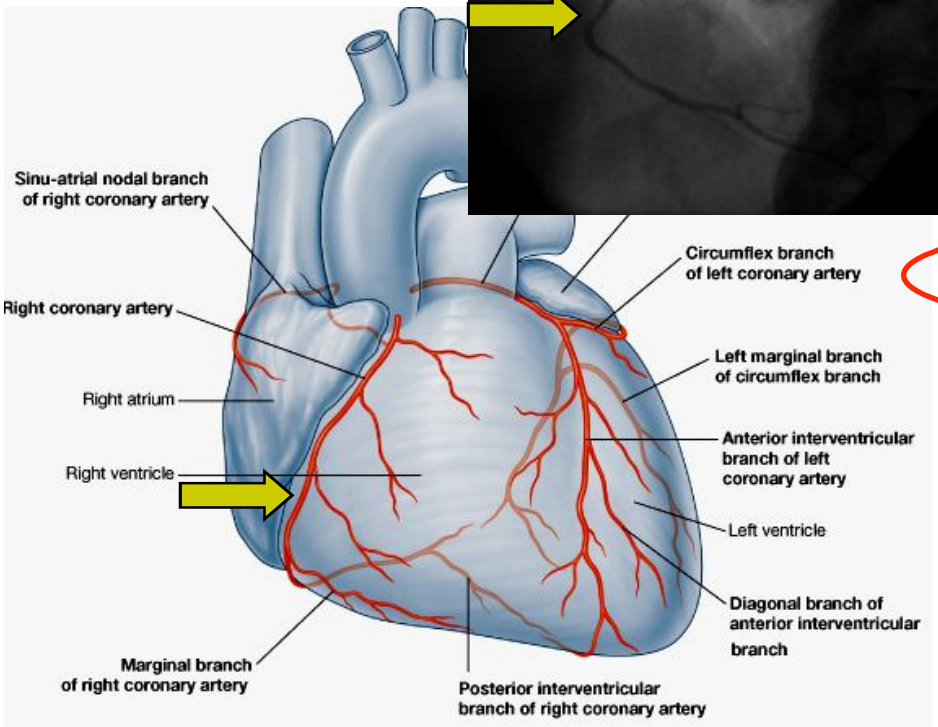
25. Blood supply of the Heart: Right coronary artery (RCA)





- It supplies major parts of the **right atrium** and the **right ventricle**.
- It anastomoses with the marginal branch of the left coronary artery posteriorly

Branches:

1. **Anterior cardiac branches** – supplies the **right atrium**
2. **Nodal branch** – supplies the (1) **SA** node, (2) **AV** node
3. **Marginal artery** – supplies the right ventricle
4. **Posterior interventricular artery** – supplies (1) **diafragmatic (inferior) surface of both ventricles** and (2) **posterior 1/3 of the IV septum**

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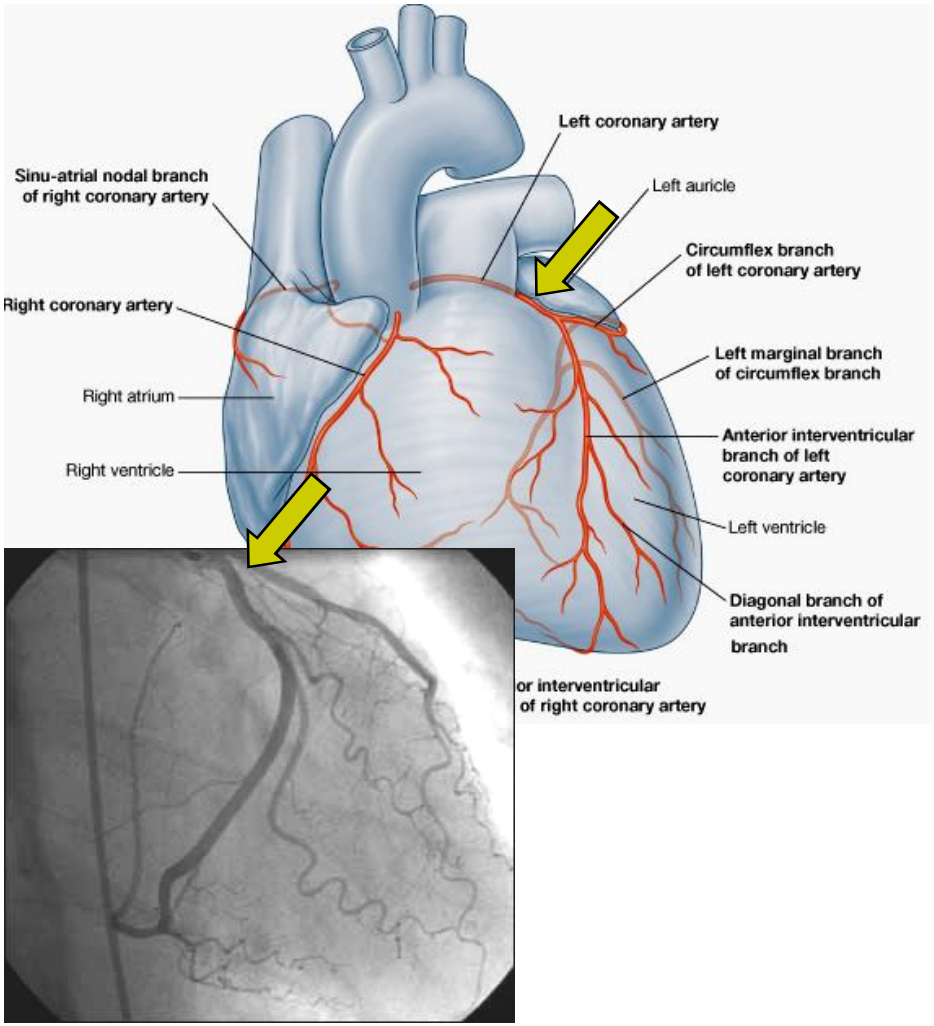
Left coronary artery (LCA)



Branches:

1. **Anterior interventricular artery** descends in the anterior interventricular sulcus and provides branches to the (1) **anterior heard wall,** (2) **anterior 2/3 of IV septum,** (3) **bundle of His,** and (4) **apex** of the heart.
2. **Circumflex artery** – winds around the left margin of the heart in the atrioventricular groove to anastomose with the right coronary artery posteriorly; supplies the **left atrium** and **left ventricle**

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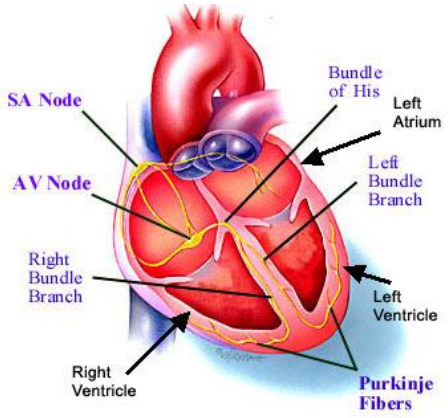
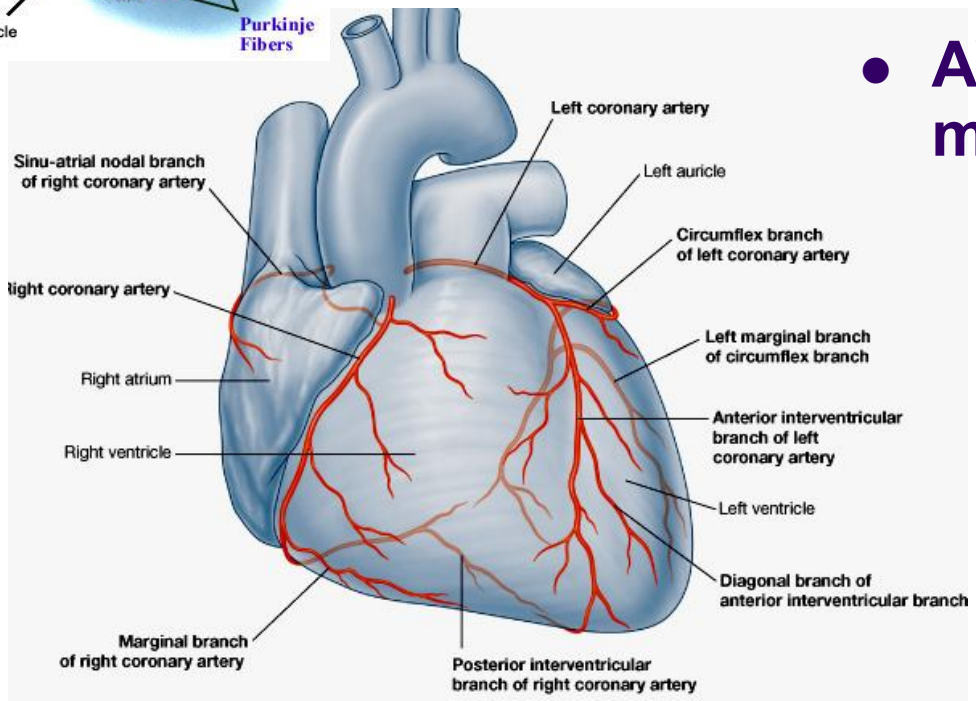
Blood supply of the conducting system



- SA node – RCA
- AV node – RCA
- AV bundle (and moderator band)- LCA

AV Bundle of His



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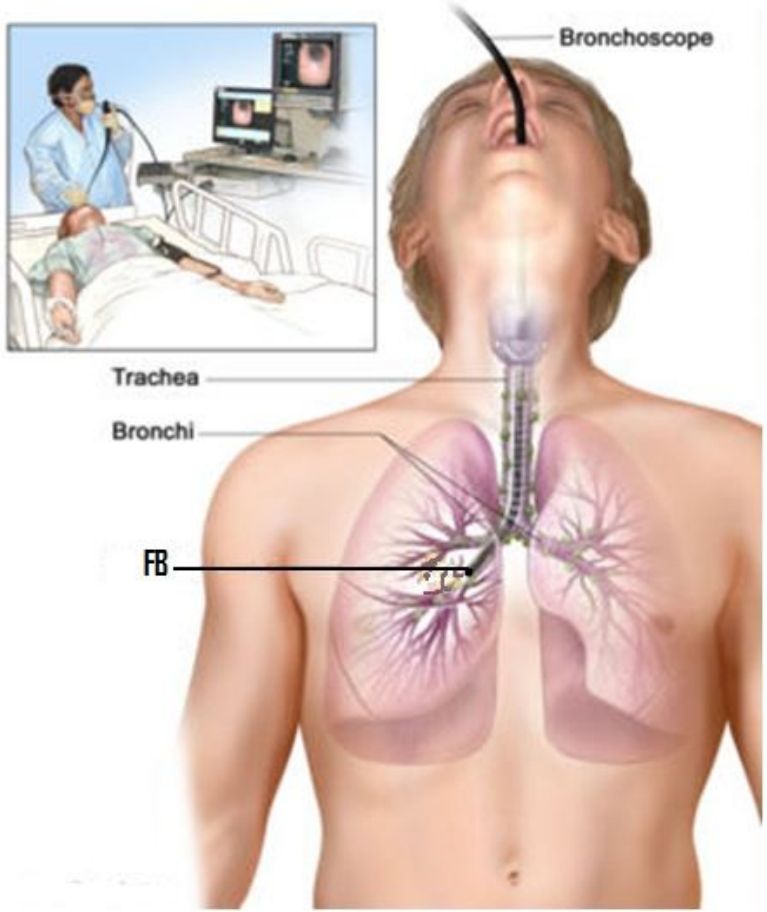
26. Aspiration of Foreign Bodies & Bronchopulmonary segments



Aspiration of Foreign Bodies:

- Inhalation of FB's (e.g. pins, parts of teeth, screws, nuts, bolts, toys) into the lower respiratory tract is common, especially **in children**
- More likely to enter the **right primary bronchus** and pass into the **middle** or **lower lobe bronchi**
- If the vertical position of the body, the foreign body usually falls into the **posterior basal segment** of the **right inferior lobe.**

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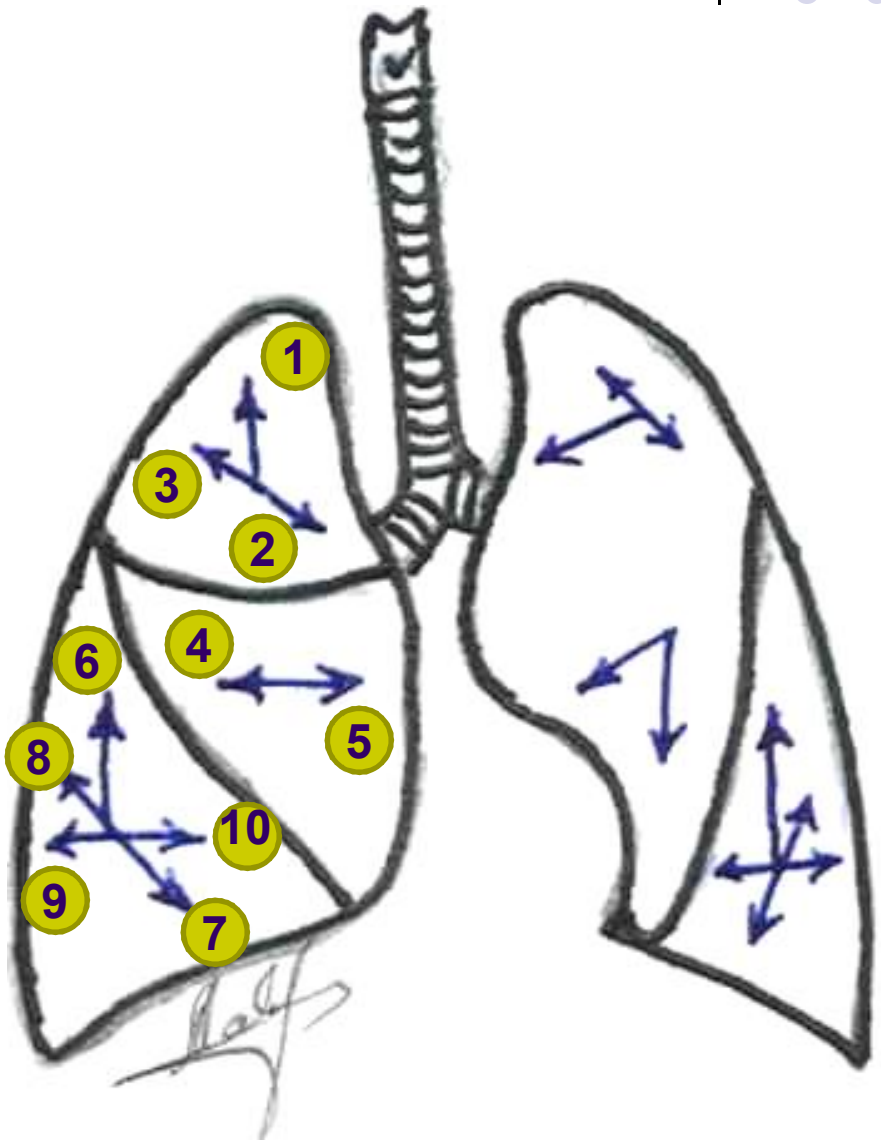
Right lung:
10 bronchopulmonary segments

Superior lobe:
1. Apical
2. Anterior
3. Posterior

Middle lobe:
4. Lateral
5. Medial

Inferior lobe:
6. Superior
7. Anterior basal
8. Posterior basal
9. Lateral basal
10. Medial basal



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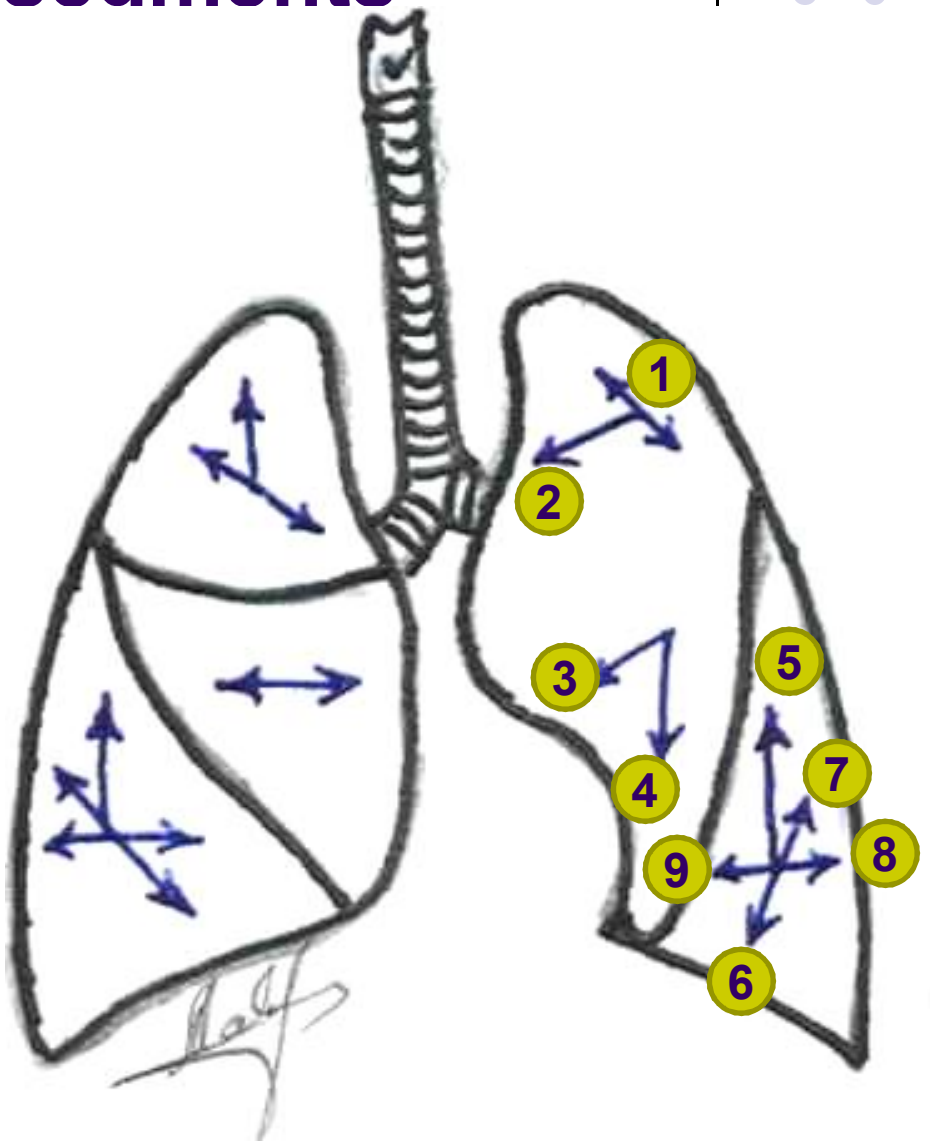
Left lung:
9 bronchopulmonary segments

Superior lobe:
1. Apicoposterior
2. Anterior
3. Superior lingular
4. Inferior lingular

Inferior lobe:
5. Superior
6. Anterior basal
7. Posterior basal
8. Lateral basal
9. Medial basal



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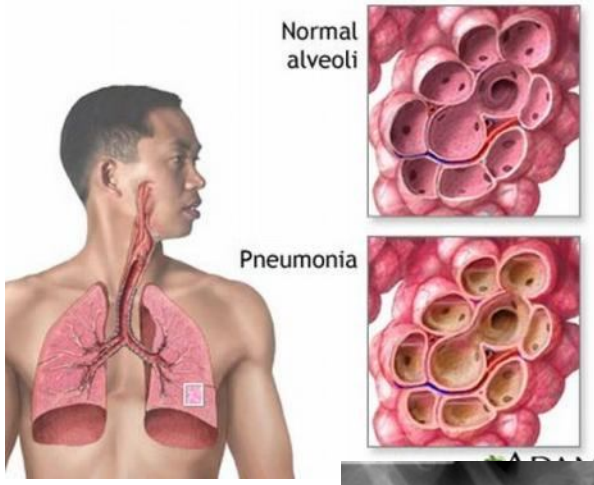
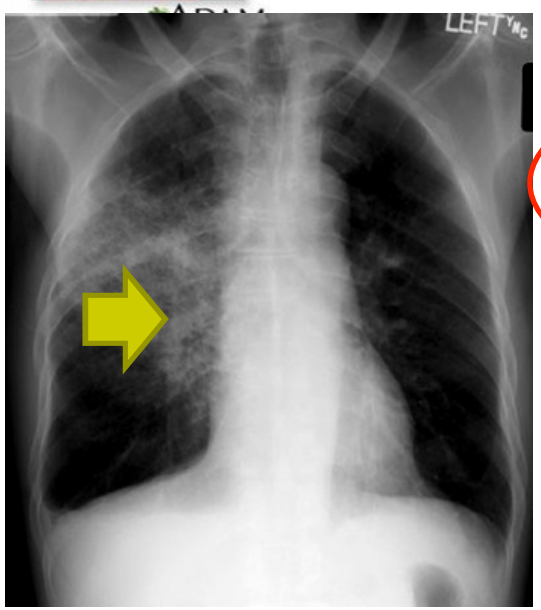
27. Lung diseases: Pneumonia





- Pneumonia is an **inflammation** of the lung, caused by an infection or chemical injury to the lungs.
- Three common causes are **bacteria**, **viruses** and fungi.
- Symptoms: **cough**, **chest pain**, fever, and difficulty in breathing.
- **Chest x-rays:** areas of **opacity** (seen as white) of the lung parenchyma and **enlargement** of bronchomediastinal **lymph nodes** (mediastinal widening).

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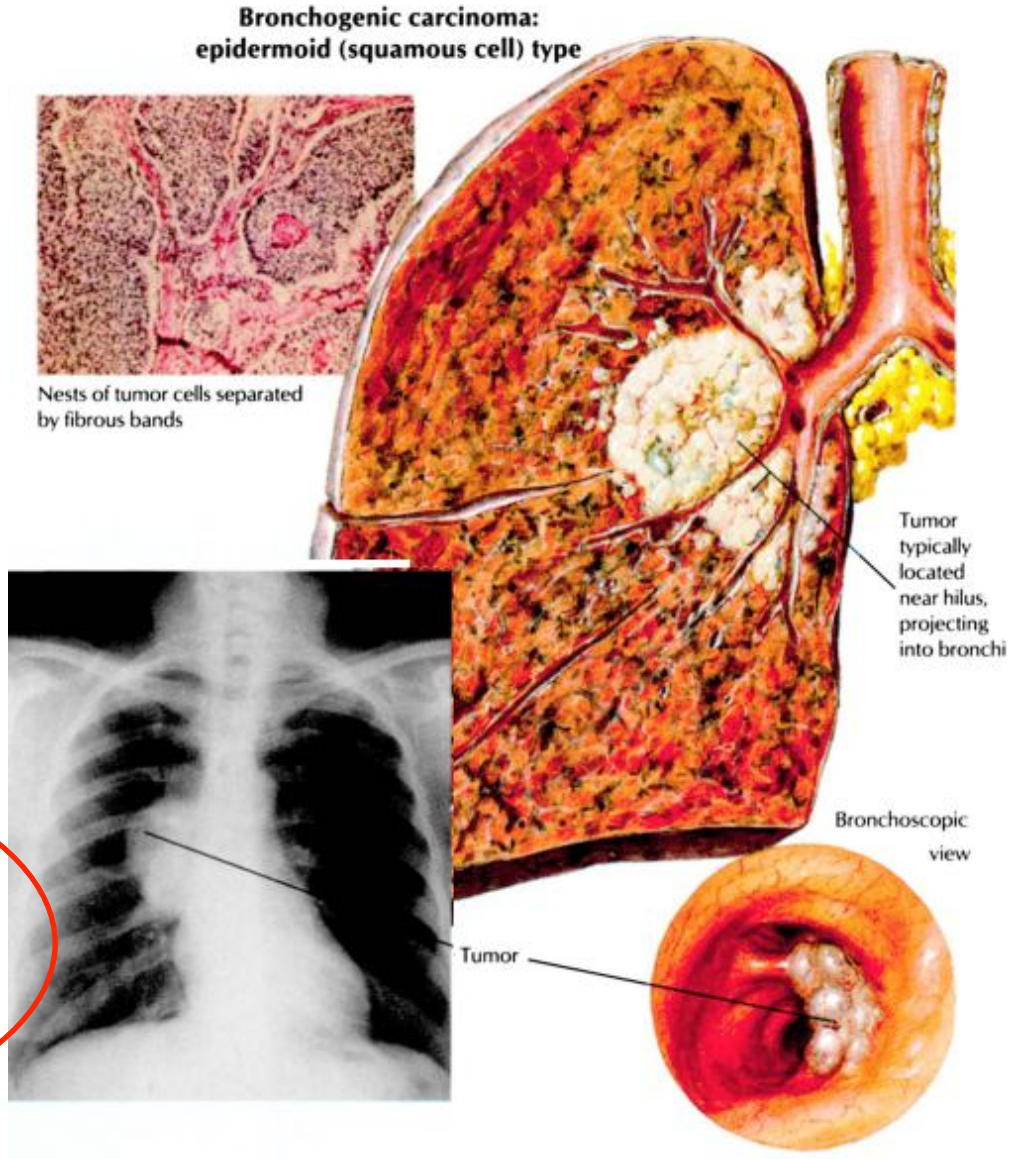
Bronchogenic Carcinoma

- Arises in the mucosa of the large **bronchi**
- Produces as persistent, productive **cough** or **hemoptysis**
- Early metastasis to **thoracic** (bronchomediatinal) lymph nodes
- Hematogenous spread to the brain, bones, lungs, suprarenal glands
- A tumor at the apex of the lung (**Pancoast tumor**) may result in thoracic outlet syndrome



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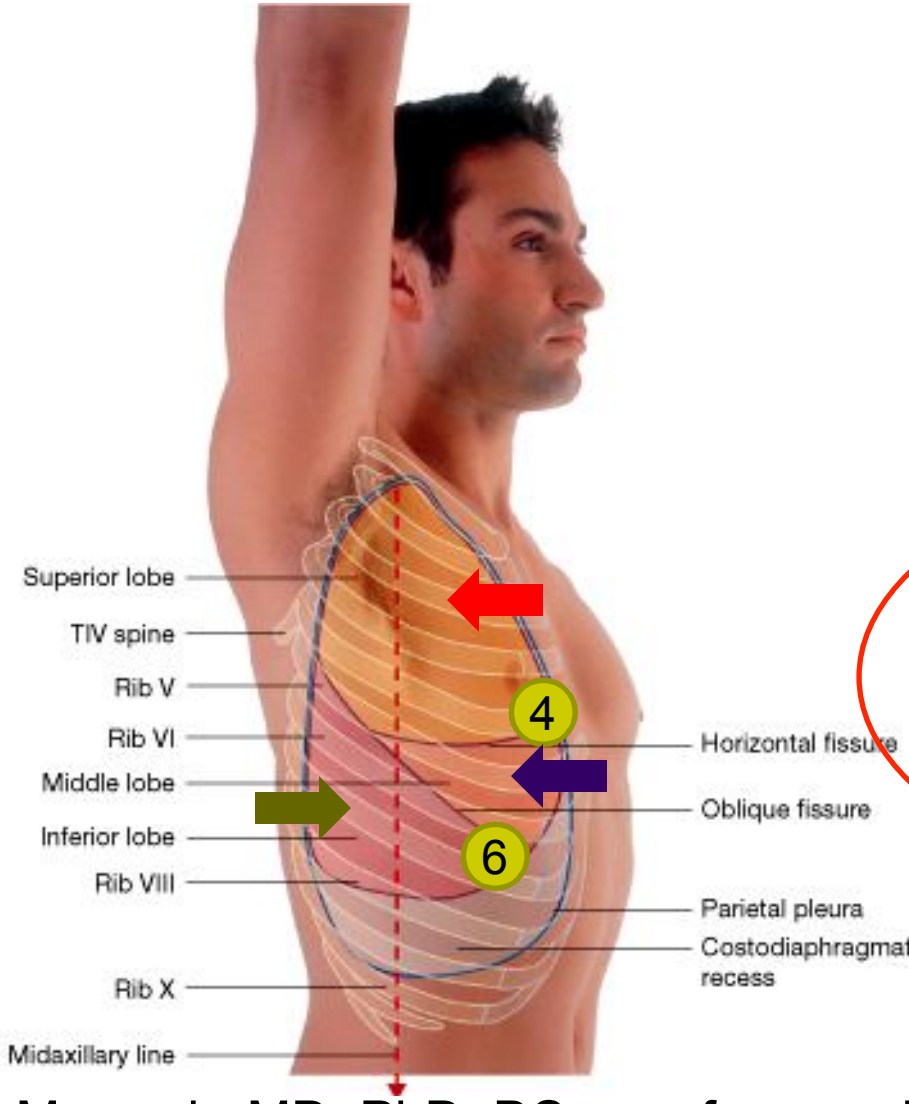
Qs about Auscultation and penetrated wounds



- To listen to **breath sounds** of the **superior lobes** of the right and left lungs, the stethoscope is placed on the superior area of the anterior chest wall **(above the 4th** rib for the **right** lung & **above 6th** for the **left** one).
- For **breath sounds** from the **middle lobe of the right lung,** the stethoscope is placed on the anterior chest wall **between the 4th and 6th ribs**
- For the **inferior lobes** of **both lungs**, **breath sounds** are primarily heard on the **posterior** chest wall.

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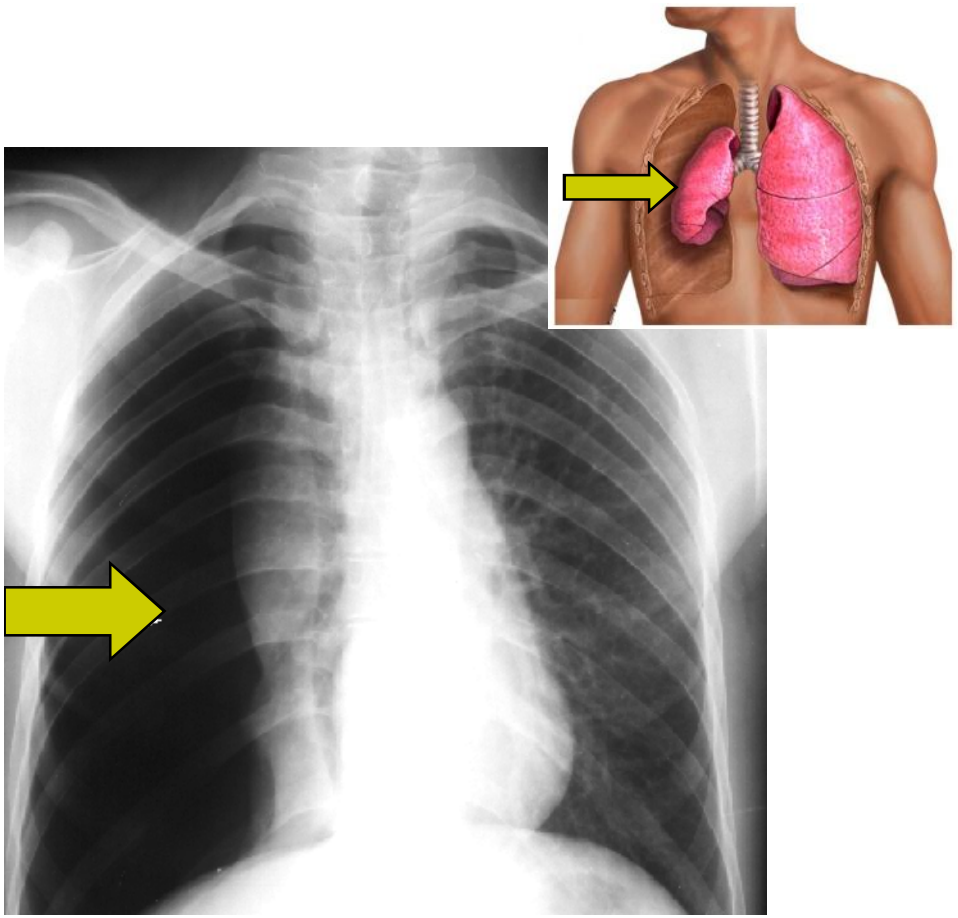
28. Open pneumothorax



- It is entry of **air** into a pleural **cavity** causing **lung collapse**.
- **Open pneumothorax** – due to stab wounds of the thoracic wall which pierce the parietal pleura so that the **pleural cavity is open to the outside** air via the lung or through the chest wall.
- **Air moves freely** through the wound during inspiration and expiration. During **inspiration**, air enters the chest wall and the mediastinum will shift toward other side and compress the opposite lung. During **expiration**, air exits the wound and the mediastinum moves back toward the affected side.

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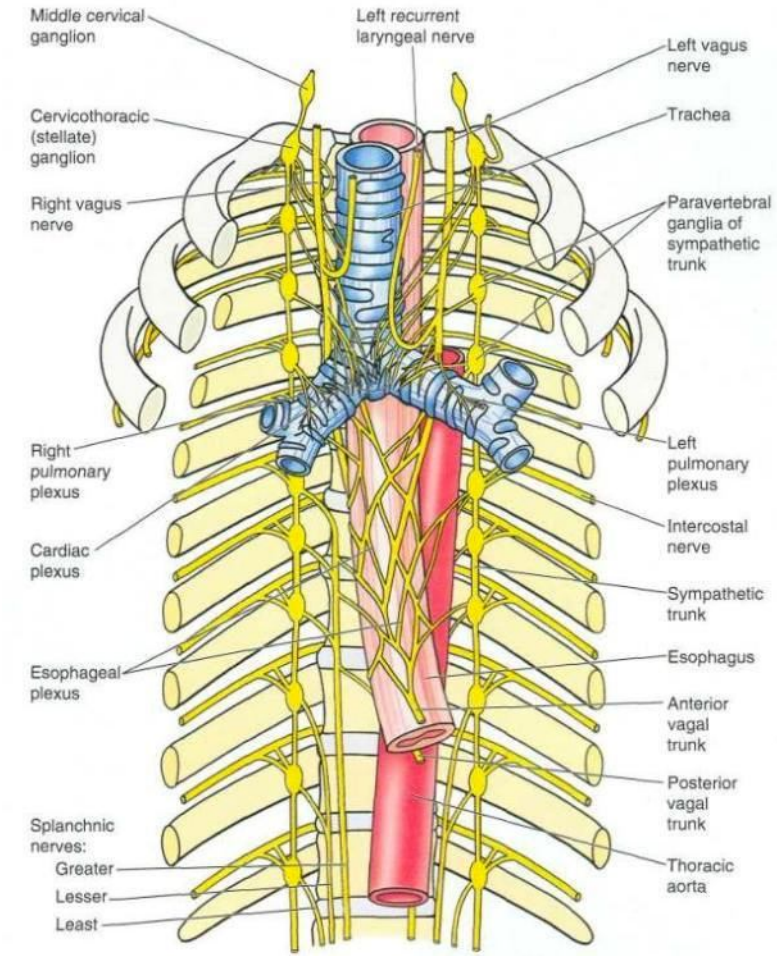
Nerve supply of the pleura



Parietal Pleura – sensitive to general sensibilities (pain, temperature, touch, and pressure) **- somatic sensory innervation**:

- **costal pleura** – **intercostal nerves**
- **mediastinal pleura** – **phrenic nerve**
- **diaphragmatic pleura** – phrenic nerve over the domes and lower 6 intercostal nerves around the periphery

Visceral Pleura – sensitive to stretch but insensitive to general sensibilities; **autonomic** nerve supply from the pulmonary plexus

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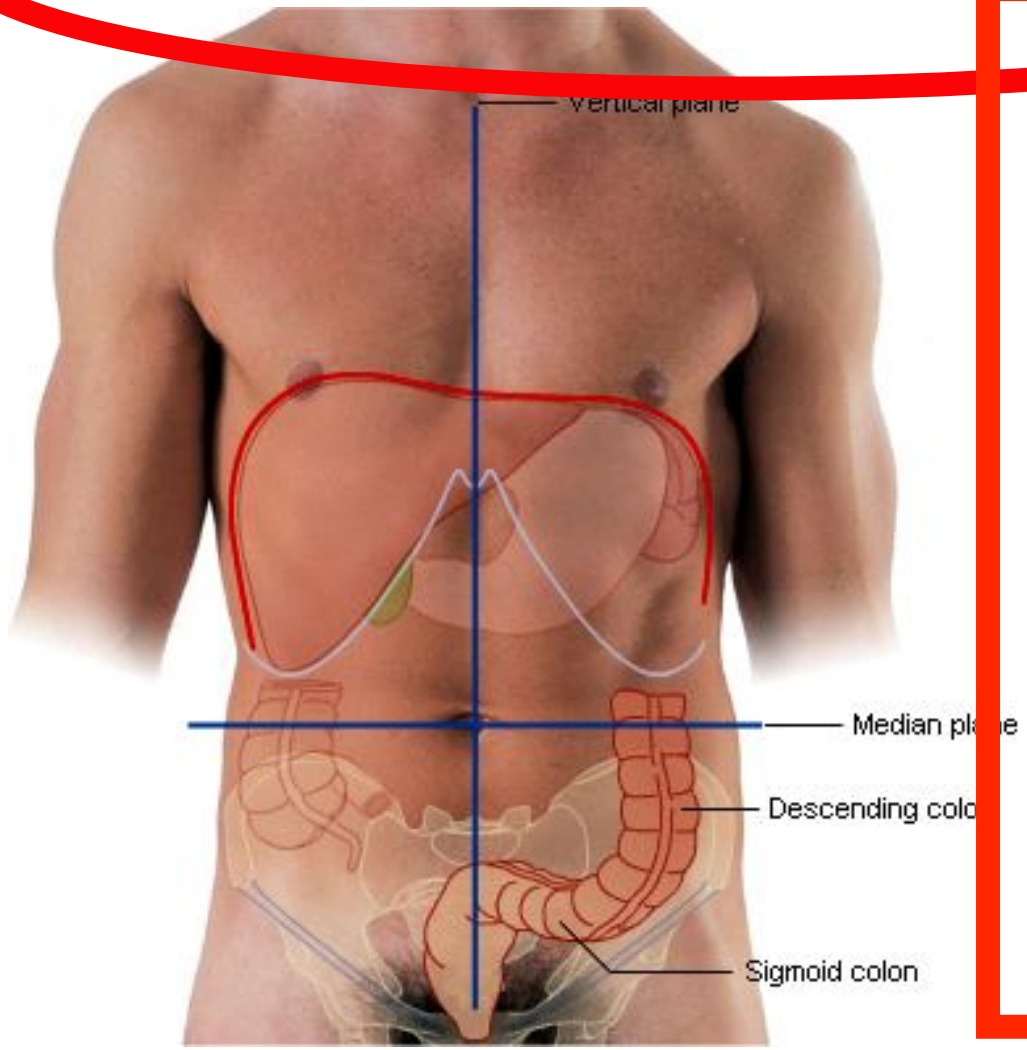
29. Anterior abdominal wall



- The **liver** and **gallbladder** are in the **right upper quadrant;**
- The **stomach** and **spleen** are in the **left upper quadrant;**
- The **cecum** and **appendix** are in the **right lower quadrant;**
- The end of the descending colon and **sigmoid colon** are in the **left lower quadrant.**

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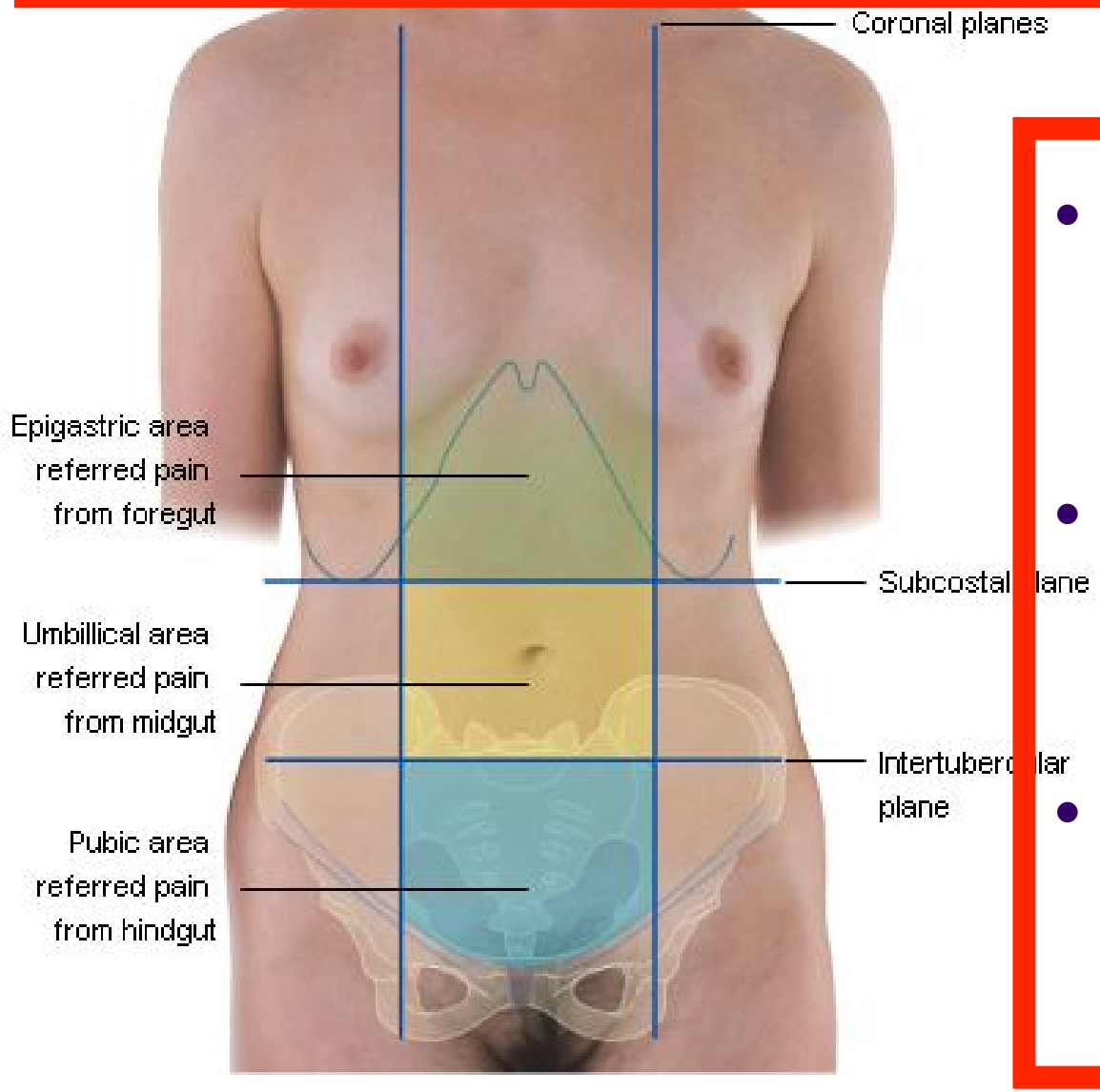
Referred abdominal pain



- **Pain** arising out of the **foregut** derived structures is referred to the **epigastric region**.
- **Pain** arising out of the **midgut** derived structures is referred to the **umbilical region**.
- **Pain** arising out of the **hindgut** derived structures is referred to the **hypogastric region**.

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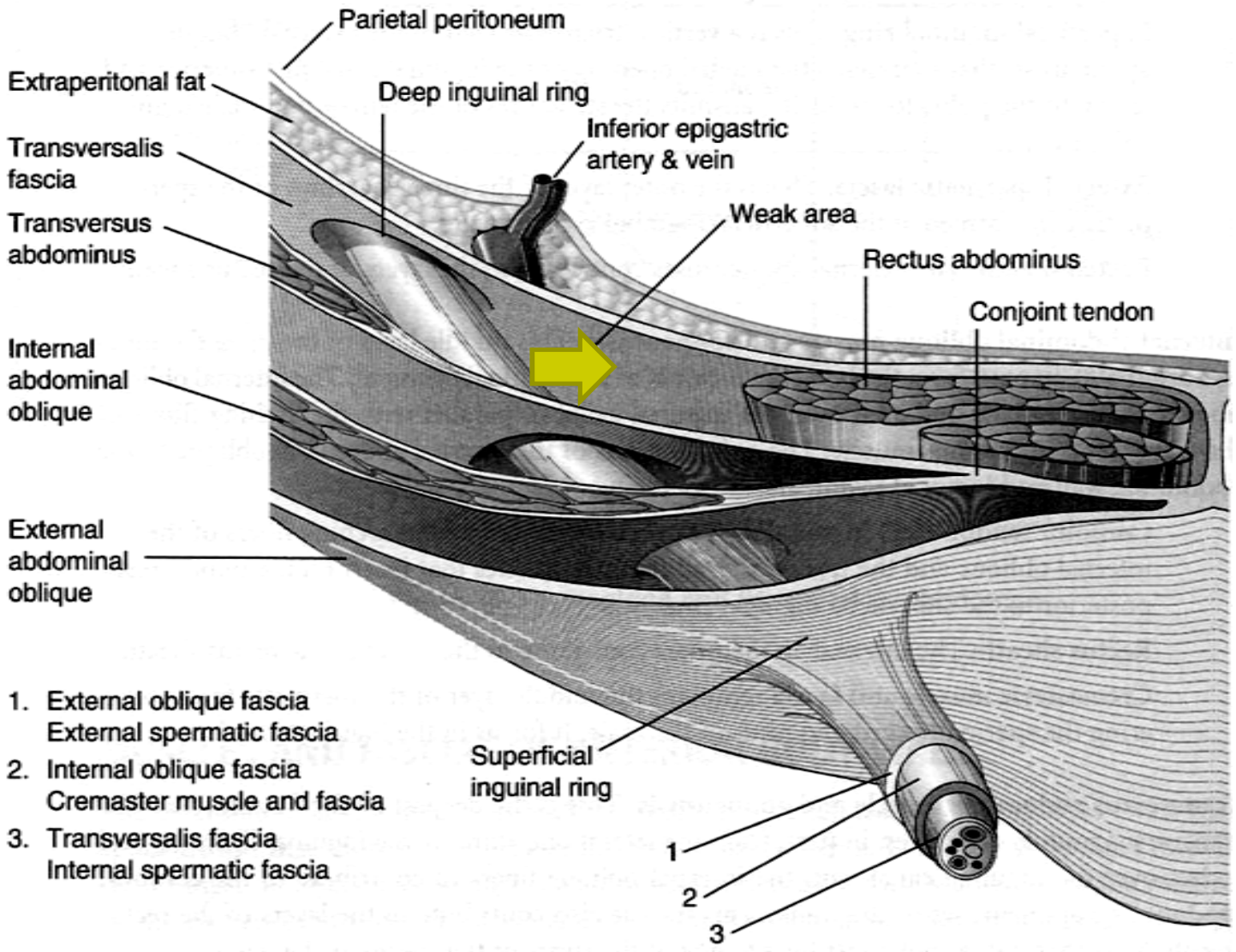
Transversalis fascia is the **FIRST STRUCTURE** which **is crossed by any abdominal hernia**



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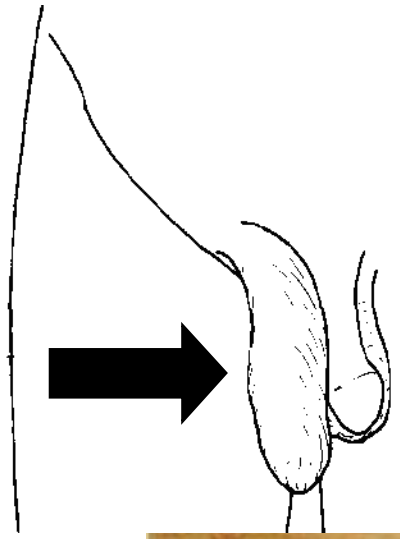
Indirect Inguinal Hernia



- Indirect inguinal hernia is the **most common form** of hernia and is believed to be **congenital in origin** (boys 0-3 years).
- It passes through the deep inguinal ring **lateral to the inferior epigastric vessels**, inguinal canal, superficial inguinal ring and **descend into the scrotum**.
- An indirect inguinal hernia is about **20 times more** common in males than in females, and nearly 1/3 are bilateral.
- It is more common on the **right** (normally, the right processus vaginalis becomes obliterated after the left; the right testis descends later than the left).

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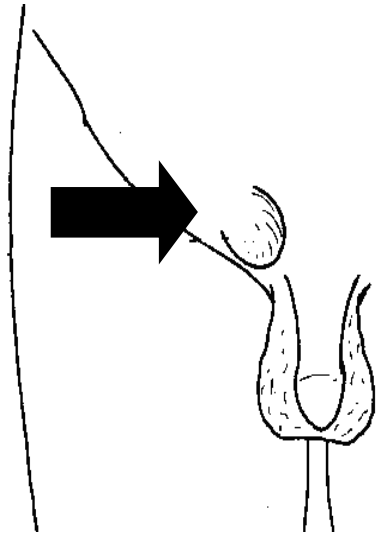
Direct Inguinal Hernia



- Direct inguinal hernia composes about **15%** of all inguinal hernias.
- During a **direct inguinal hernia**, the abdominal contents will protrude through the weak area of the posterior wall of the inguinal canal **medial** to the **inferior epigastric vessels** in the **inguinal [Hesselbach's] triangle** and after that through superficial inguinal ring. It **never descends** into the scrotum.
- It is a **disease of old men** with weak abdominal muscles. Direct inguinal hernias are rare in women, and most are bilateral.

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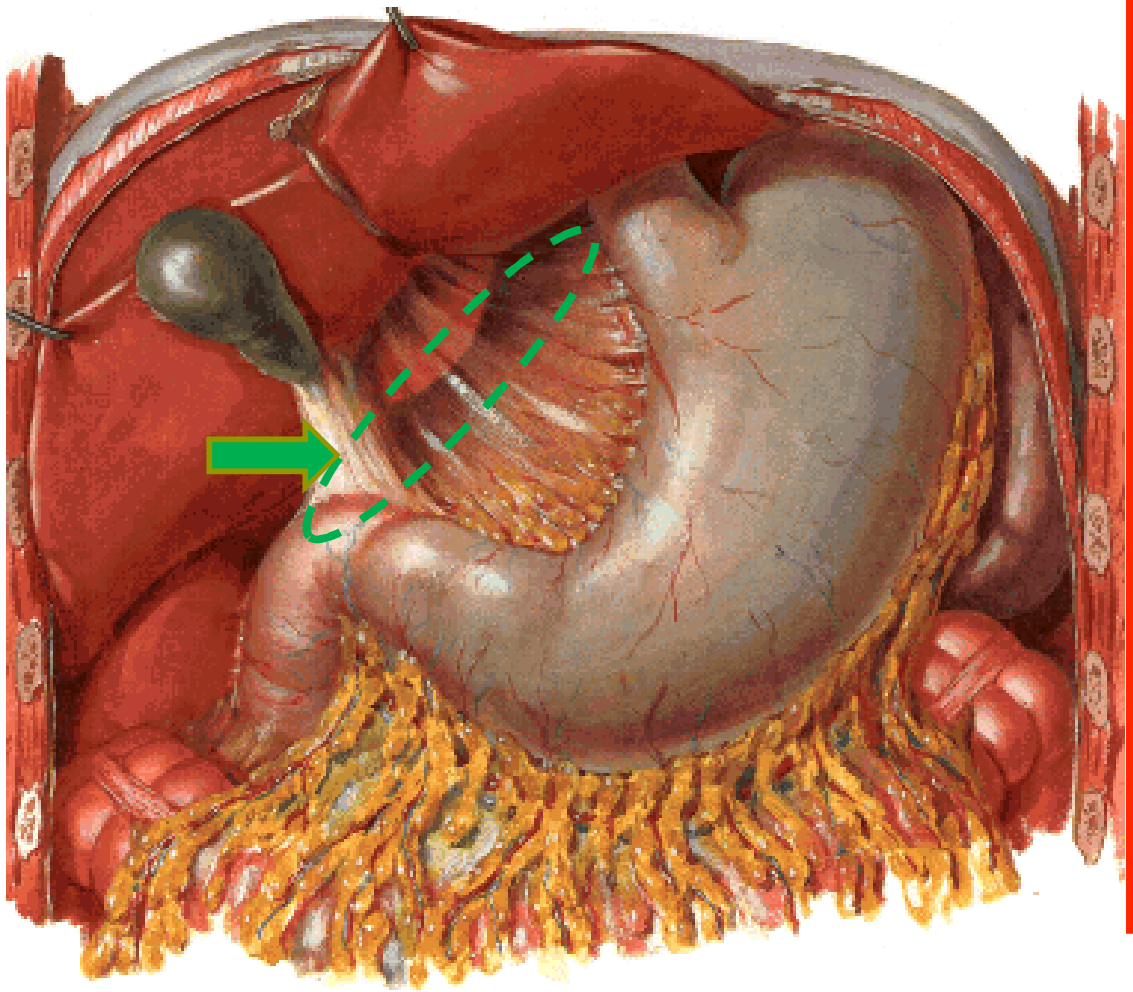
30. Peritoneal structure: Lesser omentum



Consist of **2 ligaments**:

- hepatogastric
- **hepatoduodenal**

Contents :

- Right & Left gastric vessels
- Connective and fatty tissue

and **Portal triad**:

- **Bile duct**
- **Portal vein**
- **Proper hepatic artery**

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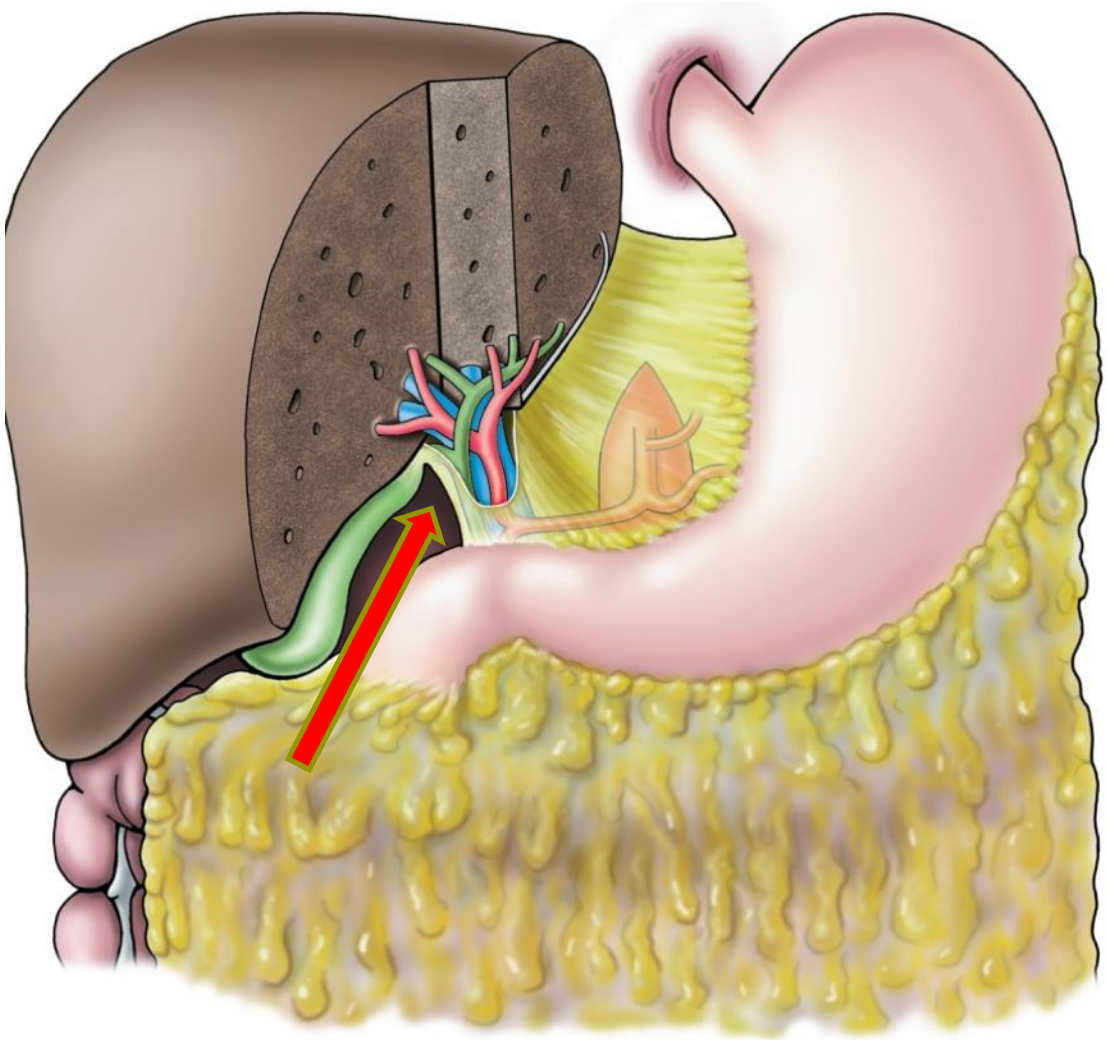
Epiploic (winslow's) foramen



- **Anteriorly:** The free border of the **hepatoduodenal ligament**, containing **portal triad** (**DVA**).
- **Posteriorly:** **IVC**
- **Superiorly:** Caudate lobe of the **liver**.
- **Inferiorly:** The **1st part** of the **duodenum**.

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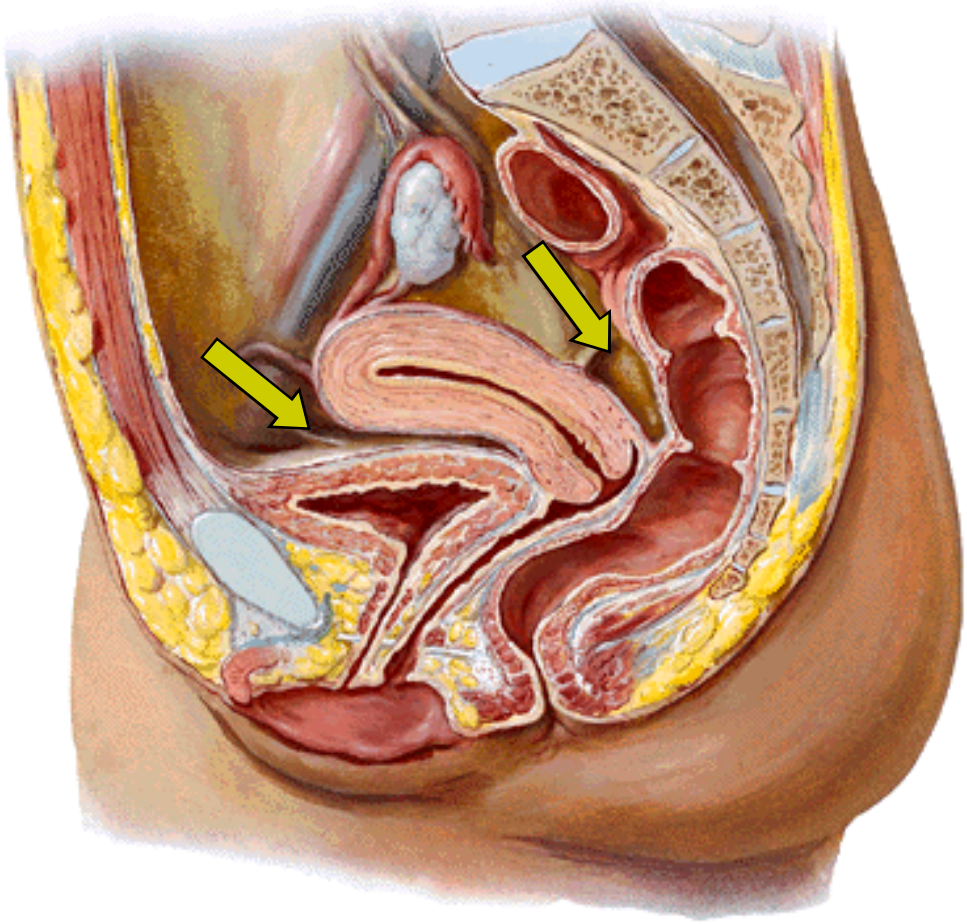
Douglas (rectouterine) pouch



- **Rectouterine pouch (pouch of Douglas):** deeper point of peritoneal space in **vertical** position of the female body between the **rectum** and the **uterus**. It is space of the **pelvic abscess location**.
- **Vesicouterine pouch:** it is deepness between the **uterus** and the urinary **bladder**.

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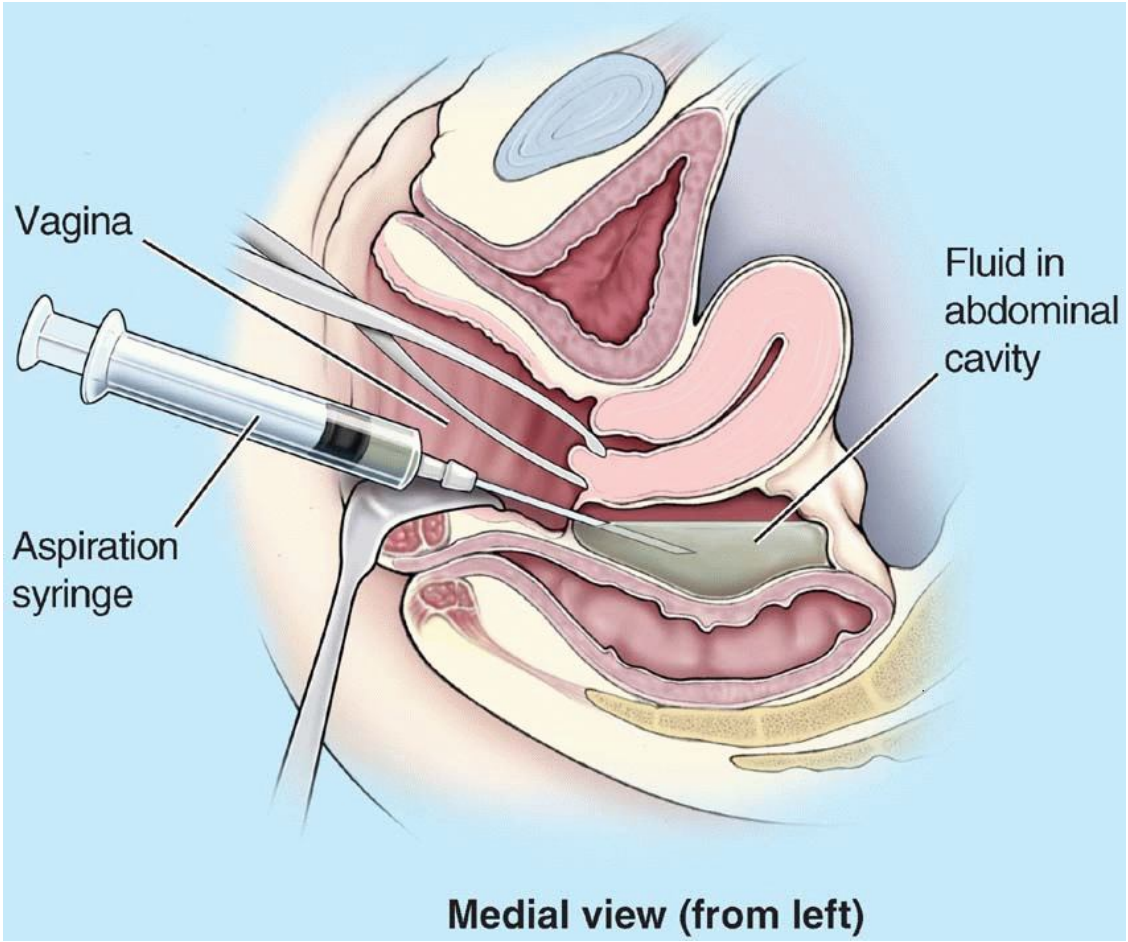
Culdocentesis



- Culdocentesis is **aspiration of fluid** from the cul-de-sac of Douglas (rectouterine pouch) by a needle puncture of the **posterior vaginal fornix** near the midline between the uterosacral ligaments
- Because the **rectouterine pouch** is the **lowest portion** of the female peritoneal cavity, it can collect inflammatory fluid (pelvic abscess).

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31. Everything about Foregut, Midgut & Hindgut

FOREGUT	MIDGUT	HINDGUT
Esophagus **Stomach** **Duodenum** (1st and 2nd parts) **Liver** **Pancreas** Biliary apparatus **Gallbladder** spleen	**Duodenum** (2nd, 3rd, 4th parts) **Jejunum** **Ileum** **Cecum** (with **Appendix**) **Ascending colon** **Transverse colon** (proximal 2/3)	Transverse colon (distal 1/3) **Descending colon** **Sigmoid colon** **Rectum** (anal canal above pectinate line)

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FOREGUT	MIDGUT	HINDGUT
Artery: CA	**Artery: SMA**	**Artery: IMA**
Parasympathetic innervation: vagus nerves, **CNX**	**Parasympathetic innervation: vagus** nerves, **CNX**	**Parasympathetic innervation: pelvic** splanchnic nerves, **S2-S4**
Sympathetic innervation: •Preganglionics: **greater** splanchnic nerves, **T5-T9** •Postganglionics: **celiac ganglion**	**Sympathetic innervation:** •Preganglionics: **lesser** splanchnic nerves, **T10-T11** •Postganglionics: **superior mesenteric ganglion**	**Sympathetic innervation:** •Preganglionics: **lumbar** splanchnic nerves, **L1-L2** •Postganglionics: **inferior mesenteric ganglion**
Sensory Innervation: DRG T5-T9	**Sensory Innervation: DRG T10-T11**	**Sensory Innervation: DRG L1-L2**
Referred Pain: Epigastrium	**Referred Pain: Umbilical**	**Referred Pain: Hypogastrium**

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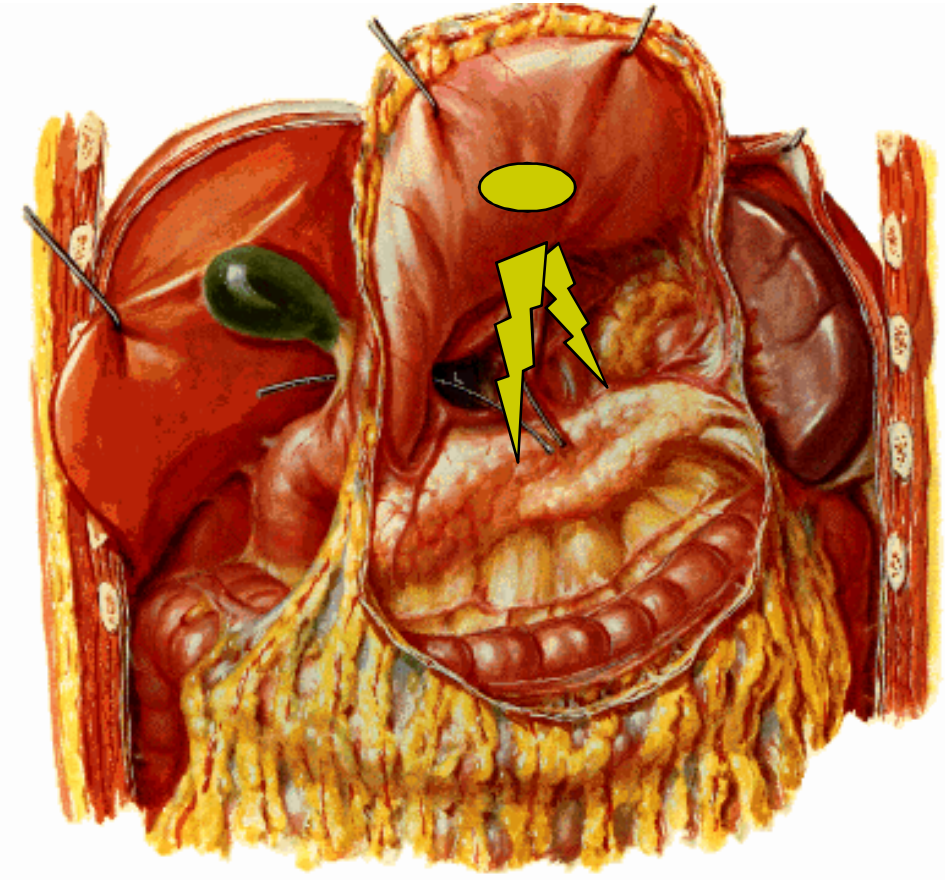
32. Posterior gastric ulcer



1. **Posterior gastric ulcer** may erode through the posterior wall of the stomach into the **pancreas** resulting in referred pain to the back.

2. **Erosion of splenic artery** is very common in **posterior gastric ulcers** because of the proximity of the artery to this wall.

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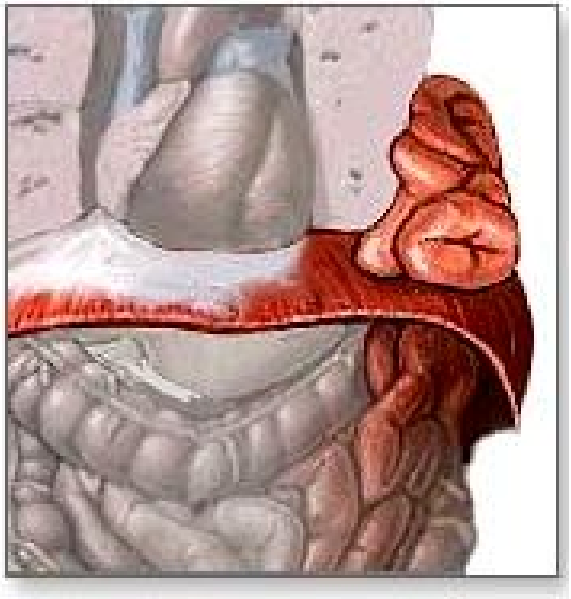
33. Congenital diaphragmatic hernia



Intestine protruding through hole in diaphragm

- Hernia of stomach or intestines **through a posterolateral defect in diaphragm** (**foramen of Bochadalek**).
- It is seen **in infants** and the mortality rate is high because of left **lung hypoplasia**.

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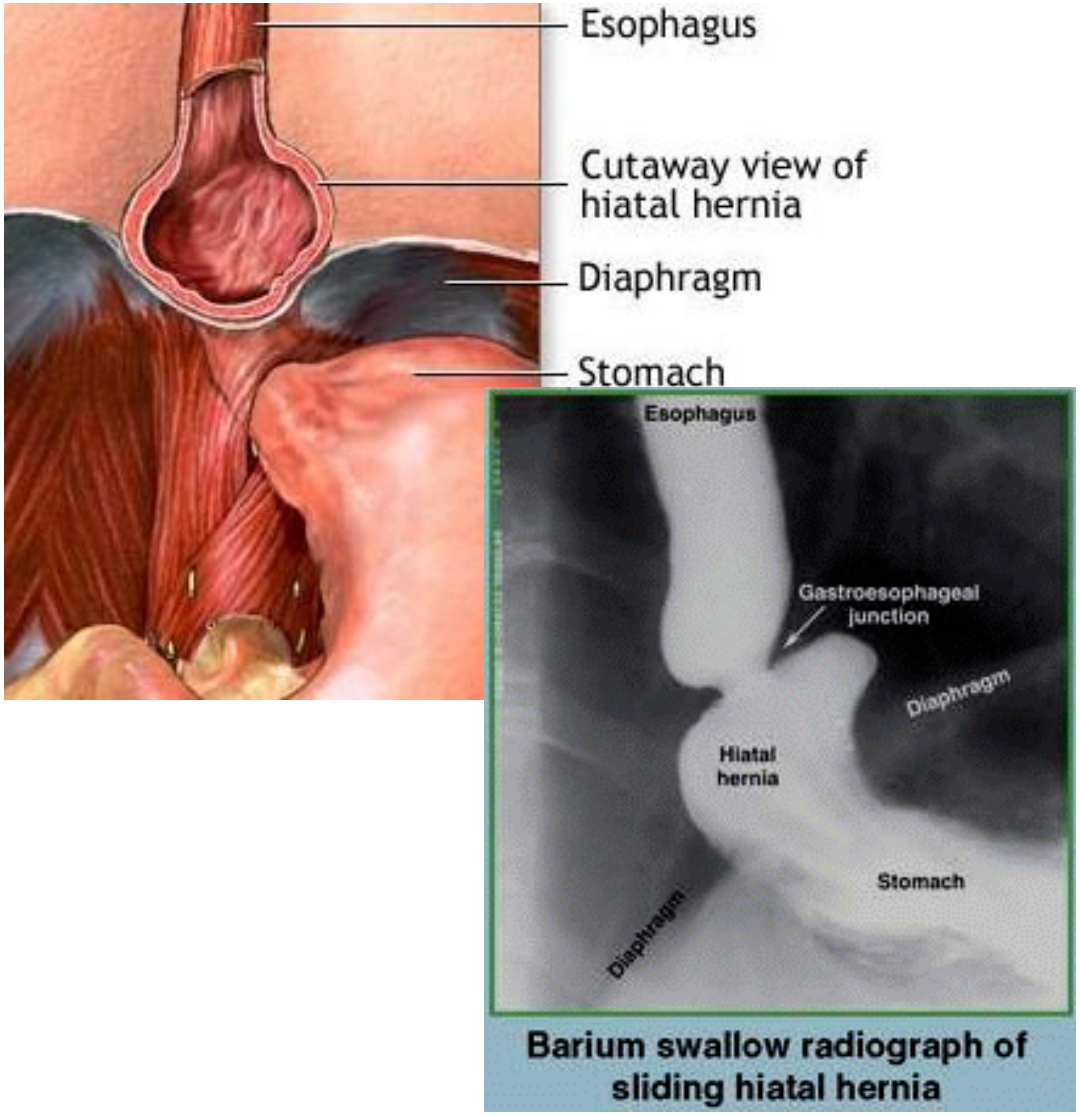
34. Sliding hiatal hernia



Barium swallow radiograph of sliding hiatal hernia

- A sliding hiatal hernia which occurs in individuals **past middle age** is caused by the **hernia of cardia of the stomach into the thorax** through the **esophageal hiatus** of the diaphragm.
- This can damage the **vagal trunks** as they pass through the hiatus and resulting in **hyposecretion of gastric juice.**

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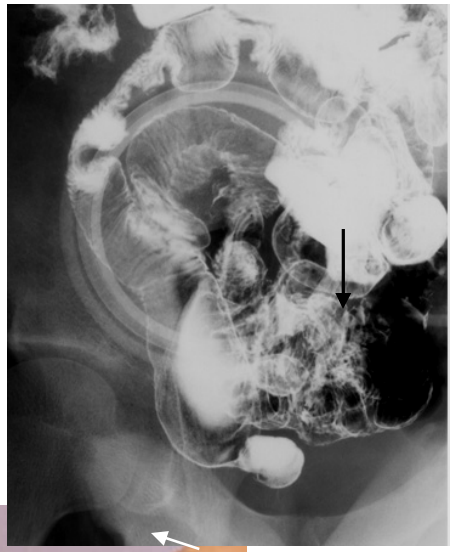
35. Meckel's diverticulum



- **Meckel's diverticulum** is a congenital anomaly representing a persistent portion of the **vitellointestinal duct**.
- This condition is often asymptomatic but occasionally becomes inflamed if it contains **ectopic** gastric, pancreatic, or endometrial **tissue**, which may produce ulceration.
- It occurs **in 2%** of patients, is located about **2 feet** (61 cm) **before** the **ileocecal junction**, and is about **2 inches** (5 cm) long.
- The diverticulum is clinically important because **diverticulitis**, liberation, bleeding, perforation, and obstruction are complications requiring surgical intervention and frequently **mimicking the symptoms of acute appendicitis**.

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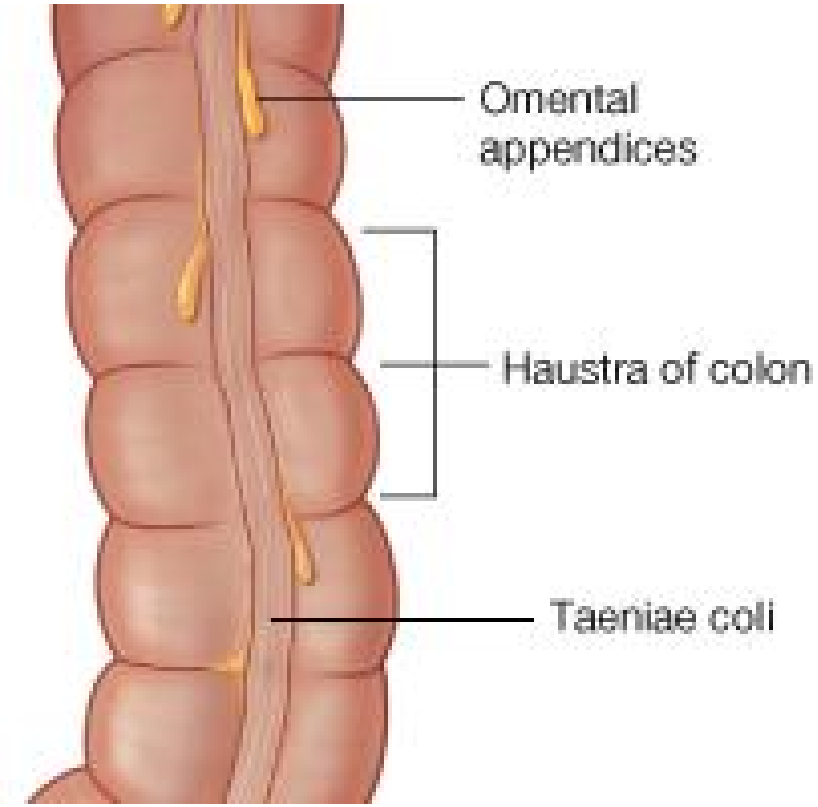
36. Features of the large intestine



Features of the large intestine:

1. **Appendices epiploic**
2. **Sacculations (haustrations)**
3. **Taeniae coli**
   - The taeniae coli meet together at the base of the **appendix** where they form a complete longitudinal muscle coat for the appendix.

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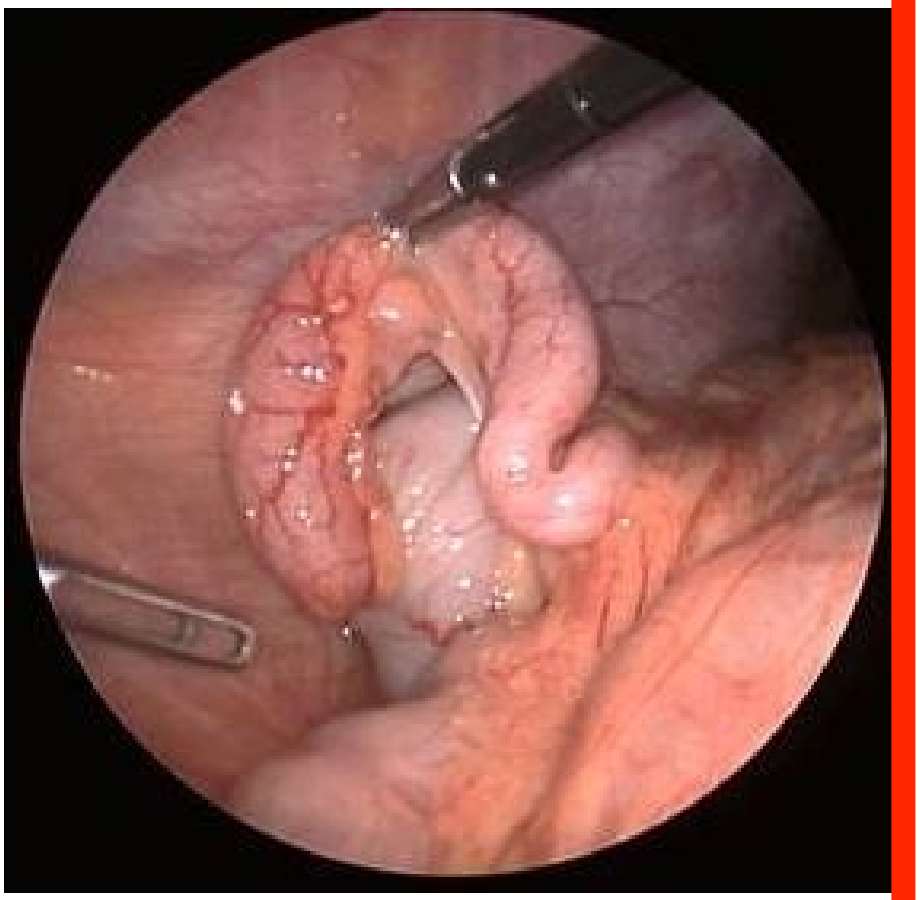
37. Pain of Appendicitis



- In appendicitis, **first pain** is referred around the **umbilicus**. **Visceral pain** in the appendix is produced by distention of its lumen or spasm of its muscle.
- The afferent pain fibers enter the spinal cord at the level of **T10 segment**, and a vague referred pain is felt in the region of the umbilicus.
- Later if **parietal peritoneum** gets involved, and then the pain is shifted laterally to the **Mc Burney's point**. Here the pain is precise, severe, and localized (**second pain**)

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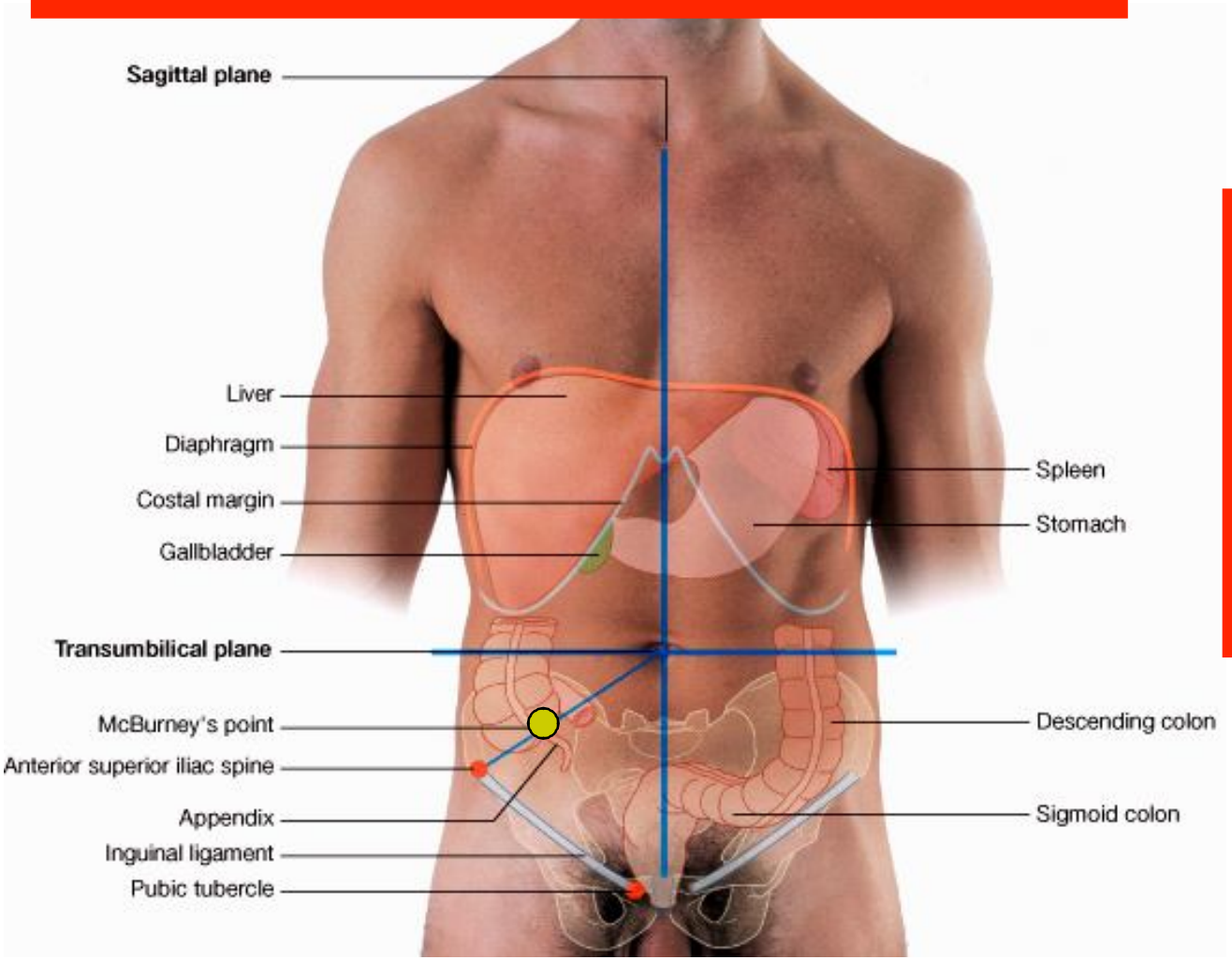
Mc Burney's point



- This point indicates the surface marking of the **base of the appendix**.
- It is a point at the junction between the **lateral 1/3** and **medial 2/3** of a line joining the right anterior superior **iliac spine** with the **umbilicus**.

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38. Volvulus

- Because of its extreme mobility, the **small intestine** and **sigmoid colon** sometimes **rotates around its mesentery**.
- This may correct itself spontaneously, or the rotation may continue until the blood supply of the gut is cut off completely.

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39. Hirschsprung's Disease

- It is a rare congenital abnormality that results in obstruction because the intestines **do not work normally**.
- It is commonly found in **Down Syndrome** children.
- The inadequate motility is a result of an **aganglionic section** (congenital **absents** of **postganglionic parasympathetic** neurons inside of the intestinal wall) of the intestines resulting in **megacolon**.
- In a newborn, the main signs and symptoms are **failure to pass a meconium stool** within **1-2 days** after birth, reluctance to eat, bile-stained (green) vomiting, and abdominal distension.
- Treatment is **removal** of the aganglionic portion of the colon.

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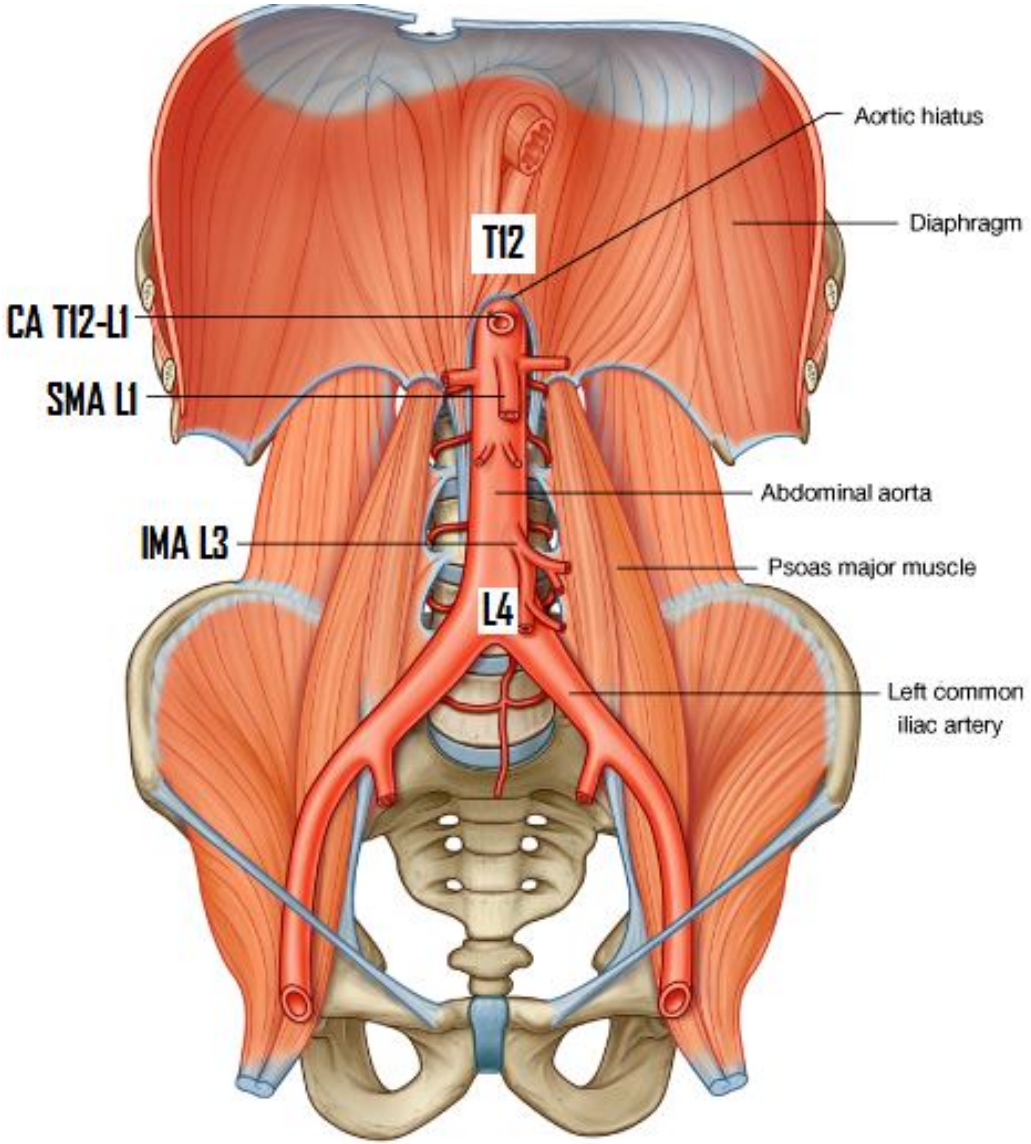
40. Branches of Abdominal aorta



- **Celiac trunk (CA)** originates from the aorta at the lower border of **T12** vertebra
- **Superior mesenteric artery** originates at the lower border of **L1** vertebra
- **Renal arteries** originate at approximately **L2** vertebra
- **Inferior mesenteric artery** originates at **L3** vertebra
- Two terminal branches are **common iliac arteries** at the level of **L4** vertebra

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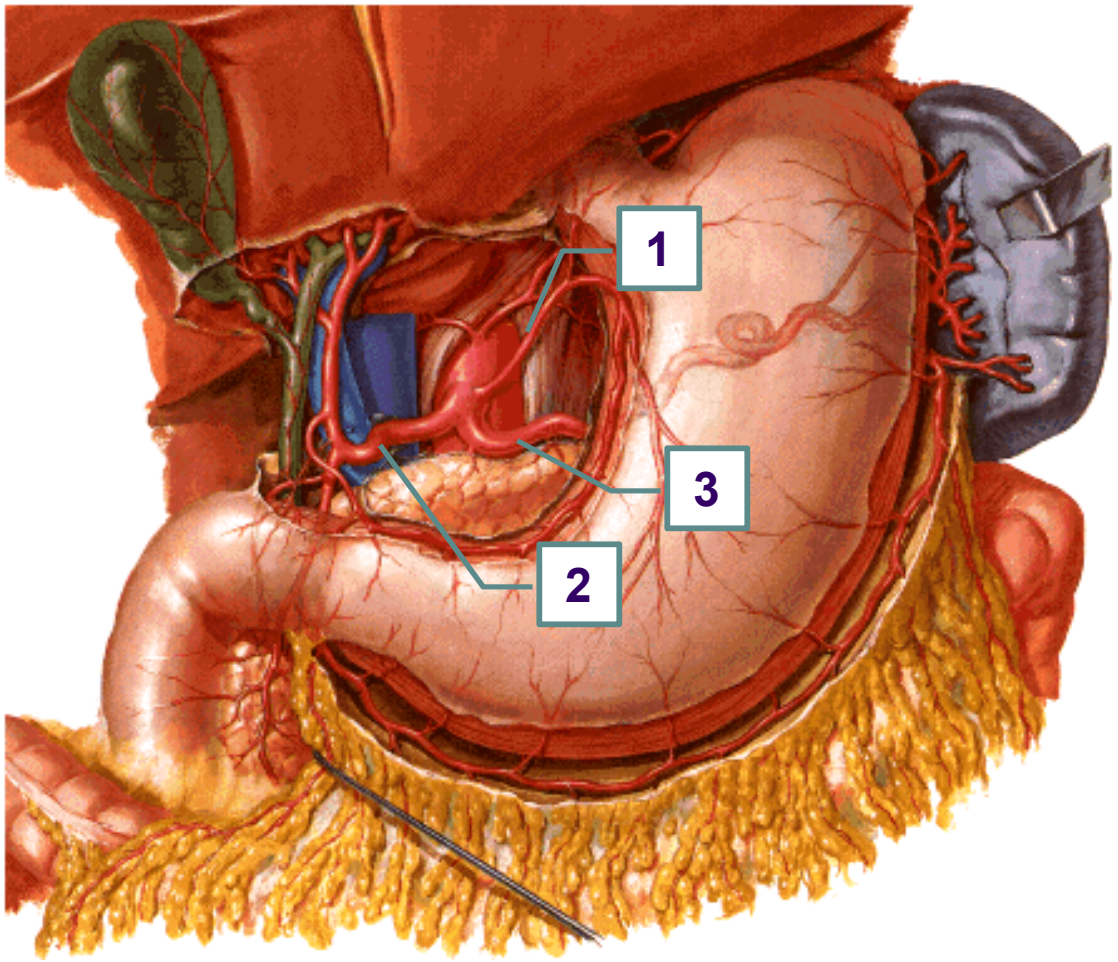
CELIAC ARTERY (TRUNK)



- **Origin:** T12-L1, just below the aortic opening of the diaphragm.
- The CA passes above the superior border of the pancreas and then divides into three retroperitoneal branches:
- **Left gastric artery (1)**
- **Common hepatic artery (2)**
- **Splenic artery (3)**

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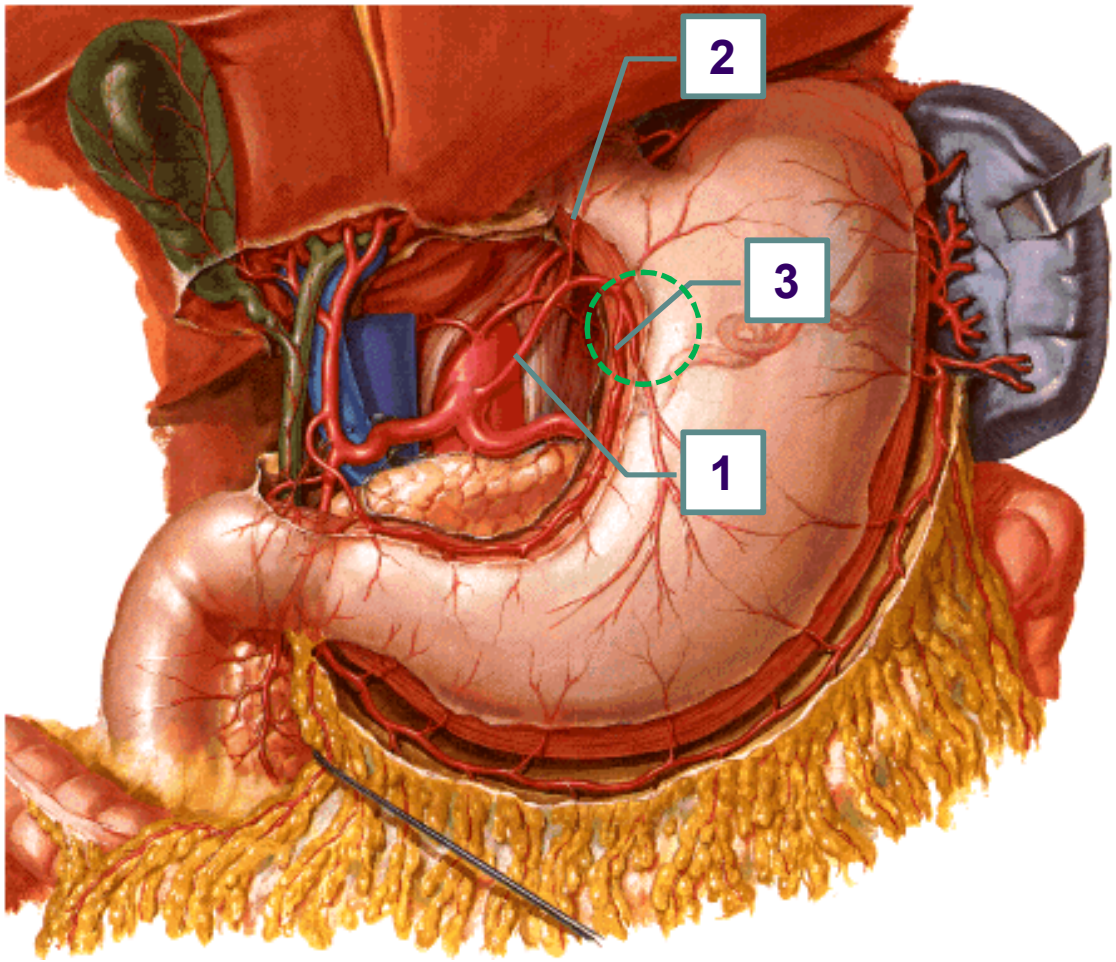
L gastric - cardia portion
R gastric - fundal portion

Left gastric artery



- The **left gastric artery (1)** courses upward to the left to reach the lesser curvature of the stomach and may be subject to erosion by a **penetrating ulcer** of the **lesser curvature** of the **stomach**.

Branches:

- **Esophageal branches (2)** - to the abdominal part of the **esophagus**
- **Gastric branches (3)** supply the left side of the **lesser curvature** of the stomach and make **anastomosis** with **right gastric artery**.

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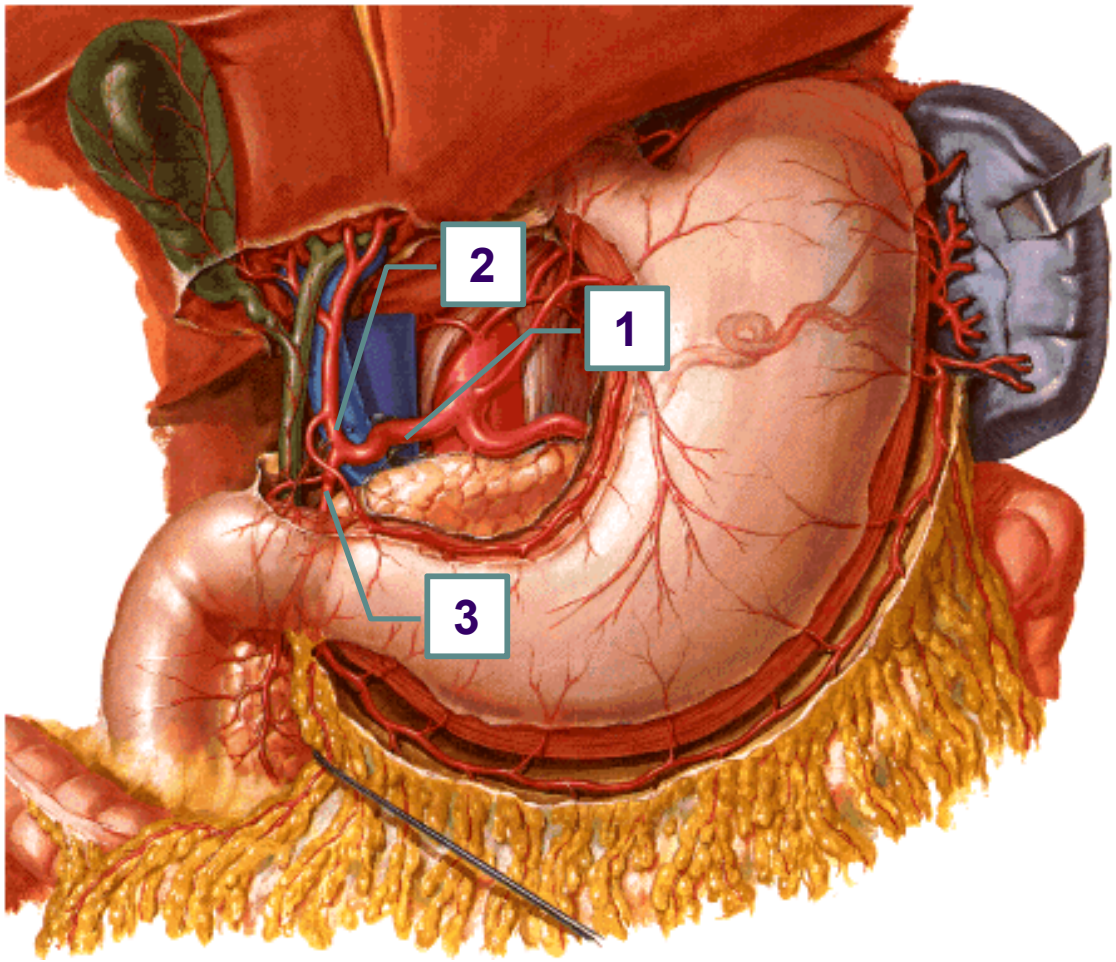
Common hepatic artery



- The **common hepatic artery (1)** passes to the right to reach the superior surface of the first part of the duodenum, where it divides into its two terminal branches:
- **Proper hepatic artery (2)**
- **Gastroduodenal artery (3)**

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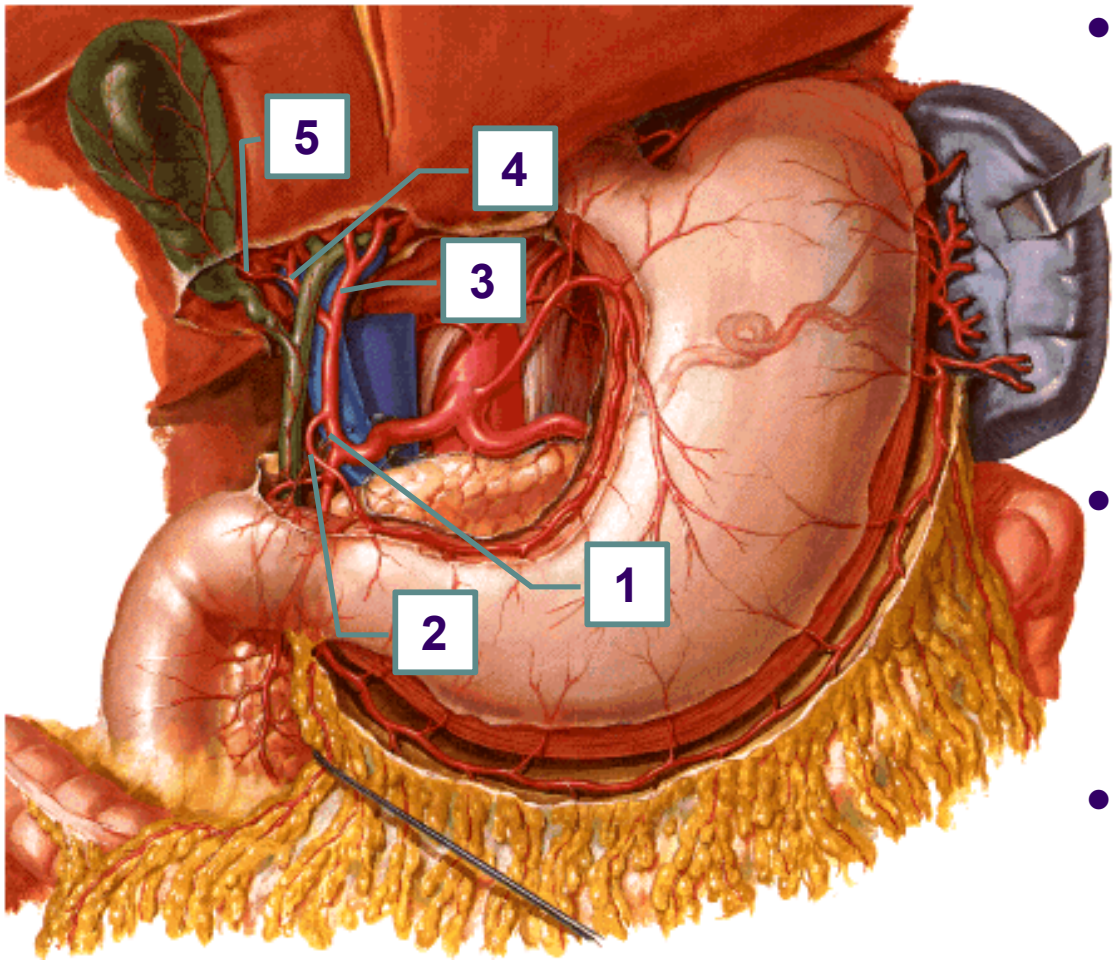
Proper hepatic artery



- **Proper hepatic artery (1)** gives off **right gastric artery (2)** and then ascends within the **hepatoduodenal** ligament of the **lesser omentum** to reach the **porta hepatis**, where it divides into the **right (4)** and **left (3) hepatic arteries.**
- The right and left arteries enter the two **lobes of the liver**, with the right hepatic artery first giving rise to the **cystic artery (5)** to the **gallbladder**.
- **Right gastric artery (2)** supplies the right side of the **lesser curvature** of the stomach where it anastomoses the **left gastric artery**.

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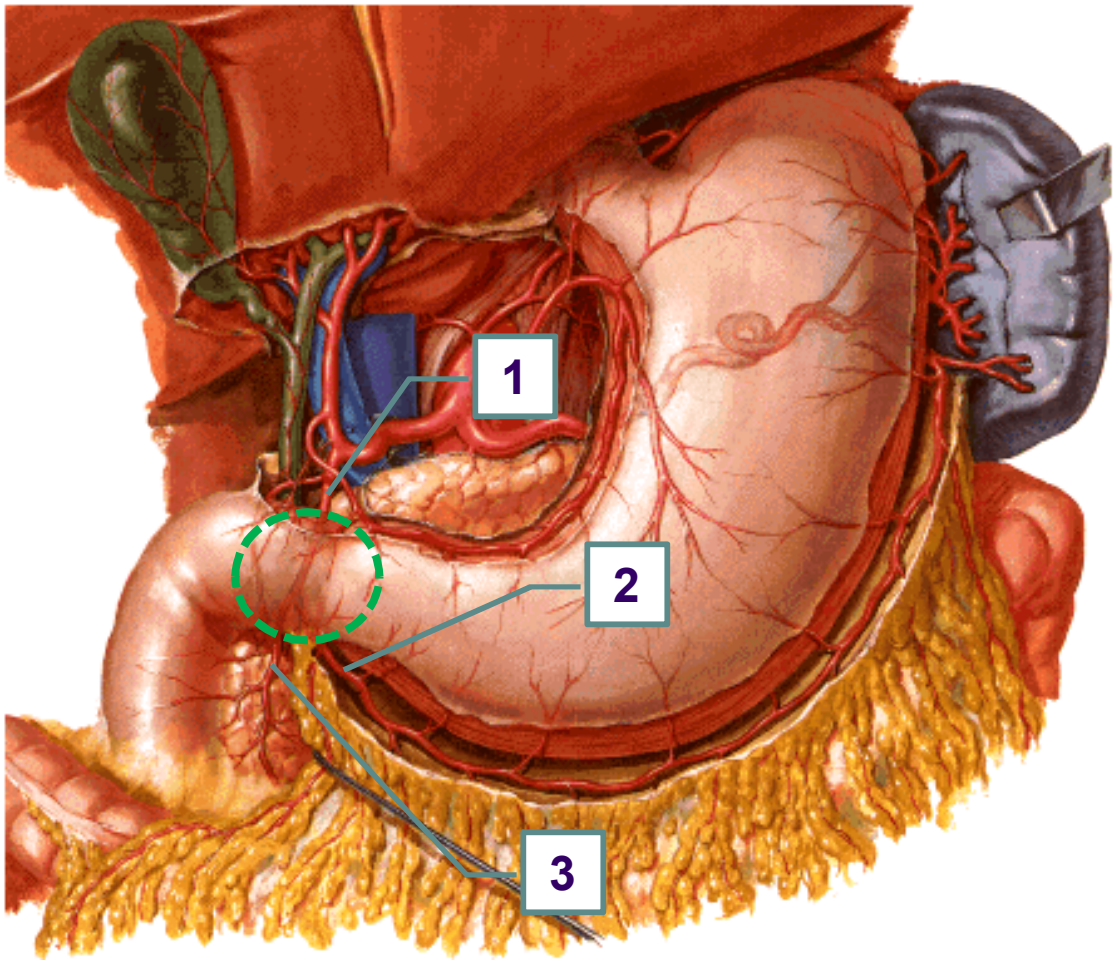
Gastroduodenal artery



- **Gastroduodenal artery (1)** descends **posterior** to the **first part** of the **duodenum** (may be subject to **erosion by a penetrating ulcer** in this place) and divides into two branches:
- **Right gastroepiploic artery (2)** (supplies the right side of the **greater curvature** of the stomach where it anastomoses the **left gastroepiploic**)
- **Superior pancreaticoduodenal arteries (3)** (supplies the **head** of the **pancreas**, where it anastomoses the **inferior pancreaticoduodenal branches** of the **SMA**).

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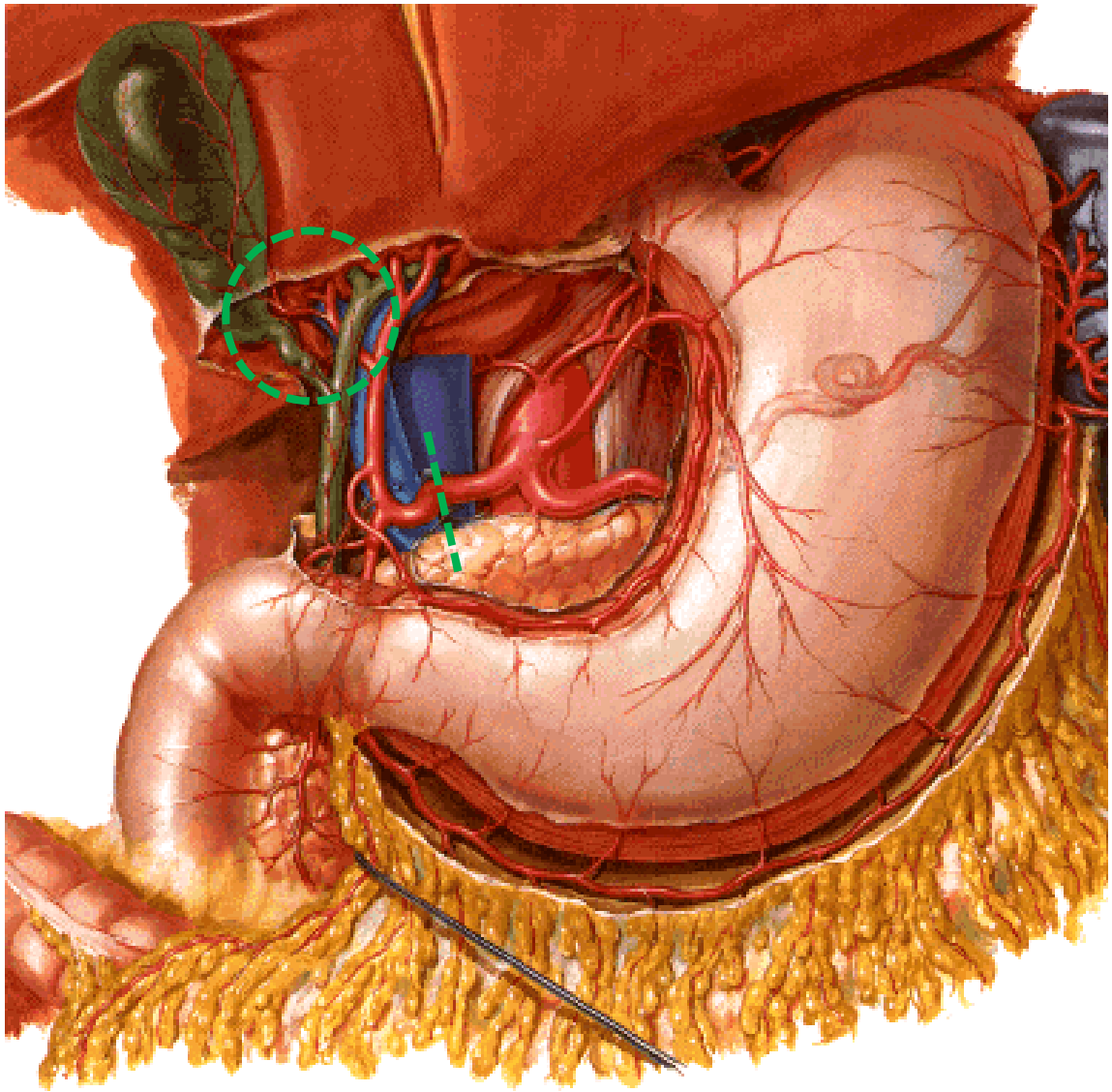
Ligature of the hepatic artery:



- The **hepatic artery** may be ligated proximal to the origin of its gastroduodenal branch, a collateral circulation to the liver is established through the **left and right gastric** arteries, **left and right gastroepiploic** and **gastroduodenal arteries.**
- The **right hepatic artery** may be **mistakenly ligated** during **holecystectomy** in **Calot** triangle together with the **cystic artery**, **right lobe hepatic necrosis** commonly occurs.

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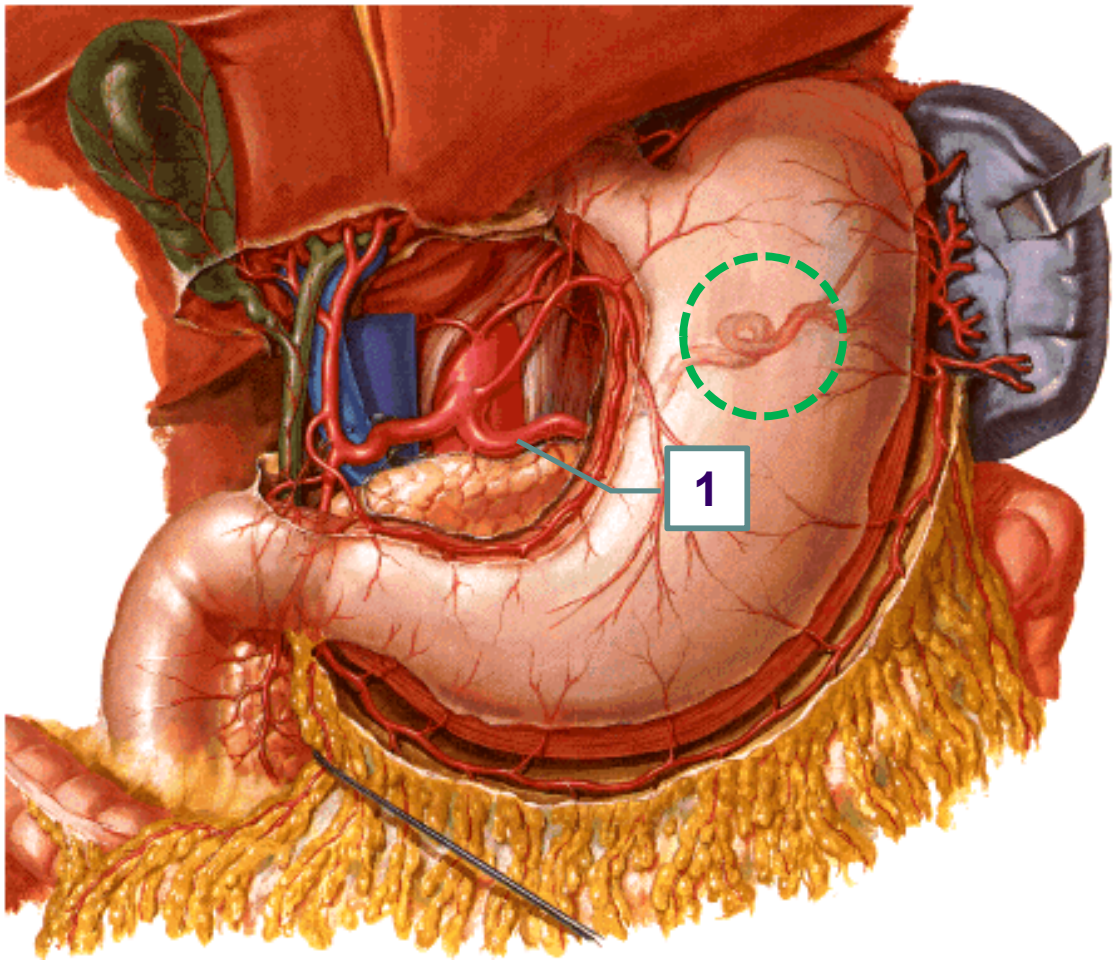
Splenic artery



- **Splenic artery (1)** runs a **tortuous** horizontal course to the left along the **upper border of the pancreas, behind the peritoneum** of the posterior wall of the **lesser sac**, forming a part of the **stomach bed**.
- The splenic artery may be subject to **erosion** by a **penetrating ulcer** of the **posterior wall** of the **stomach into the lesser sac**.
- **N.B.** The **splenic vein** runs a more **straight** course below the artery and **behind of the pancreas.**

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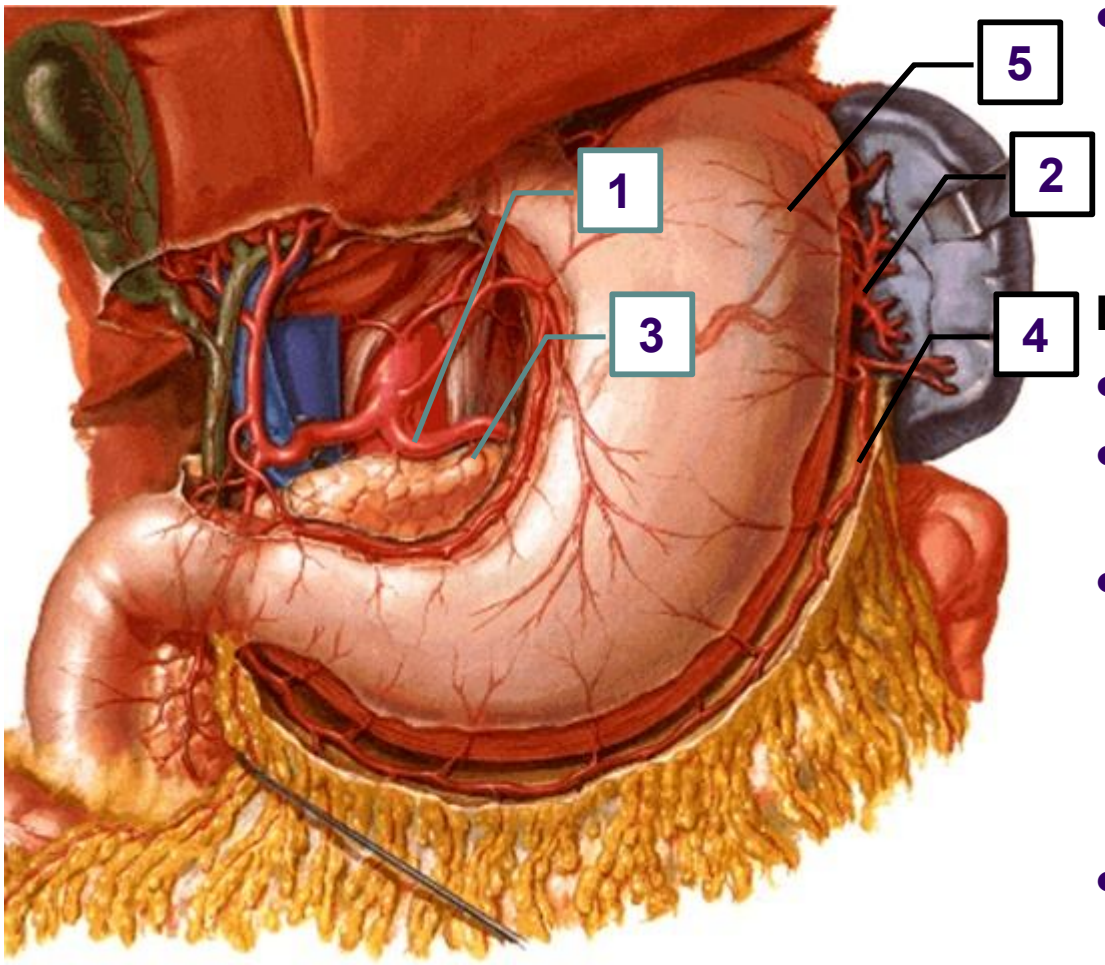
Splenic artery



- **Splenic (1) a.** is retroperitoneal until it reaches the **tail** of the **pancreas**, where it enters the **splenorenal ligament** to enter the hilum of the **spleen**.

Branches:

- Branches to the **spleen (2)**
- Branches to the **neck**, **body**, and **tail of pancreas (3)**
- **Left gastroepiploic (4)** artery that supplies the left side of the **greater** curvature of the stomach where it anastomoses the **right gastroepiploic**
- **Short gastric (5)** branches that supply to the **fundus** of the **stomach**

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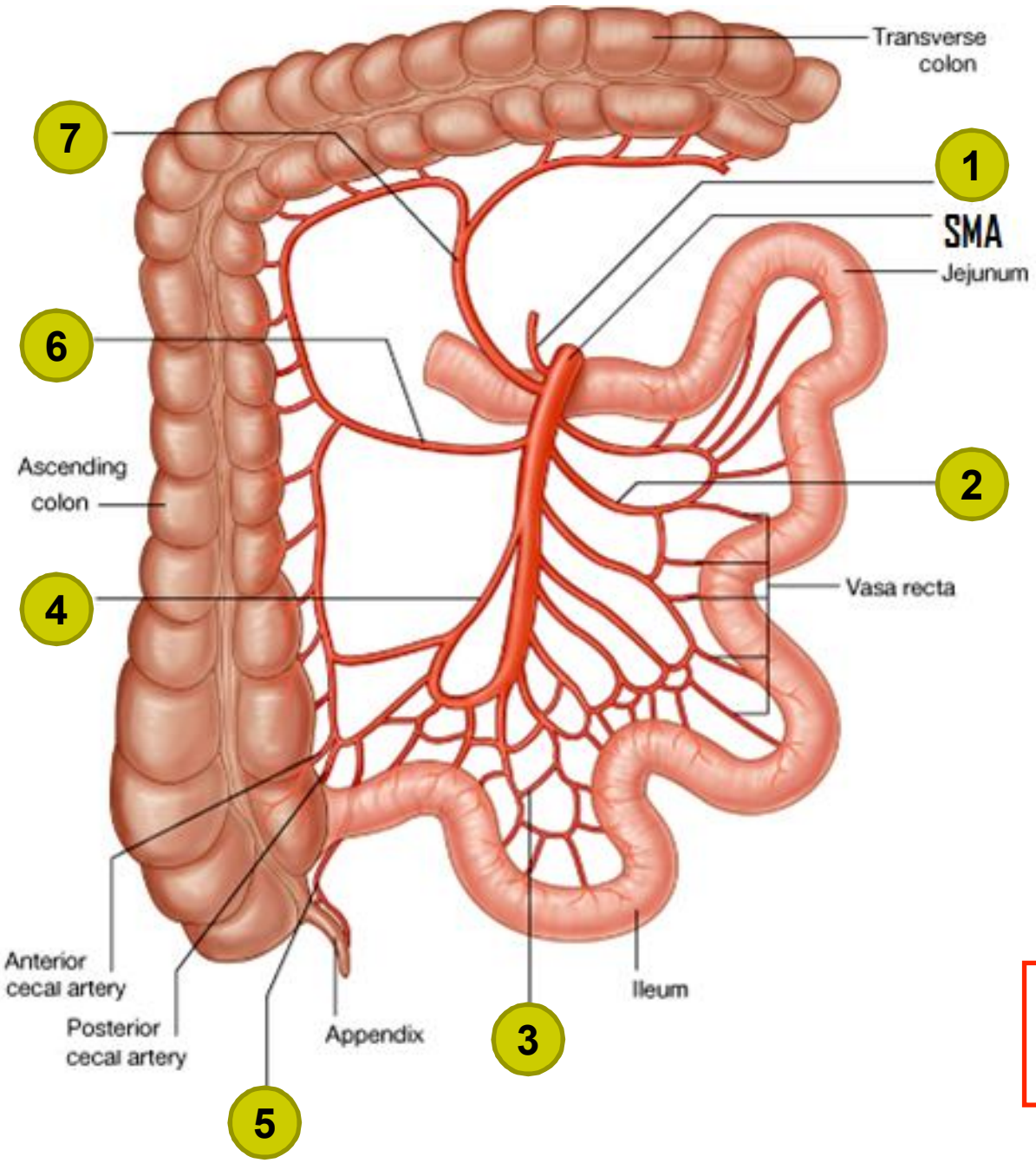

SMA Branches:

- **(1) Inferior pancreaticoduodenal** arteries
- **(2)Jejunal** and **(3) Ileal** branches
- **(4) Ileocolic** artery
  - Ascending branch
  - Anterior cecal artery
  - Posterior cecal artery
  - **(5) Appendicular** artery
- **(6) Right colic** artery
- **(7) Middle colic** artery

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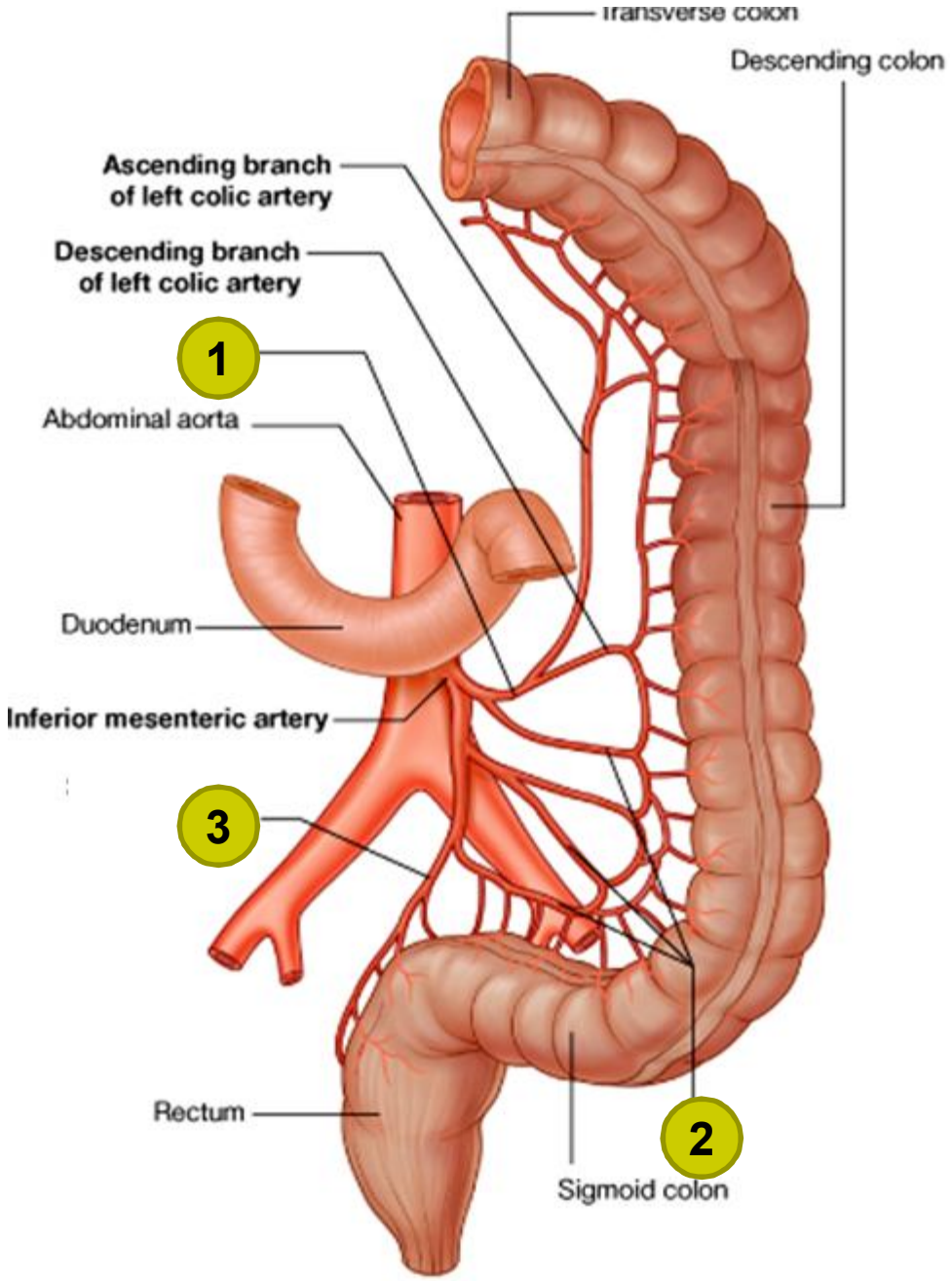

IMA Branches:

- **(1) Left colic** artery
- **(2) Sigmoid** arteries
- **(3) Superior rectal** artery

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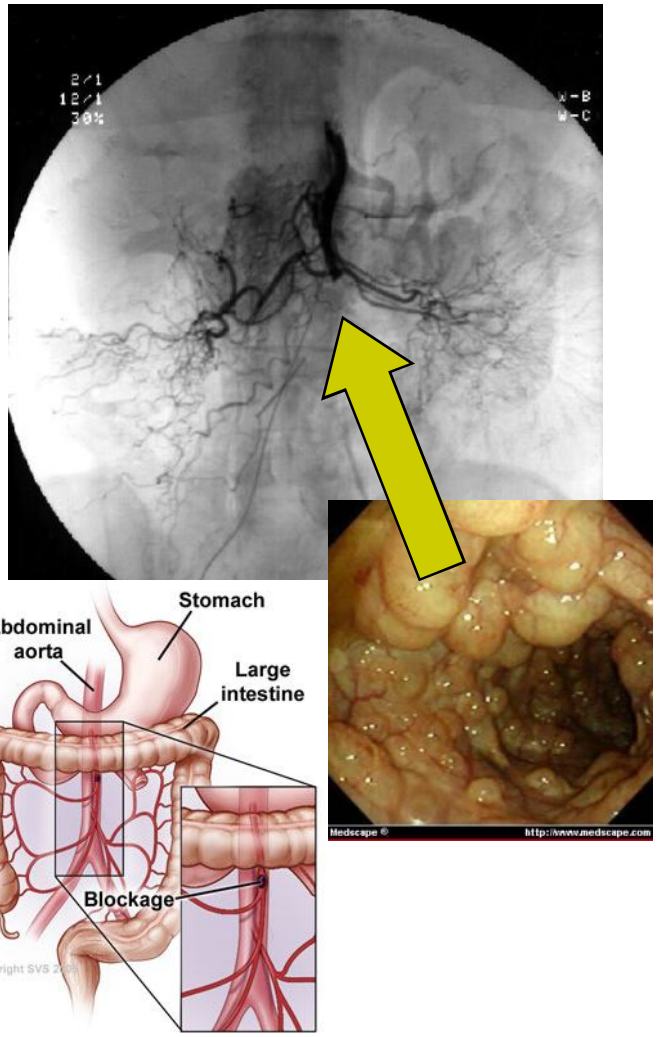
41. Mesenteric ischemia



- Ischemia occurs when your blood cannot flow through arteries as well as it should, and intestines do not receive the necessary oxygen to perform normally. Mesenteric ischemia usually involves the **small intestine**.
- Mesenteric ischemia usually occurs in **people older than age 60**. You may be more likely to experience mesenteric ischemia if you are a ***smoker*** or have a ***high cholesterol*** level.
- **Atherosclerosis**, which slows the amount blood flowing through arteries, is a frequent cause of chronic mesenteric ischemia.

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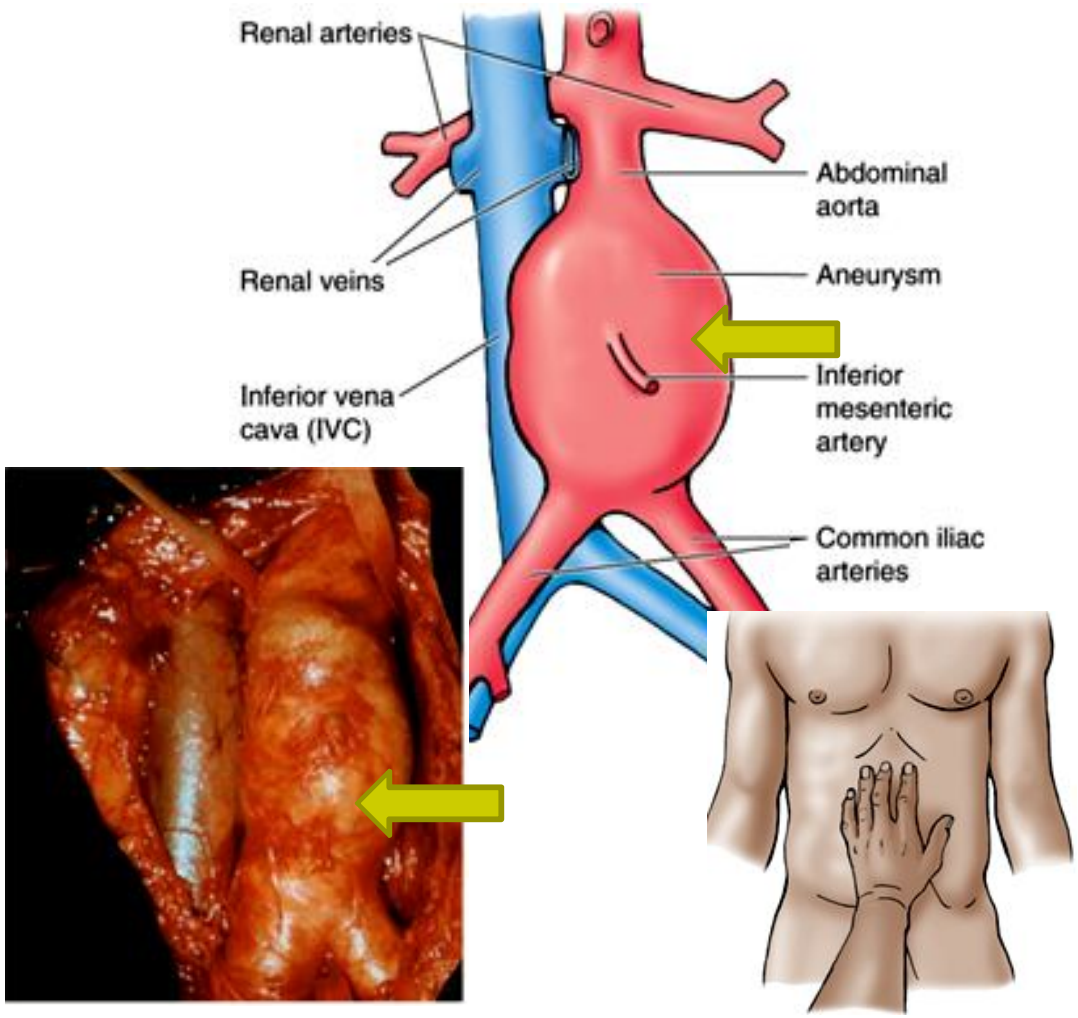
42. Abdominal aortic aneurysm



- It is a localized **dilatation** of the aorta. It is typically happened just above of the **bifurcation** at level of **L4** and crossed by **3rd part of duodenum**.
- Pulsations of a large aneurysm can be detected to the **left of the midline** at the **umbilical region**.
- **Acute rupture** of an abdominal aortic aneurysm is associated with severe pain in the abdomen or back (mortality rate is nearly **90%**).
- Surgeons can repair an aneurysm by opening it and inserting a **prosthetic graft.**

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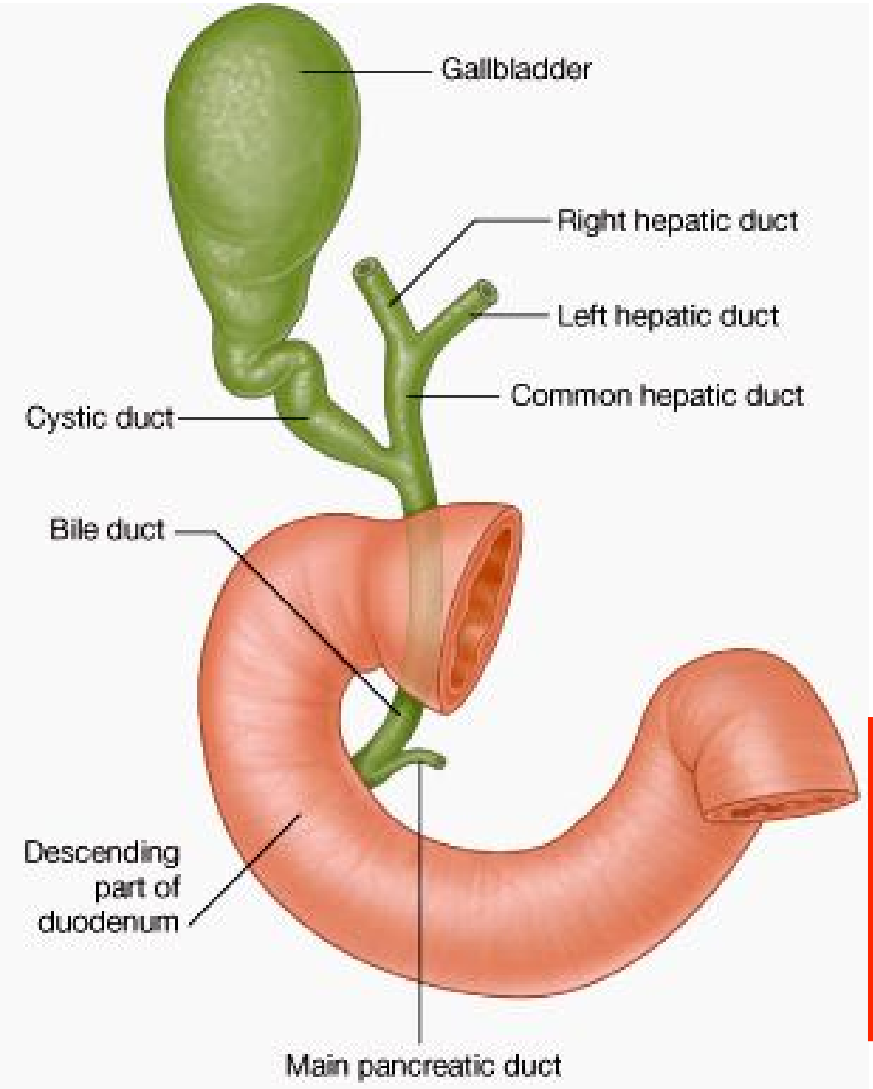
43. Biliary system



- Bile is secreted by the **liver** cells, stored, and concentrated in the **gallbladder** and later it is delivered to the **duodenum**.
- The **gallbladder** lies in a fossa on the visceral surface of the liver to the right of the quadrate lobe.
- It stores and concentrates bile, which **enters and leaves** through the **cystic duct**
- The cystic duct joins the **common hepatic (from left** and **right hepatic)**due to form the **common bile duct.**

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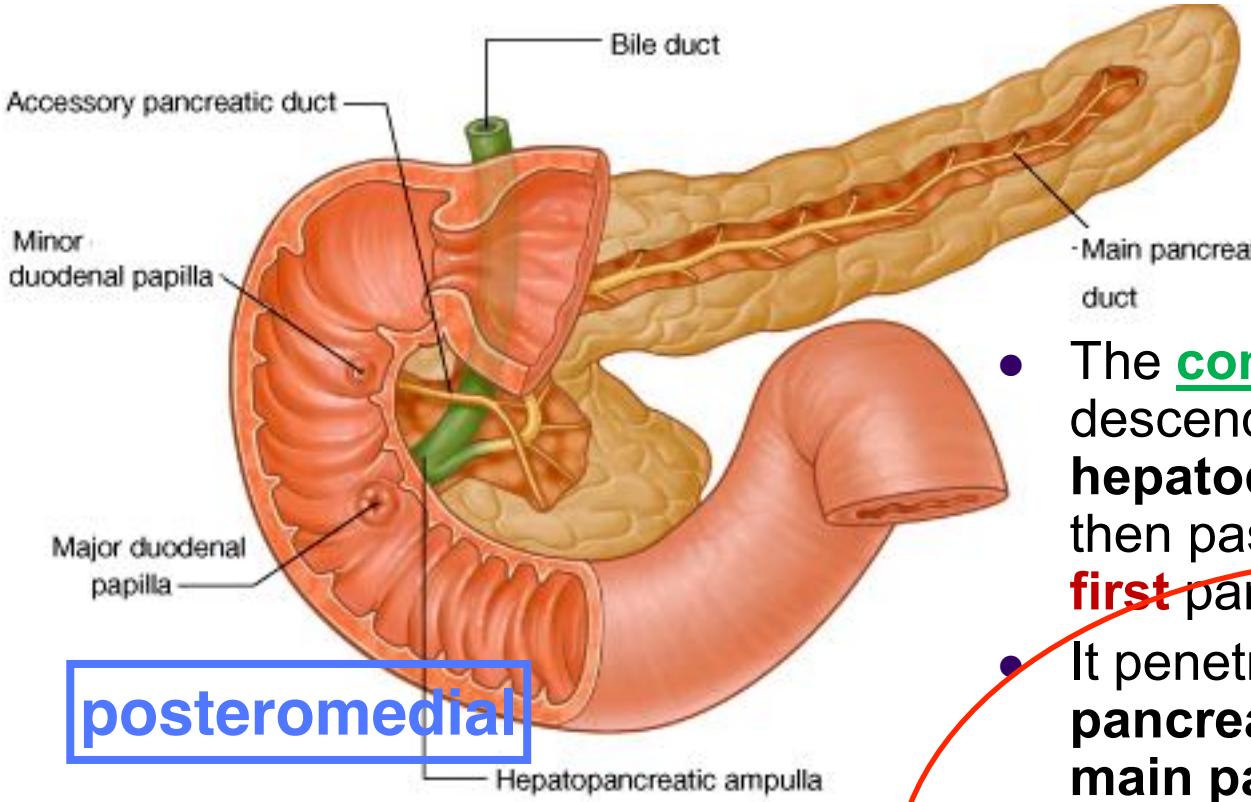
Biliary system



- The **common bile duct** descends in the **hepatoduodenal ligament**, then passes **posterior** to the **first** part of the **duodenum**
- It penetrates the head of the **pancreas** where it **joins the main pancreatic duct** and forms the **hepatopancreatic ampulla (sphincter of Oddi)**, which drains into the **second** part of the **duodenum** at the **major** duodenal **papilla**.

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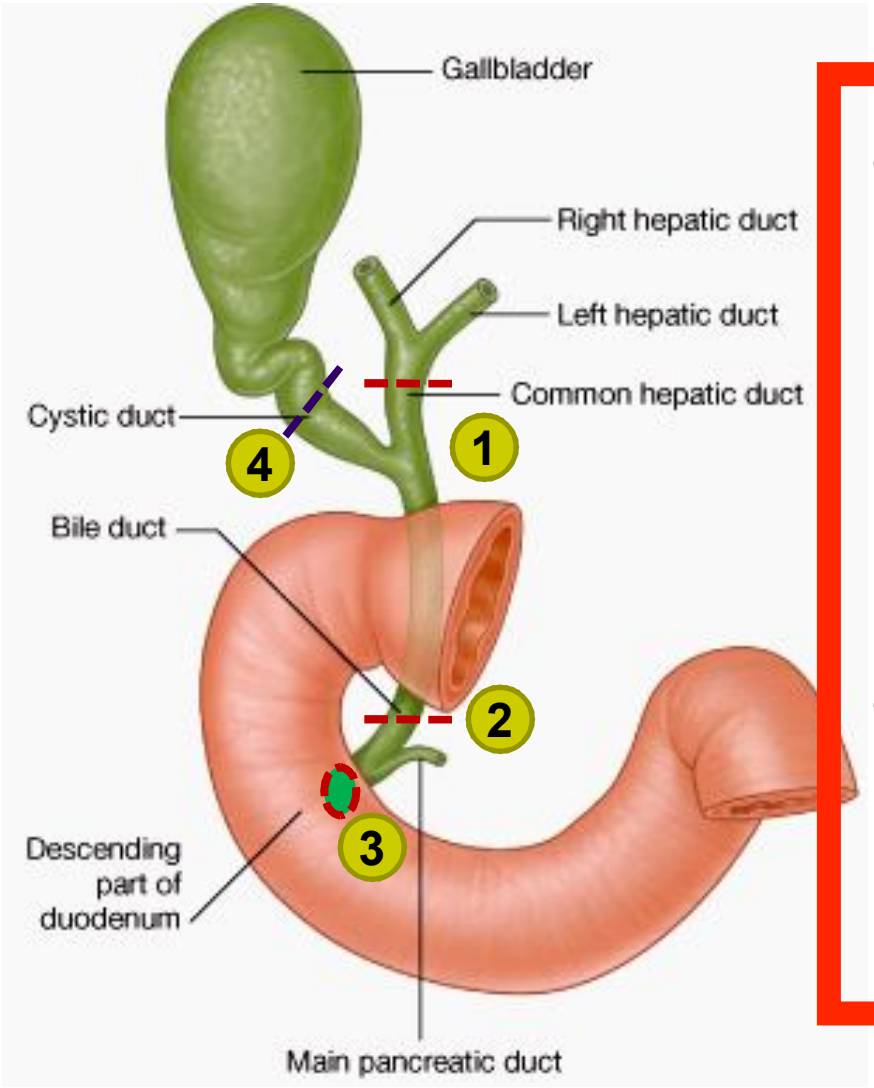
44. Cholelithiasis (gallstones)



- The distal end of the **hepatopancreatic ampulla** is the narrowest part of the biliary passages and is the **common site for impaction** of **gallstones**. As result of **common hepatic (1)**, **bile duct (2)**, or **hepatopancreatic ampulla (3)** obstruction patient **will have yellow eyes** and **jaundice**

- Gallstones may also lodge in the **cystic duct**. A stone lodged in the **cystic duct (4)** causes **biliary colic** (intense, spasmodic pain in the gallbladder) but **doesn't produce jaundice**.

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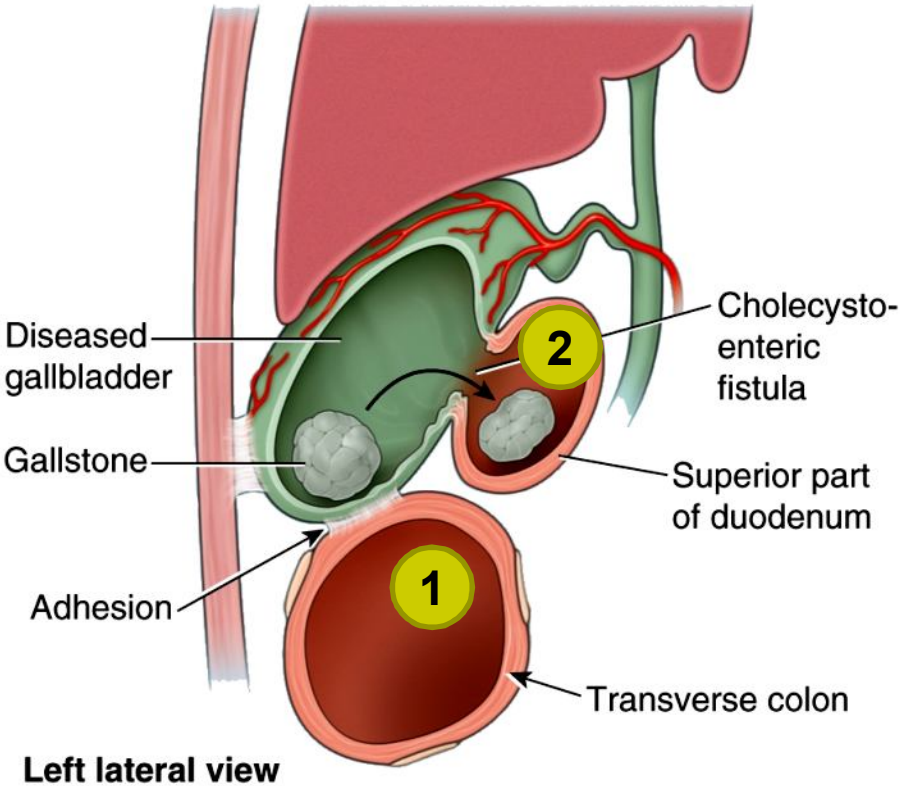
Gallstones

- The **fundus (1) of the gallbladder** is in contact with the **transverse colon** and thus gallstones erode through the posterior wall of the gallbladder and enter the transverse colon. They are passed naturally to the rectum through the descending colon and sigmoid colon.

- Gallstones lodged in the **body (2)** of the **gallbladder** may ulcerate through the posterior wall of the body of the gallbladder into the **duodenum** (because the gallbladder body is in contact with the duodenum) and may be held up at the ileocecal junction, producing an **intestinal obstruction**.



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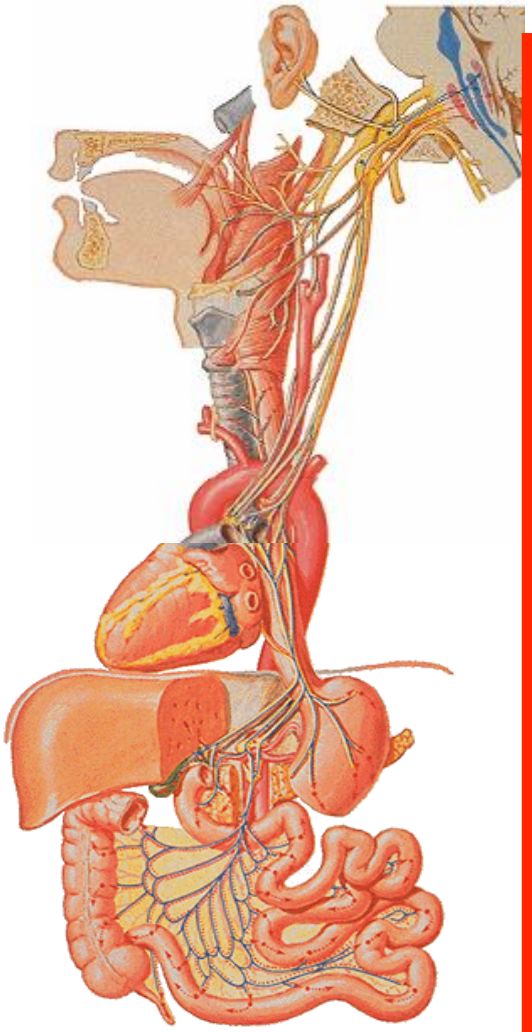
45. Nerve supply of the liver and gallbladder



- **Sensory innervation** of the liver is done by the **right phrenic nerve** (**C3-C5**). **Pain may radiate to the right shoulder**.
- The **liver** receives **parasympathetic innervation** from the **vagi nerves** (**CNX**), reaching it through the **celiac plexuses** around the supplying arteries. The preganglionic fibers synapse on the cells of the **uxtaramural plexuses** in hilum of the liver and shot **postganglionic fibers** supply organs.
- **Sympathetic fibers** of **preganglionic neurons T5-T9** segments (**IML**) come through the sympathetic trunk and form **greater splanchnic nerves**. They contribute to the **celiac plexus**, where **postganglionic neurons** are located. Branches of celiac plexus reach the liver wrapping around the branches of the celiac artery.

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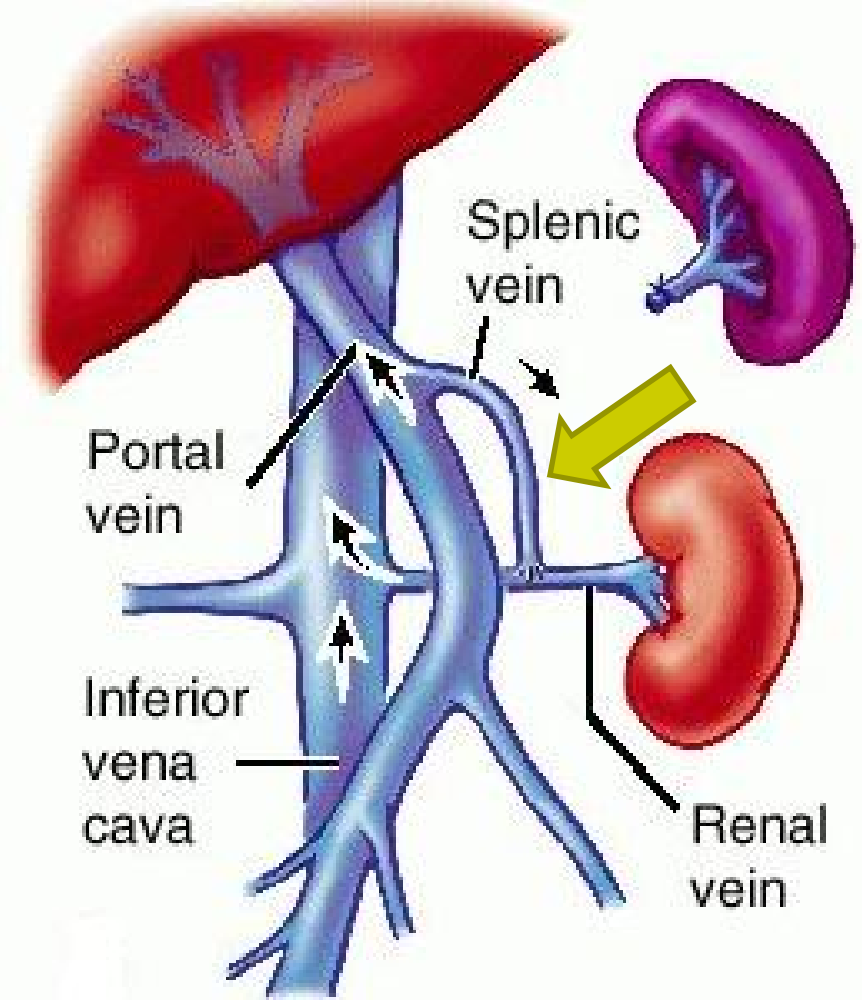
46. Portal Hypertension



- **Portal hypertension** is a common clinical condition, and for this reason the list of portal-systemic anastomoses should be remembered. Enlargement of the portal-systemic connections is frequently accompanied by congestive enlargement of the spleen.

- **Portacaval shunt** for the treatment of portal hypertension: the **splenic vein** may be anastomoses to the **left renal vein after removing the spleen**.

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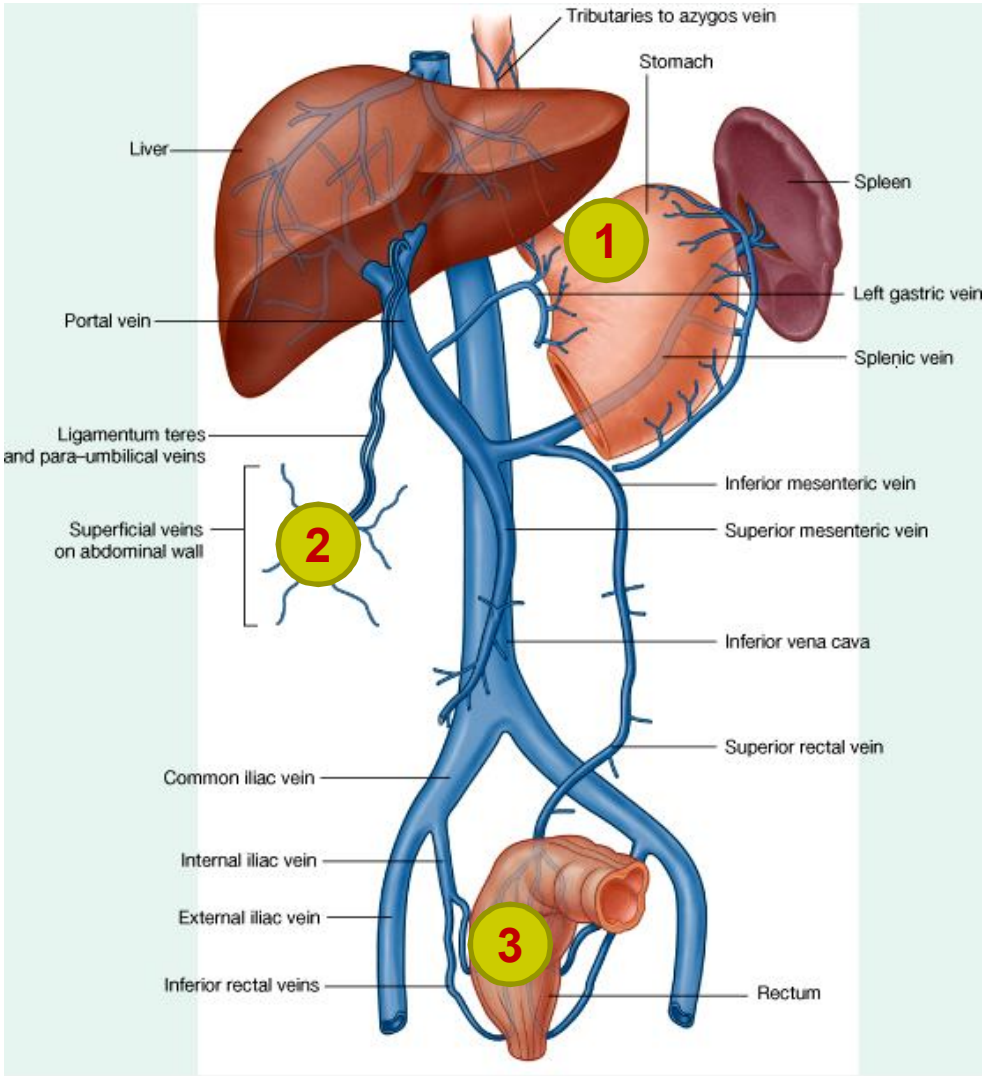
Portocaval anastomosis



- If there is an **obstruction to flow** through the portal system (**portal hypertension**), blood can flow in a **retrograde direction** (because of the absence of valves in the portal system) and pass through **anastomoses** to reach the **caval system**.
- Sites for these anastomoses include the **(1) esophageal veins, (2) thoracoepigastric veins,** and **(3) rectal veins.**
- Enlargement of these veins may result in **(1) esophageal varices**, **(2) a caput medusae** and **(3) internal hemorrhoids.**

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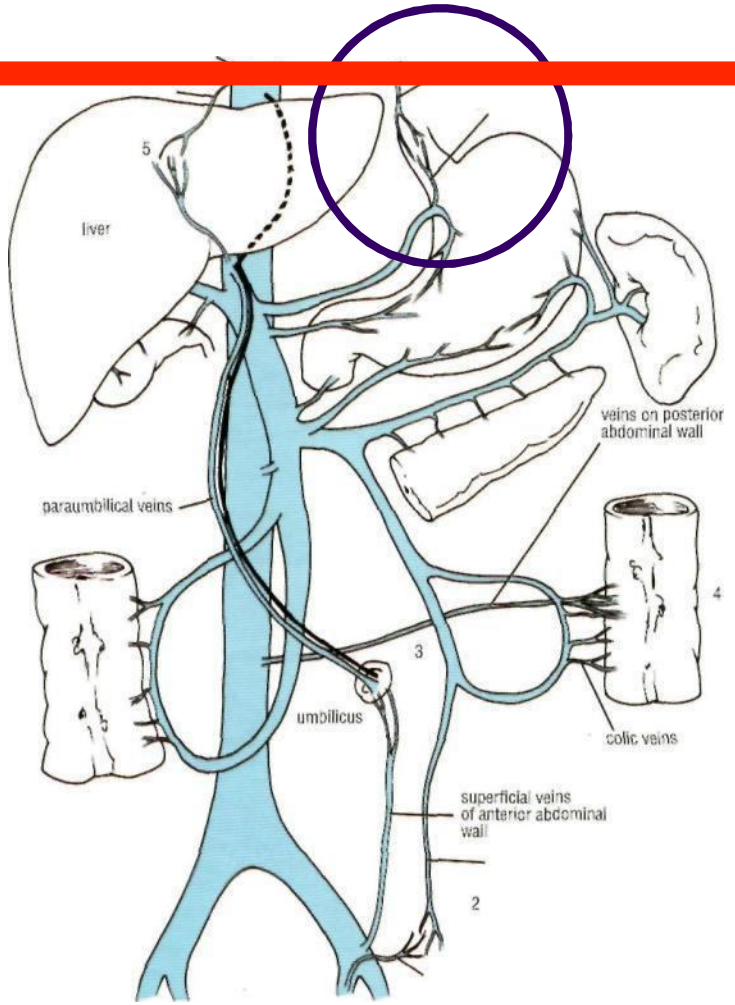
Esophageal anastomosis



- **Anastomosis** between the tributaries of the **left gastric vein (portal vein)** and the tributaries of the **azygous vein (SVC)** in the wall of the **lower end** of the **esophagus**.
- In portal hypertension these anastomoses veins enlarge in the wall of the **esophagus** and later burst into the lumen of the esophagus (**esophageal varices**) resulting in **hematemesis** (vomiting red blood).

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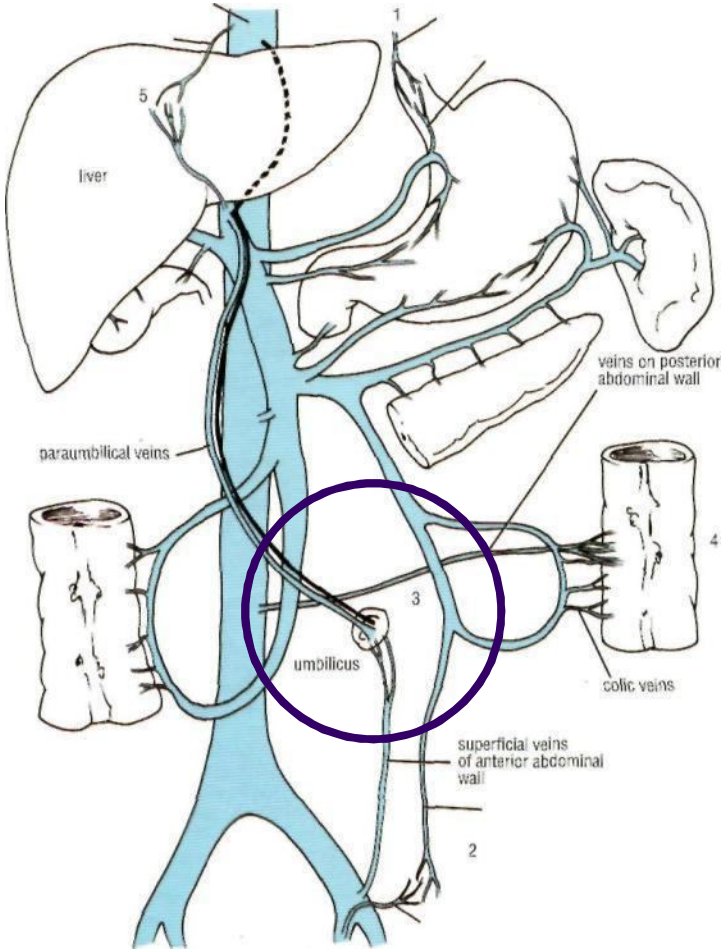
Umbilical anastomosis



- Anastomosis between the **paraumbilical vein** (portal vein) and the **superior** and **inferior epigastric** veins (**SVC** and **IVC**) of the anterior abdominal wall around the **umbilicus**.
- In portal hypertension, this anastomosis gets enlarged and dilated veins form **"caput Medussae"** around the **umbilicus**.

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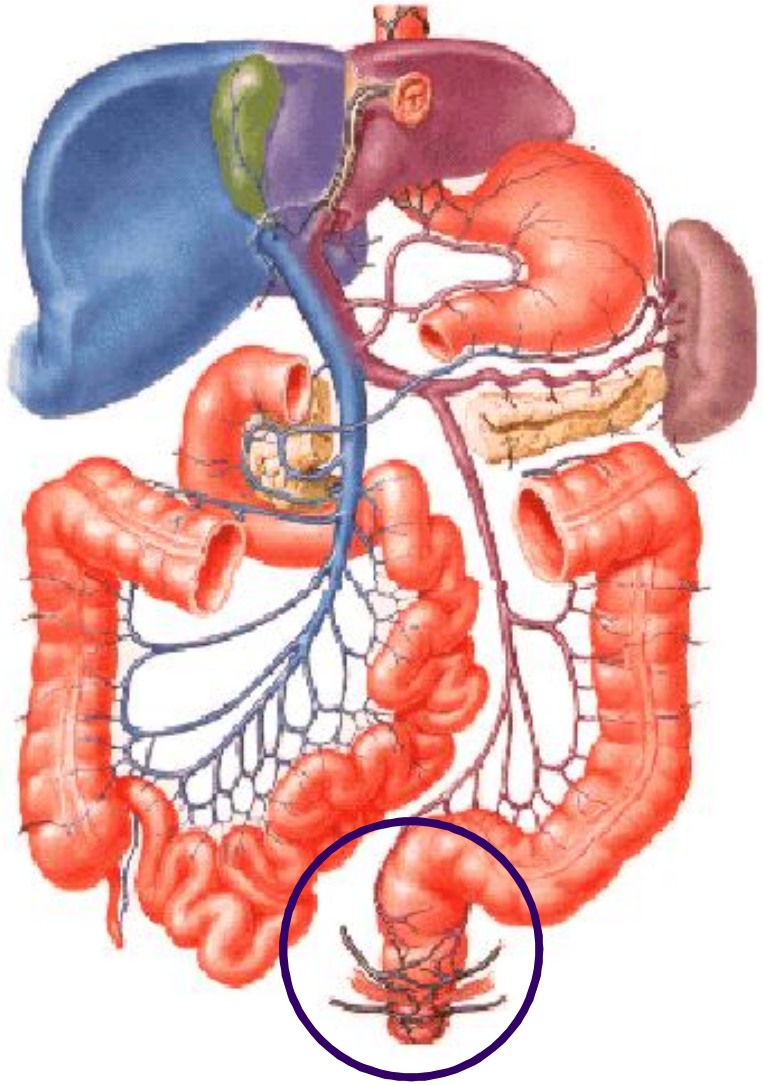
Rectal anastomosis



- Anastomosis between the **superior rectal vein** (inferior mesenteric vein and then into **portal vein**) and **inferior rectal vein** which drains into the internal iliac vein (from **IVC** system).
- In portal hypertension this anastomoses gets dilated resulting in **internal hemorrhoids** and bleeding per anus.

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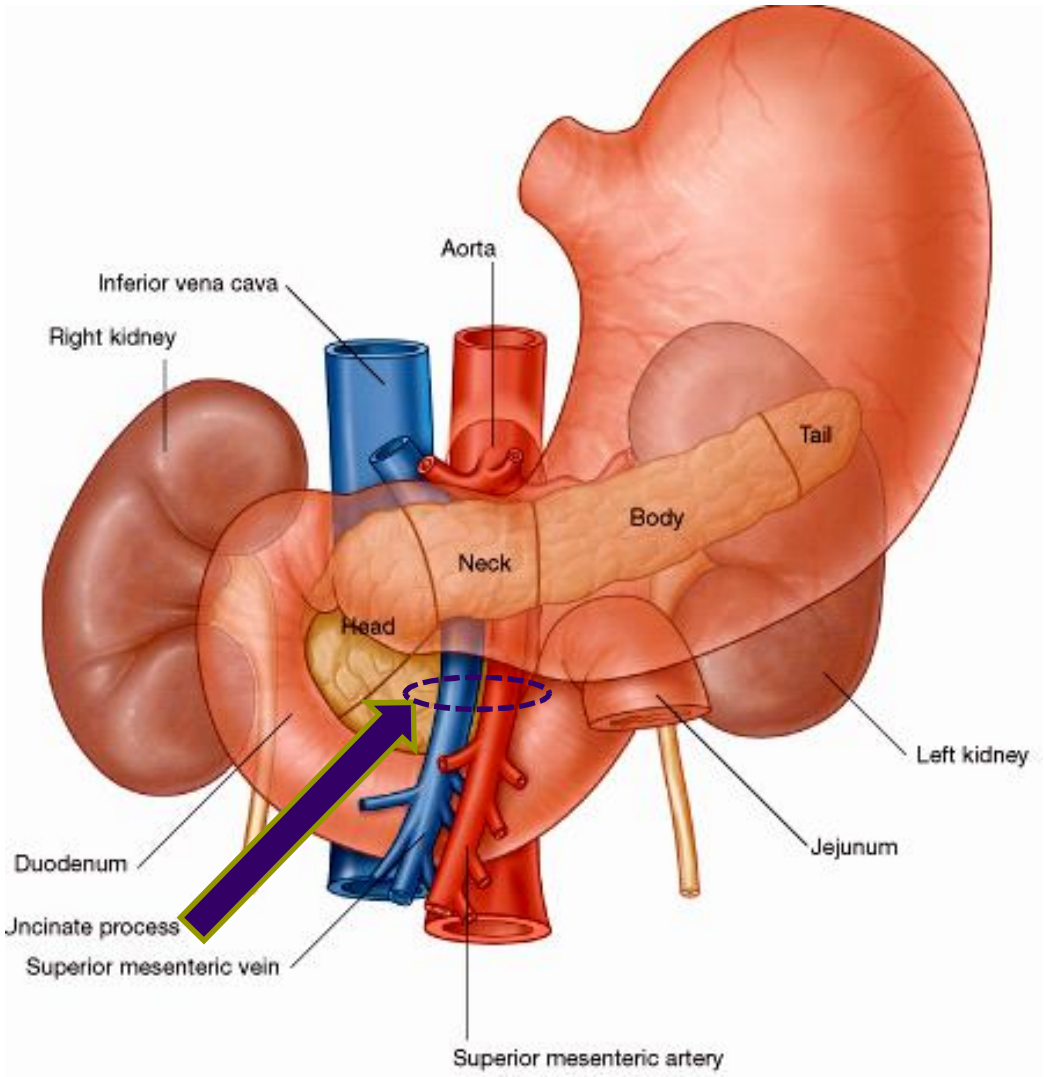
47. Pancreas: Head and uncinate process



- The **head of the pancreas** rests within the **C-shaped** area **formed by the duodenum** and is traversed by the **common bile duct**.
- It includes the **uncinate process** which is crossed by the **superior mesenteric vessels**.

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Cancer of the head of the pancreas

- **Cancer** of the **head of the pancreas** **compresses the bile duct** and it results in **OBSTRUCTIVE TYPE OF JAUNDICE.**
- This type of jaundice is **NOT** usually **associated with** pain or **fever**.
- **Hepatitis** also causes jaundice but **is associated with** the **fever**.

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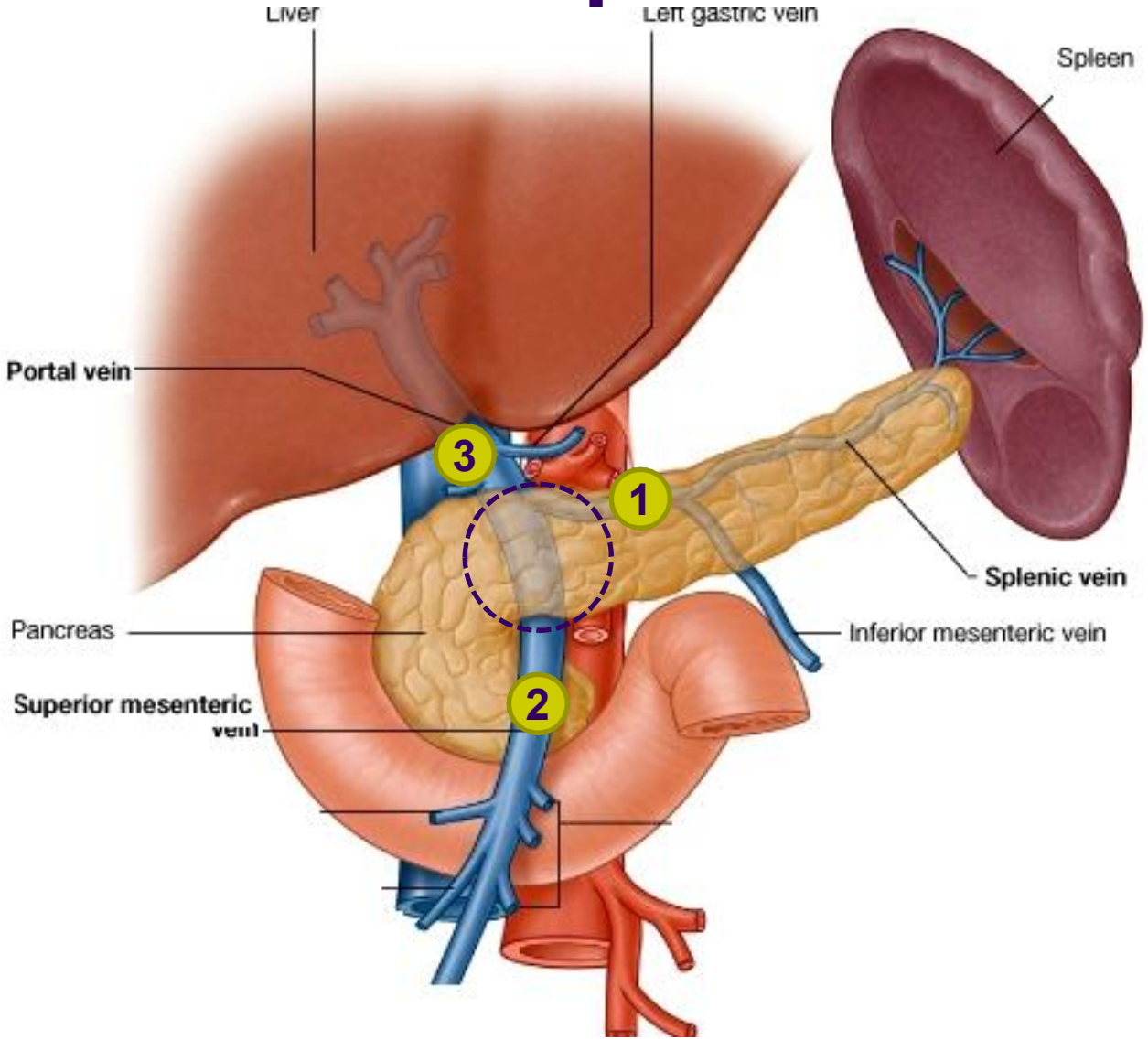
Neck of the pancreas



Posterior to the **neck** of the pancreas is the site of formation of the **PORTAL VEIN**.

(1)Splenic vein joins with **(2) superior mesenteric vein** to form **(3) portal vein**.

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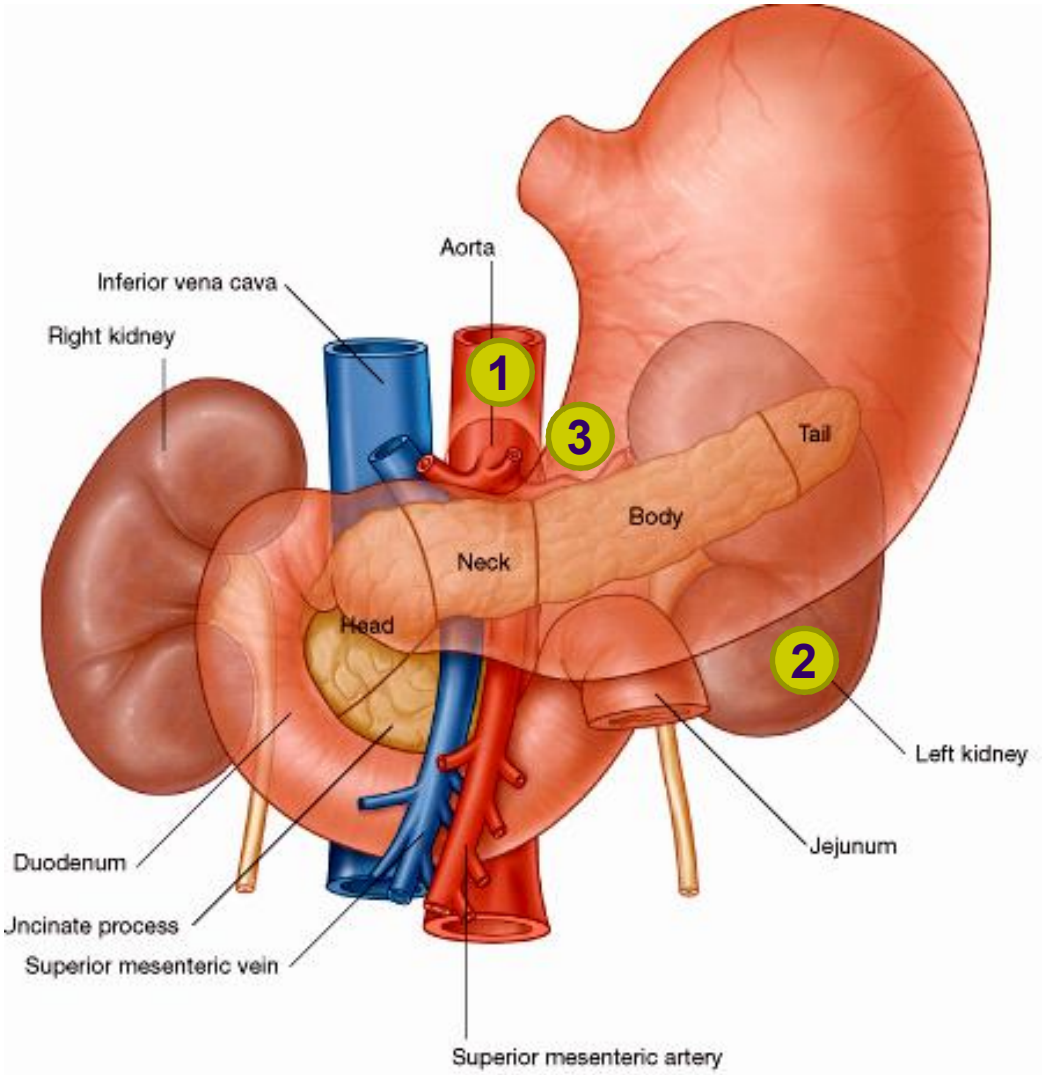
Body of the pancreas



- The **body** passes to the left and passes **anterior** to the **(1) aorta** and the **(2) left kidney.**
- The **(3) splenic artery** undulates **along the superior border** of the body of the pancreas with the **splenic vein** coursing **posterior to the body**.

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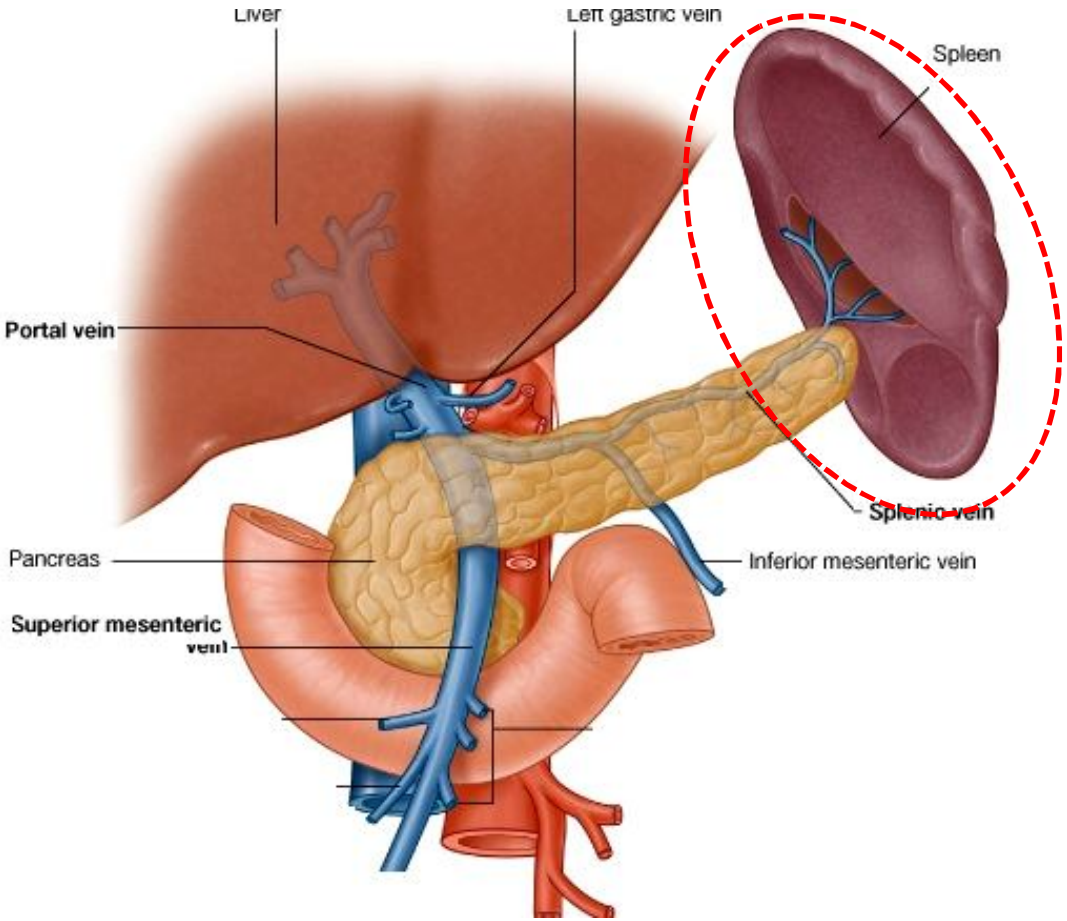
Tail of the pancreas



- The **tail** of the pancreas enters the **splenorenal ligament** to reach the **hilum of the spleen**.
- It is the only part of the pancreas that is **intraperitoneal.**
- **Tail of the pancreas** may be **mistakenly removed** during **spleenectomy** and resulting in **sugar diabetes** because it contains a lot endocrine cells.

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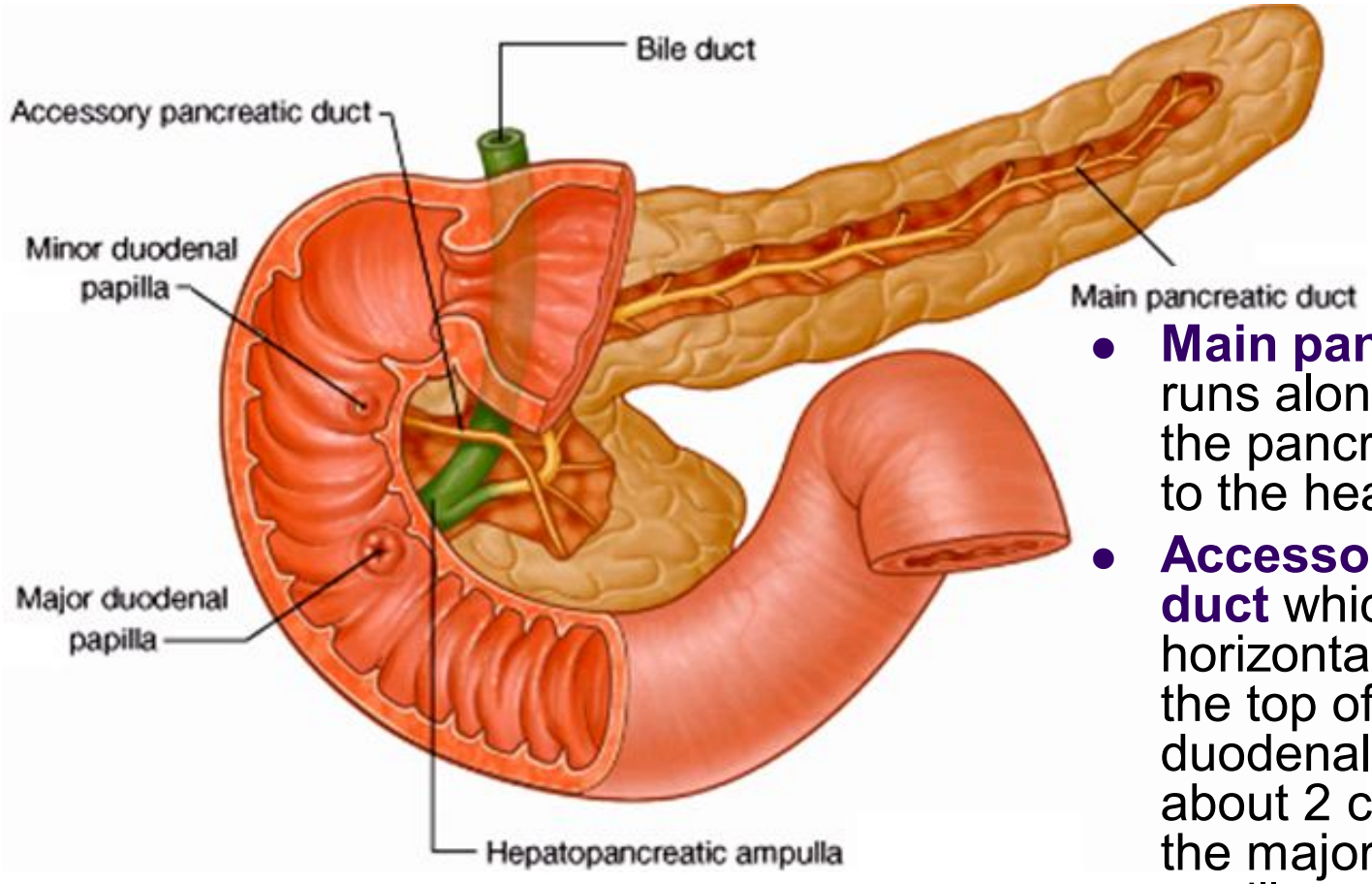
Ducts of the pancreas



- **Main pancreatic duct** runs along the long axis of the pancreas from the tail to the head.
- **Accessory pancreatic duct** which is runs horizontally opens onto the top of the minor duodenal papilla which is about 2 cm proximal to the major duodenal papilla on the posteromedial wall of the duodenum.

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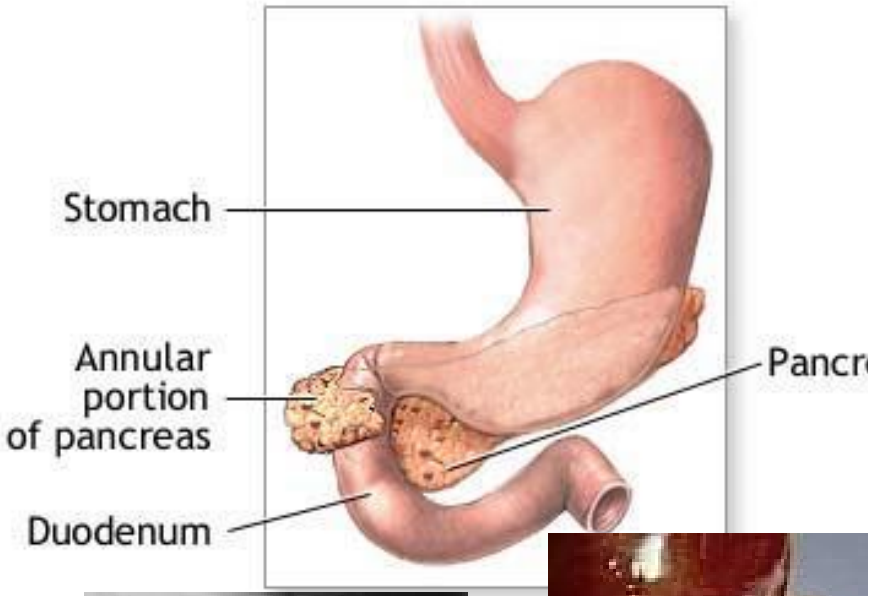
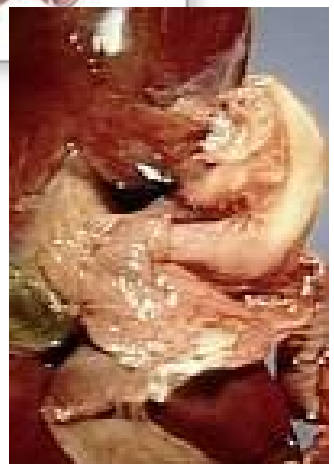
Annular Pancreas





- **Annular pancreas** is caused by malformation during the development of the pancreas, before birth.
- Occurs when the ventral and dorsal pancreatic buds form a **ring around the duodenum**, thereby causing an **obstruction of the duodenum** and **polyhydramnios**
- **Symptoms:**

1. **Feeding intolerance in newborns**
2. Fullness after eating
3. Nausea and **vomiting**

- **Half of cases** are not diagnosed until symptoms occur in **adulthood**.

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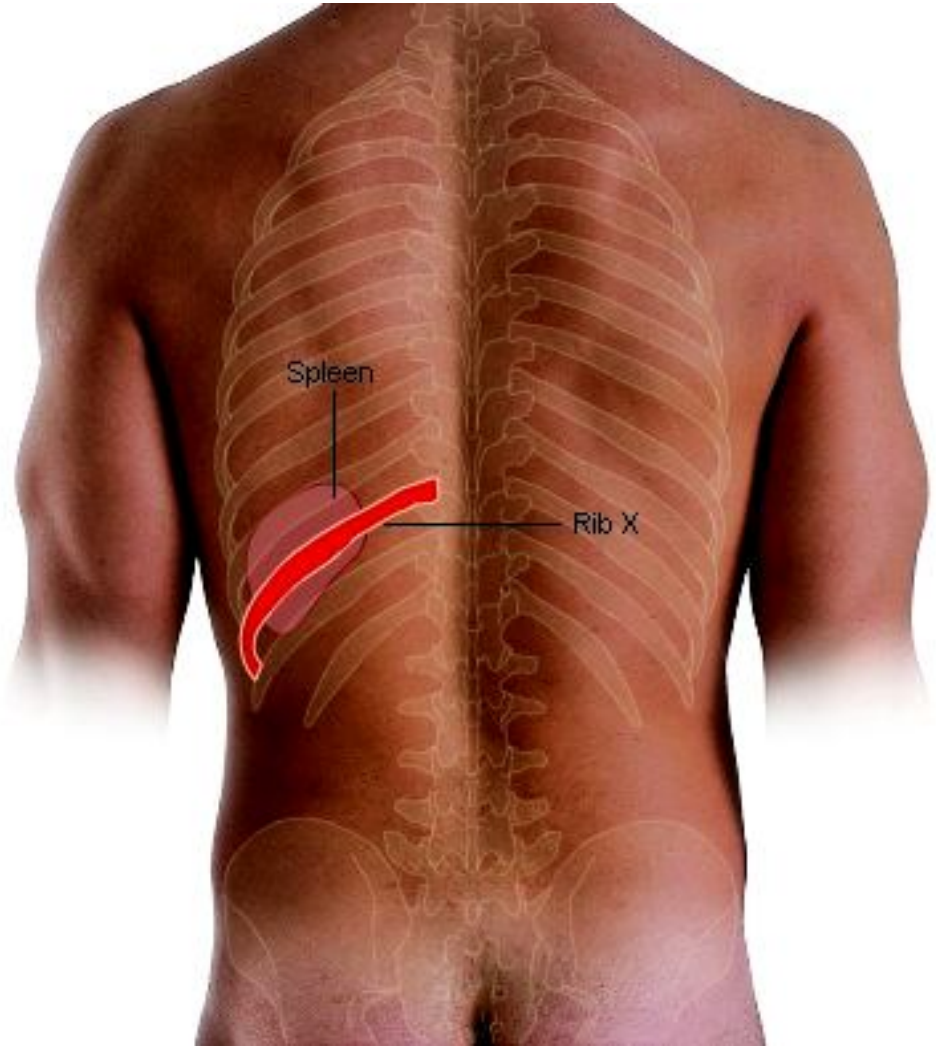
48. Spleen: Two borders

spleen comes from -dorsal mesogastrium
and liver comes from ventral mesogastrium



- The spleen is a **peritoneal** organ in the upper left quadrant that is deep to the left **9th, 10th, and 11th ribs.**
- The spleen follows the contour of **rib 10 (axis of the spleen).**

- Because the spleen lies above the costal margin, a normal-sized spleen **is not palpable**.
- The spleen **may be lacerated** with a **fracture of the 9th and 10th ribs.**

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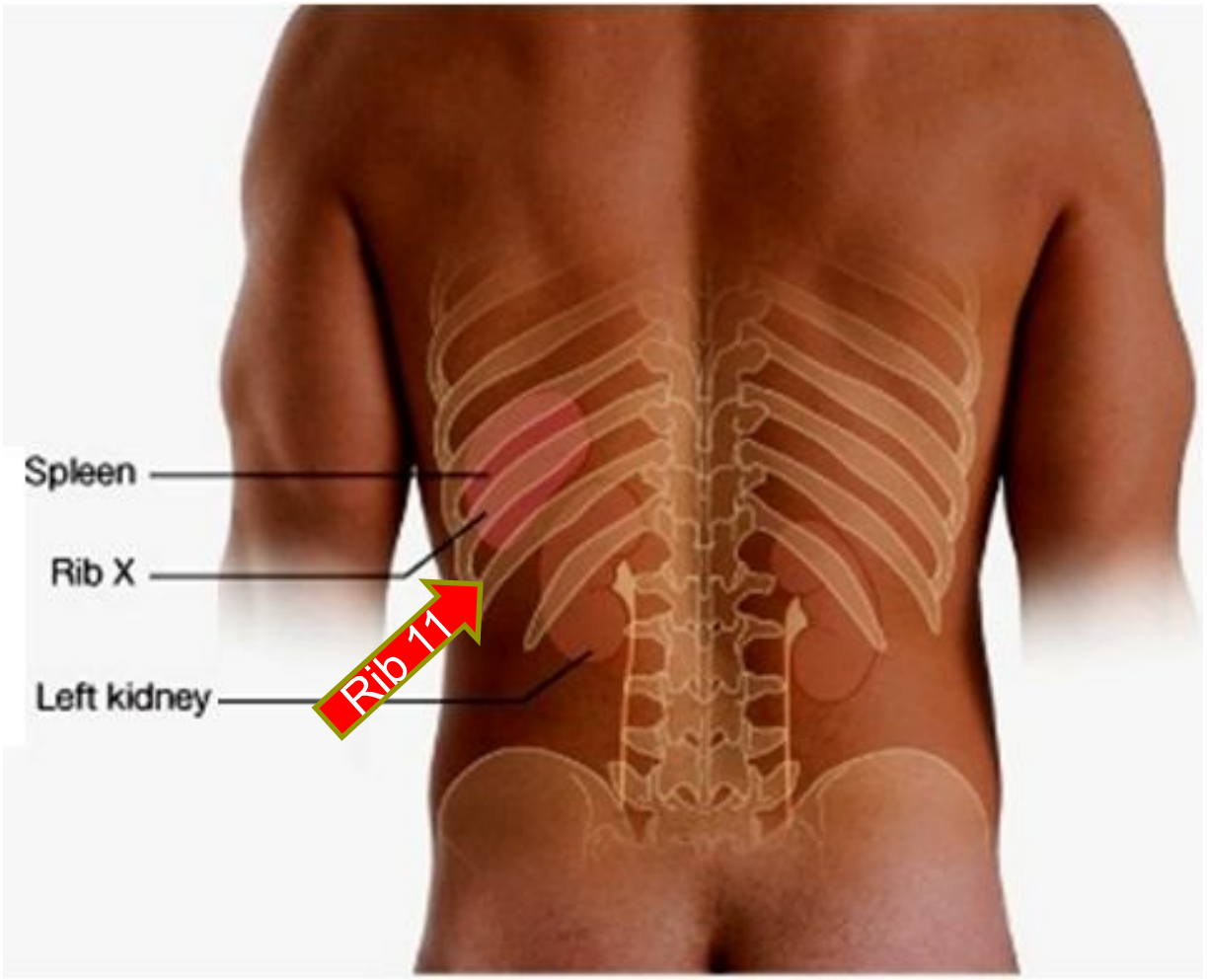
Relations of the Spleen and Left Kidney

- The spleen follows the contour of **10th rib** and extends from the superior pole of the left kidney to just posterior to the midaxillary line.
- **The border between spleen and** upper pole of the **left kidney** is **11th rib.**



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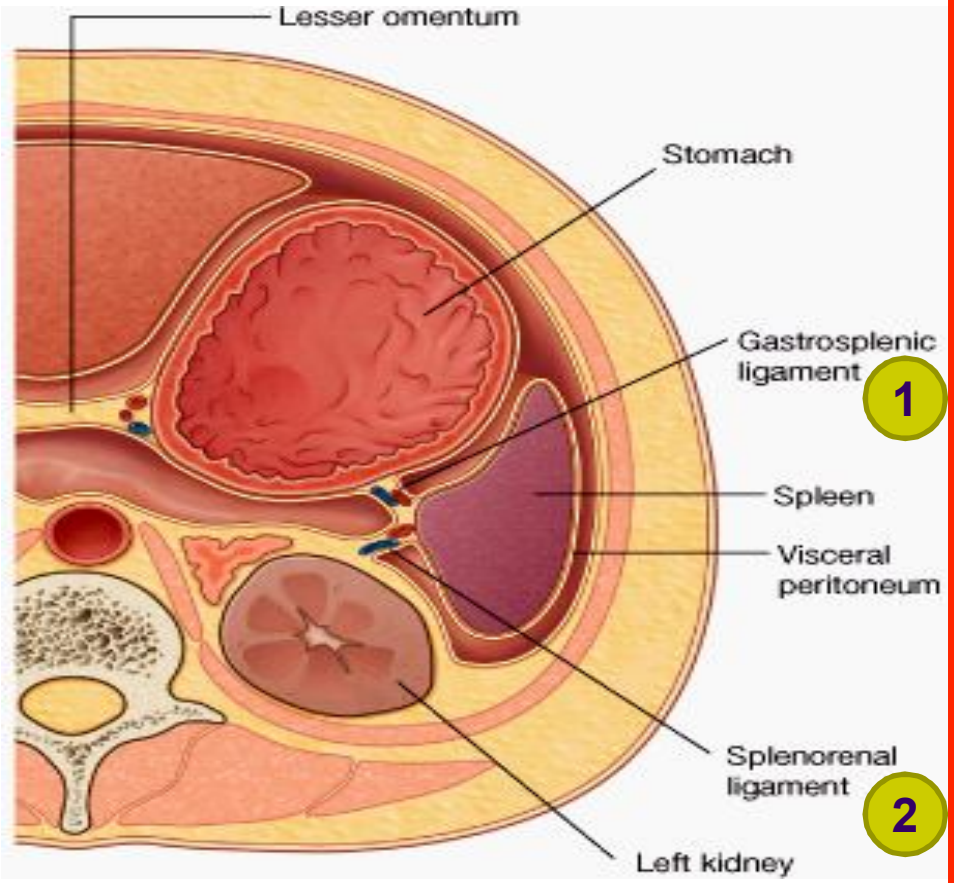
Peritoneal connections



- **Gastrosplenic ligament (1)** connects the spleen with the upper end of the **greater curvature** of the **stomach**. It contains the **short gastric** vessels, **left gastroepiploic (gastroomental) vessels** and accompanying lymph vessels

- **Splenorenal (lienorenal) ligament (2)** connects the spleen with the **left kidney**. It contains the **tail of the pancreas, splenic vessels,** accompanying lymph vessels and nerves.

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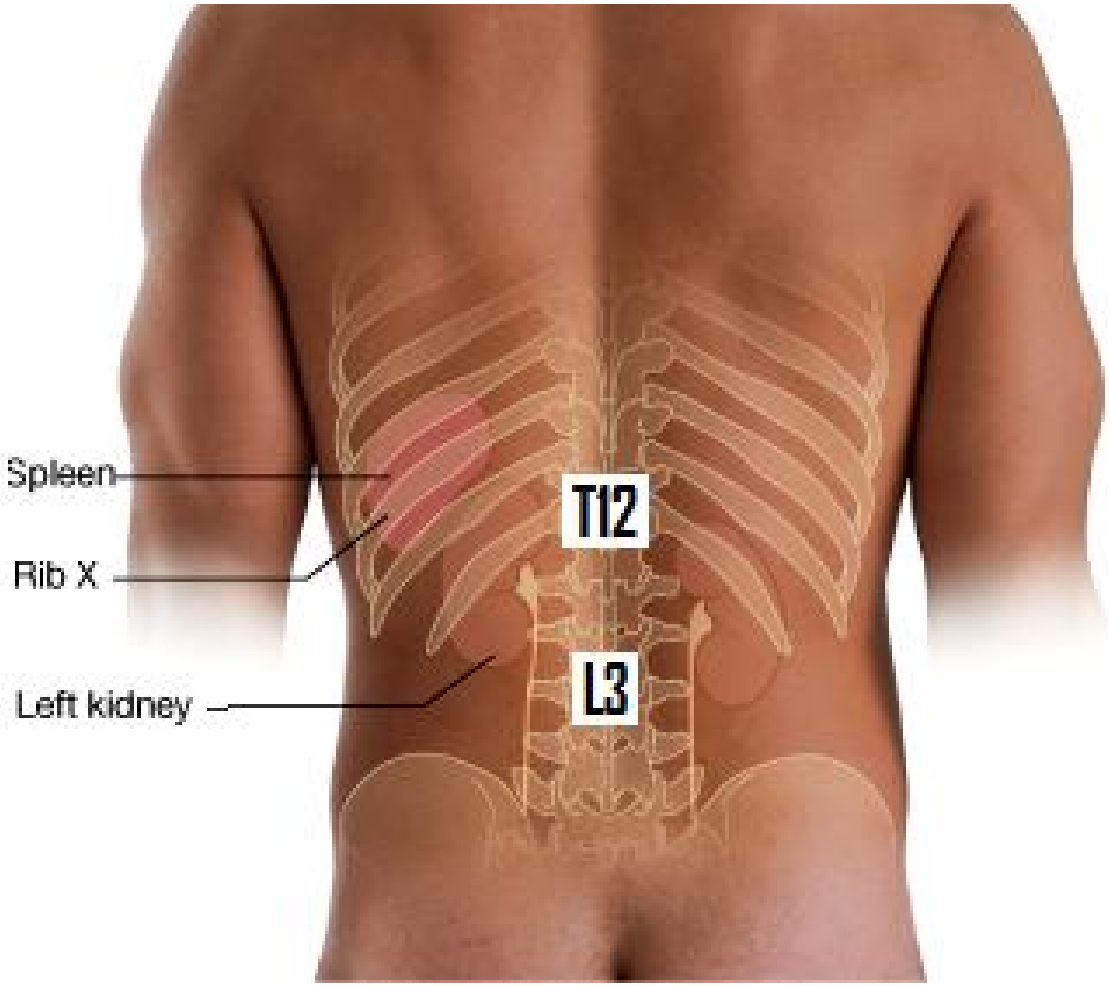
49. Kidney: Dimensions and position



- During life, the kidneys are reddish brown and measure approximately **11-12 cm in length**, **5-6 cm in width**, and **2.5-3 cm in thickness**.
- They are extending from the level of **T12** to the level of **L3**, the **right kidney** lying about **2-3 cm lower than the left one**.
- The lateral border of the kidney is convex. Its medial border is convex at both ends but concave in the middle where there is the **hilum** of the kidney.

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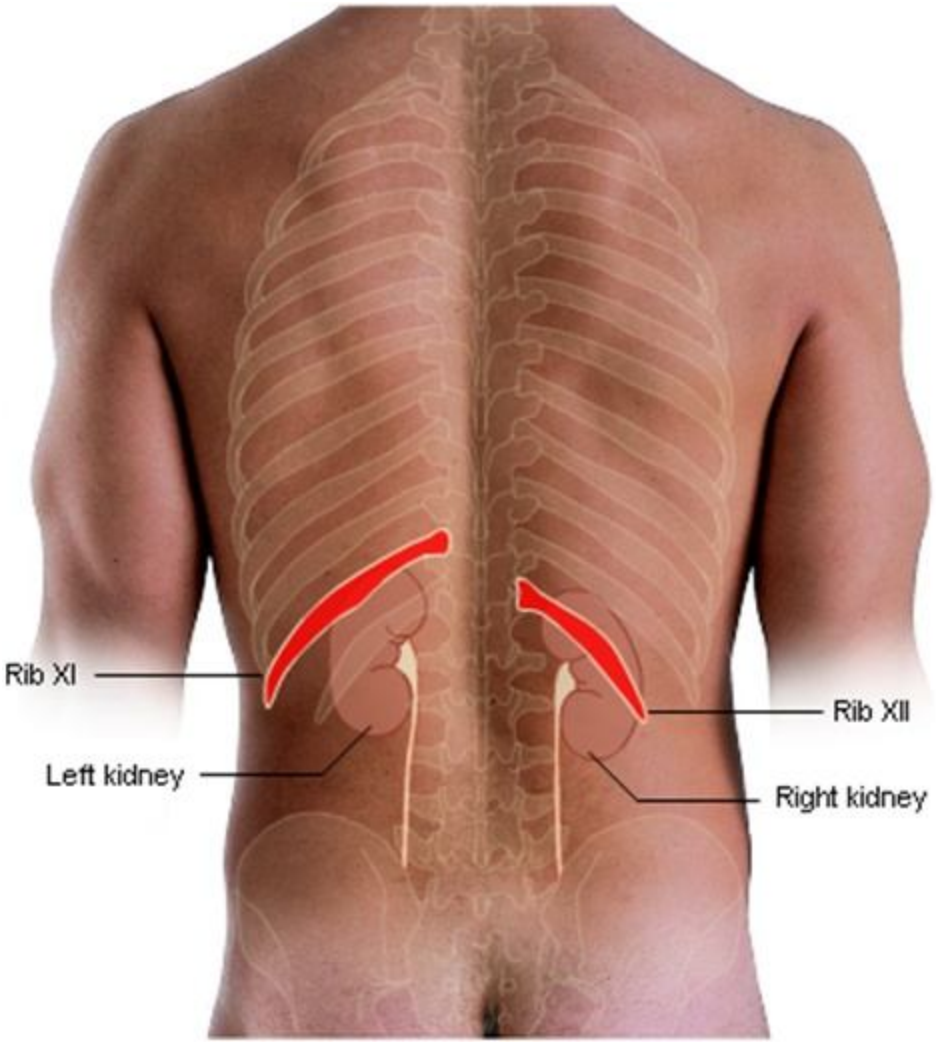
Position of the kidneys



- The **upper** end of the **left** kidney (**XI rib**) is a little higher than the **right** one (**XII rib**).
- The **lower** ends of the kidneys occur around the level of the IV disc L3/L4.
- **N.B.** The border **between left kidney and spleen is XI rib**
- The **hila** of the kidneys and the beginnings of the ureters are at approximately the **L1** vertebra.
- The **ureters** descend vertically anterior to the tips of the transverse processes of the lower lumbar vertebrae and enter the pelvis and **lies on the psoas major** muscle.

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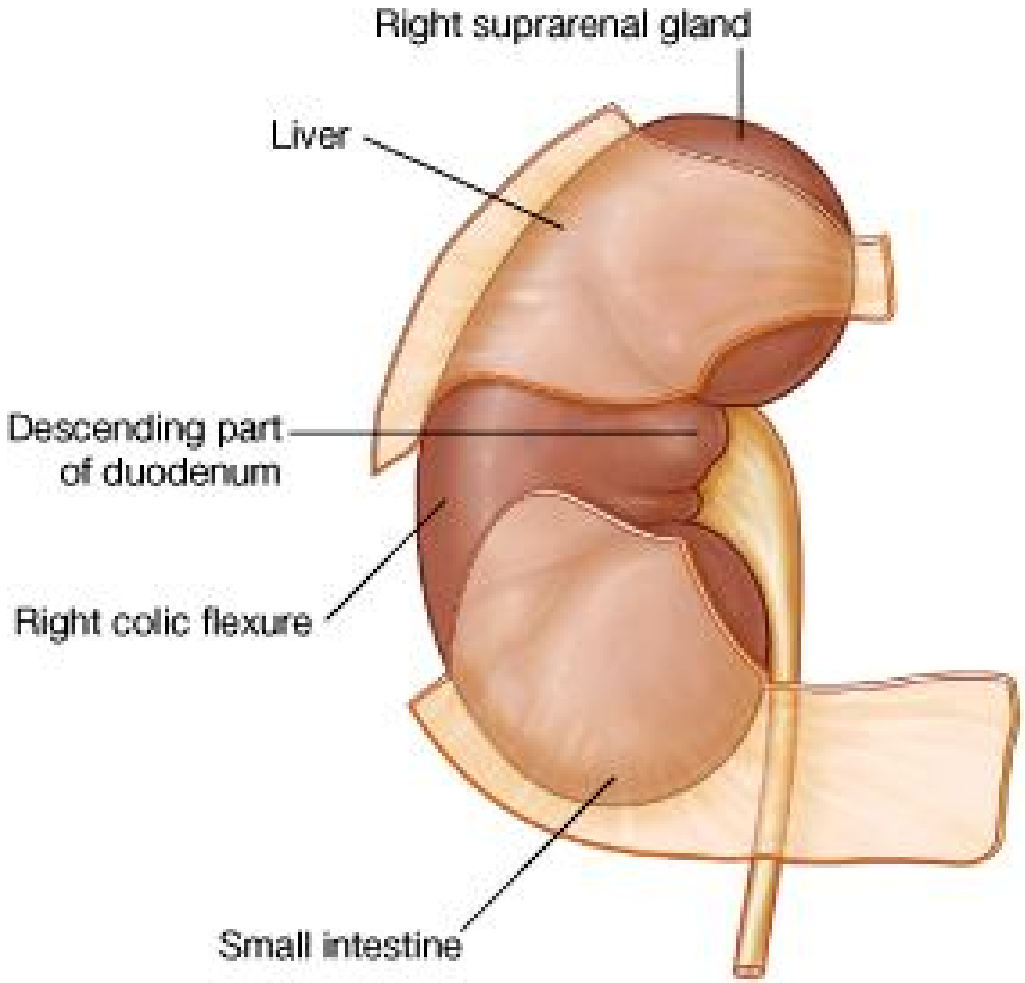
Anterior relations of the right kidney



1. **Right suprarenal gland**
2. **2nd part of the duodenum**
3. **Right** lobe of the **liver**
4. **Right colic flexure**
5. **Small intestine**

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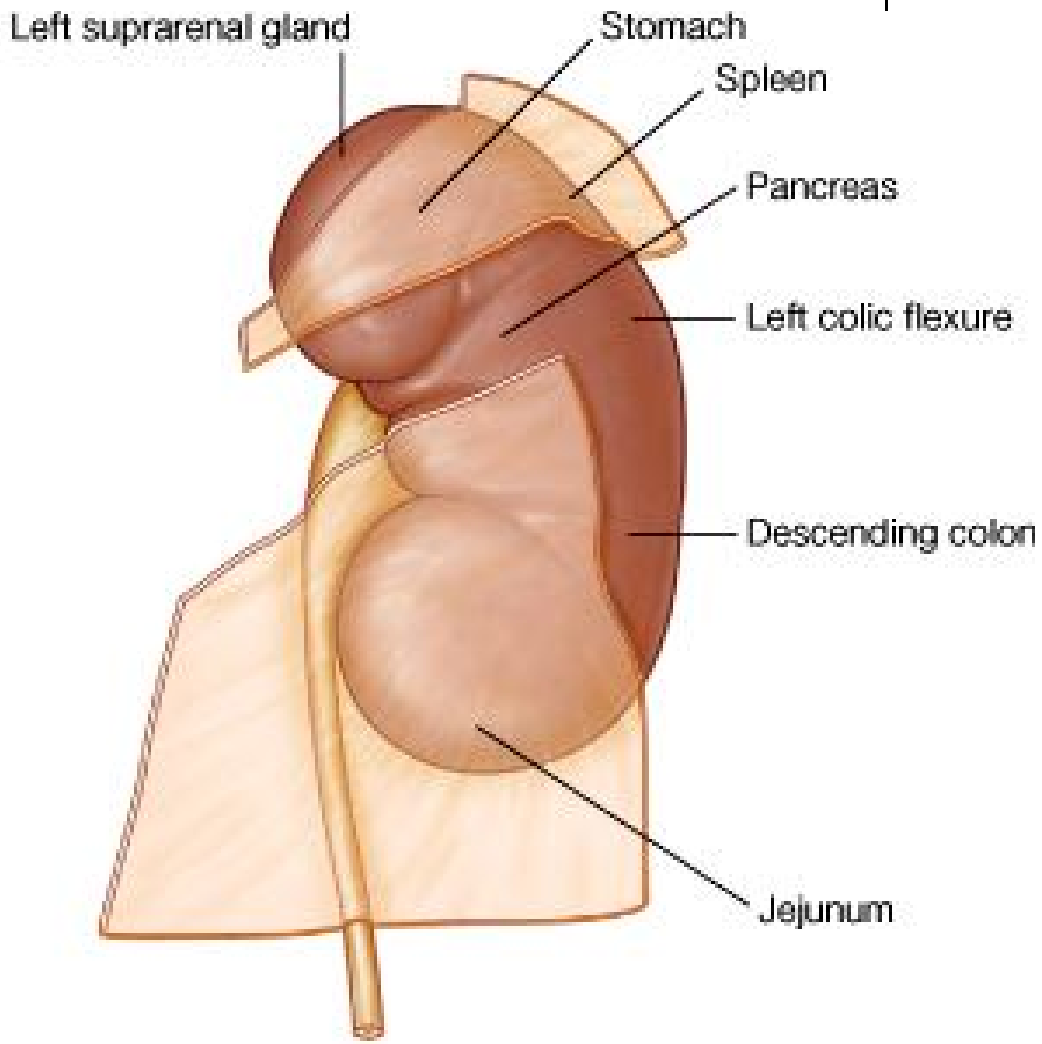
Anterior relations of the left kidney

1. **Left suprarenal gland**
2. **Stomach**
3. **Spleen**
4. **Body of pancreas** and splenic vessels
5. **Descending colon**
6. **Small intestine**



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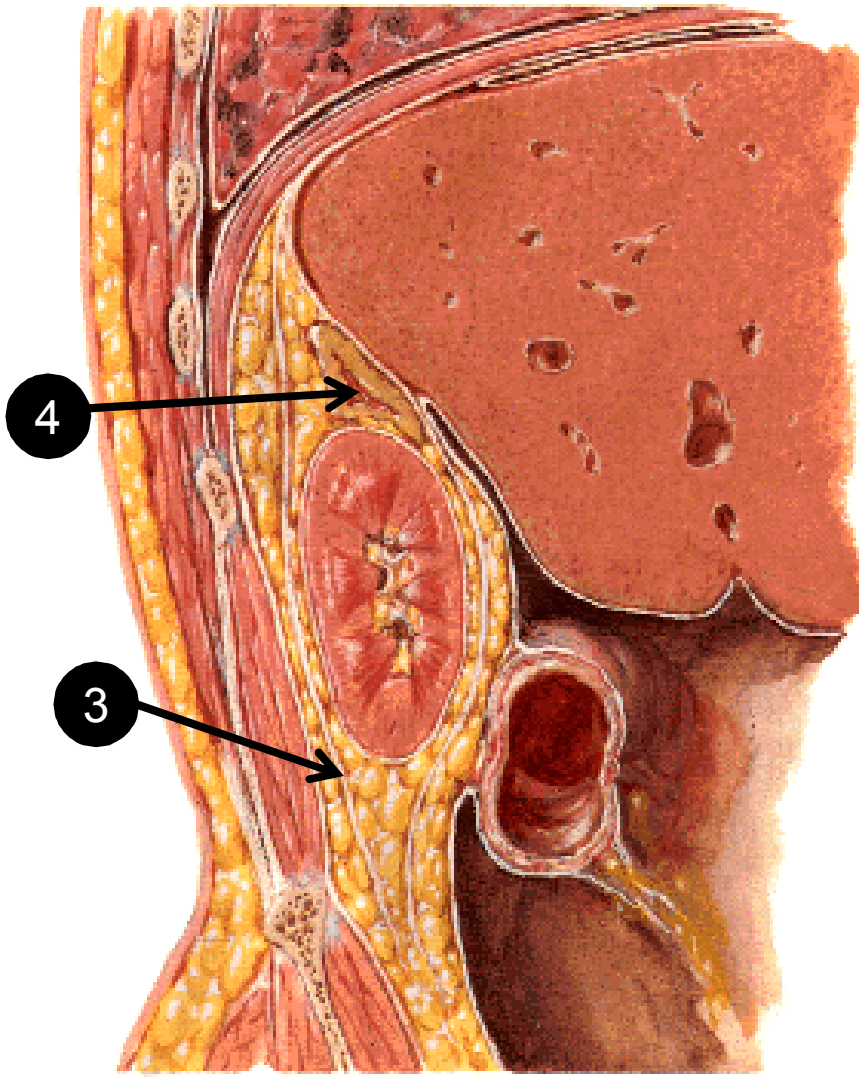
Renal (Gerota) fascia



- Enclosing the perinephric fat is a membranous condensation of the extraperitoneal fascia - the **renal fascia (3)**.
- The **suprarenal glands (4)** are also enclosed in this fascial compartment, usually separated from the kidneys by a thin septum.
- **N.B.** ***The renal fascia must be incised in any surgical approach to this organ.***

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50. Nephrolithiasis

- **Renal calculi** are solid concretions (crystal aggregations) formed in the kidneys from dissolved urinary minerals.
- There are several types of kidney stones. The majority are **calcium oxalate** stones, followed by **calcium phosphate** stones.
- Kidney stones typically leave the body by passage in the urine stream, and many stones are formed and passed without causing symptoms.
- If stones grow to sufficient size before passage (at least 2-3 mm), they can cause **obstruction of the ureter** (renal colic).

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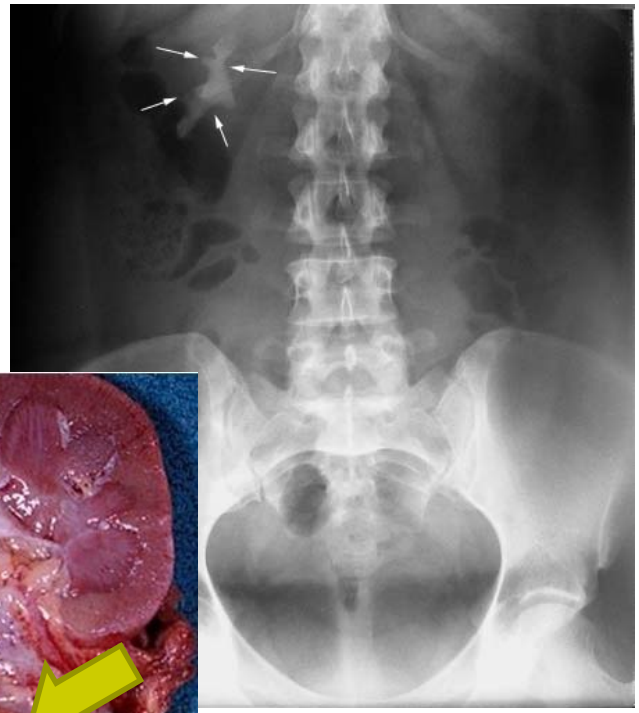
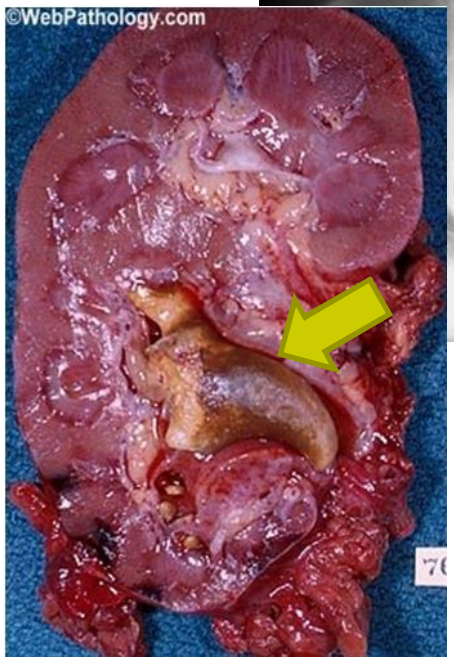
Staghorn calculi





- Renal stone that develops in the **pelvicaliceal system**, and in advanced cases has a branching configuration which resembles the **antlers of a stag**.
- Staghorn calculi are composed of **magnesium ammonium phosphate**, which forms in urine that has an abnormally **high pH** (above 7.2).
- This high pH usually develops because of recurrent urinary tract infection with microorganisms such as **Proteus mirabilis**.

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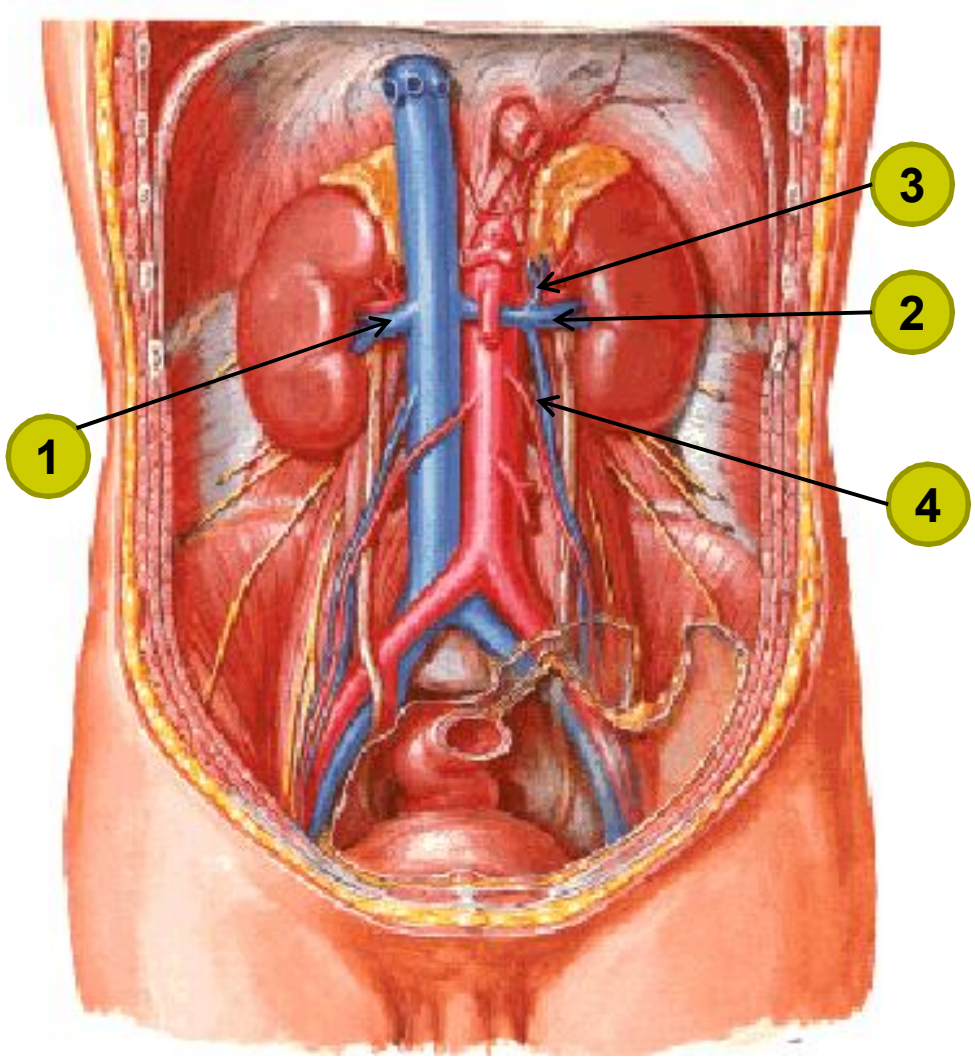
51. Renal veins



- The **right renal (1)** vein is much **shorter** than the left. Both veins lie anterior to the corresponding artery in hilum of kidneys.
- The long **left renal vein (2)** is joined by the **left suprarenal (3)** and **left gonadal (4)** (testicular or ovarian) **veins** before it reached **IVC.**
- The **left renal** vein **crosses anterior to the aorta**, just inferior to the origin of the **SMA**.

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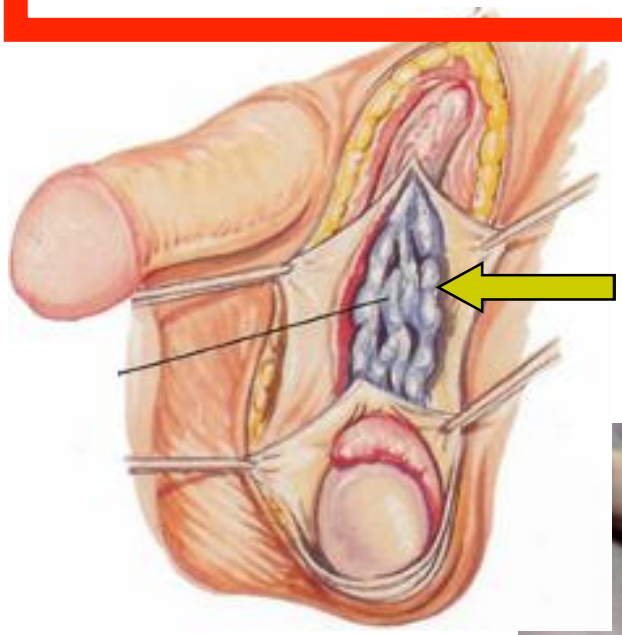
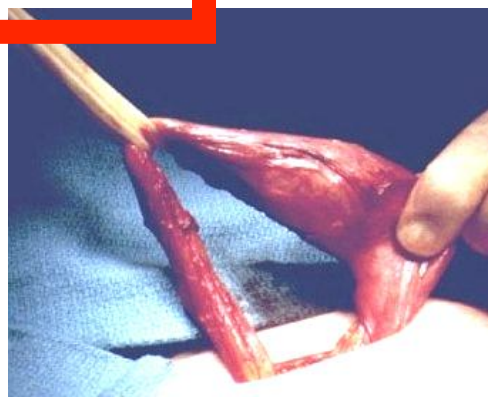
52. Varicocele





- It is **engorgement** of the **pampiniform plexus** that produces a **wormlike scrotal mass** and enlargement of the spermatic cord.
- Formation is usually on the **left side**.
- Varicocele on either side may indicate **kidney disease** or may signal a retro peritoneal malignancy **obstructing the testicular vein.**

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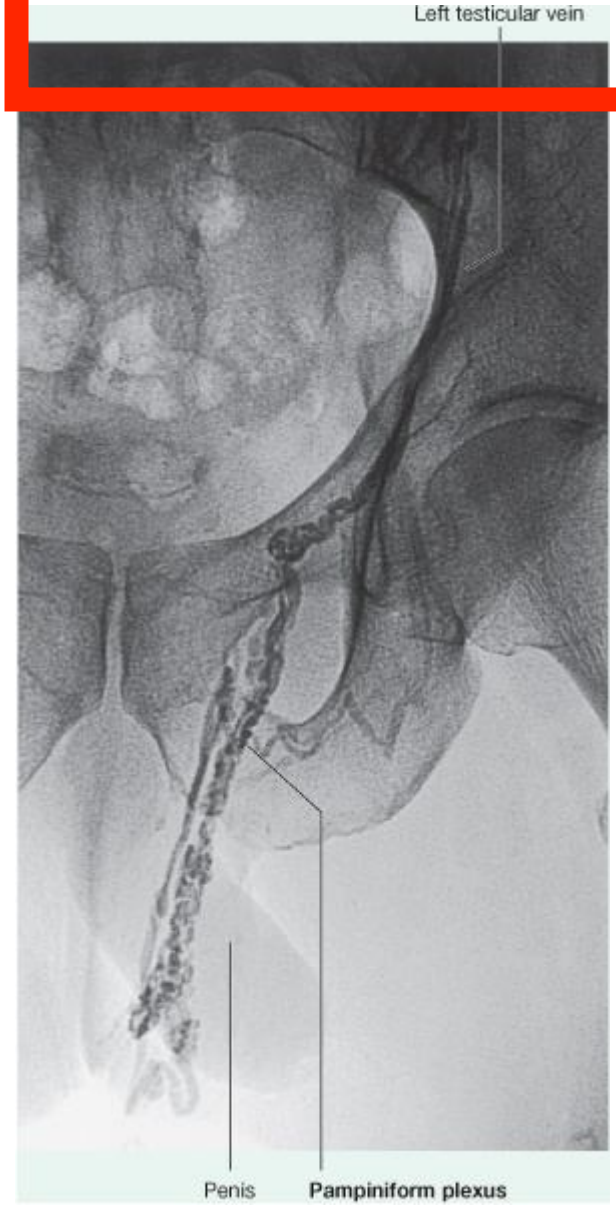
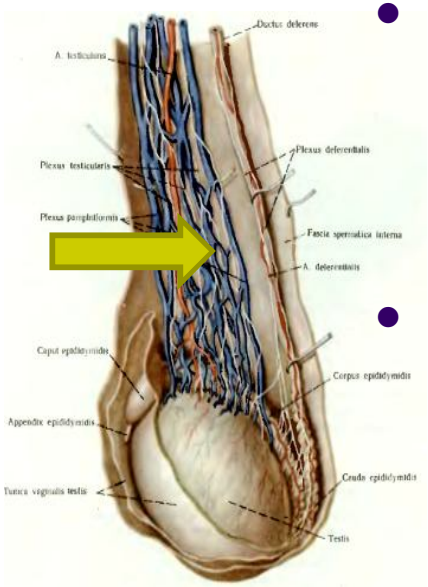
Pampiniform plexus





- Each testicular or ovarian vein is formed by coalescence of a **pampiniform plexus**: the testicular at the **deep inguinal ring**, the ovarian at the margin of the superior aperture of the pelvis.
- The veins run accompany the corresponding arteries. The **left pampiniform plexus enters the left renal vein**; the **right one enters directly the IVC** inferior to the renal vein.
- That is why **varicocely** (engorgement of the pampiniform plexus that produces a scrotal mass) is more often located on the **left**.

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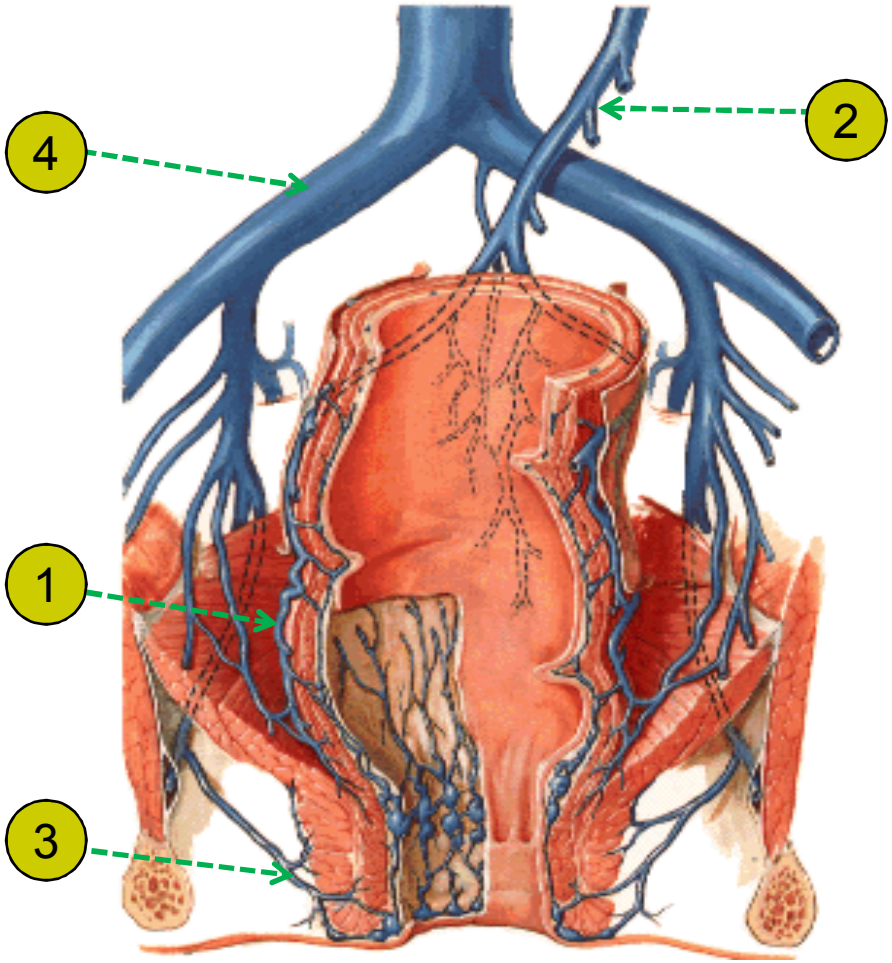
53. Hemorrhoids: Venous drainage from rectum



- **Above** pectinate line: **superior rectal vein [1]** into **portal system [2]**.
- **Below** pectinate line: **inferior rectal vein [3]** into **inferior vena cava [4]**.

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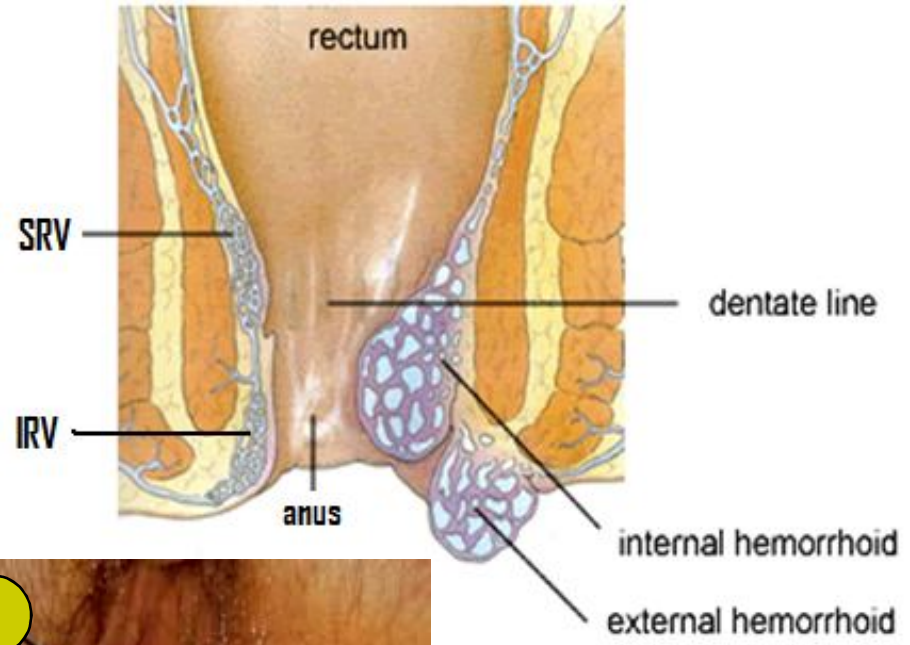
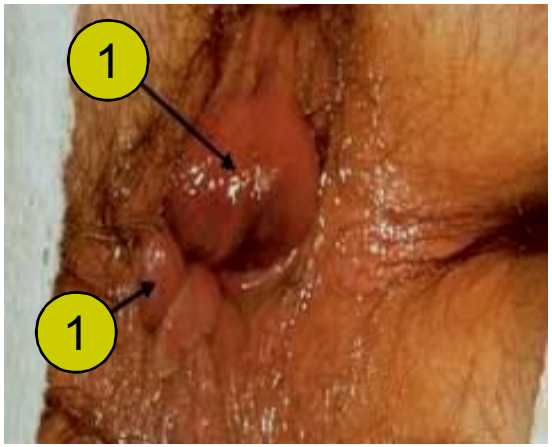
External hemorrhoids





- **Hemorrhoids** are masses that typically **protrude from anus** during **defecation**.
- Hemorrhoids are commonly associated with **constipation**, extended **sitting** and straining at the toilet, **pregnancy**, and disorders that hinder venous return

1. External hemorrhoids are dilated tributaries of the **inferior rectal veins (IRV)** below the pectinate line and are **painful** because the mucosa is supplied by somatic afferent fibers of the inferior rectal nerves.

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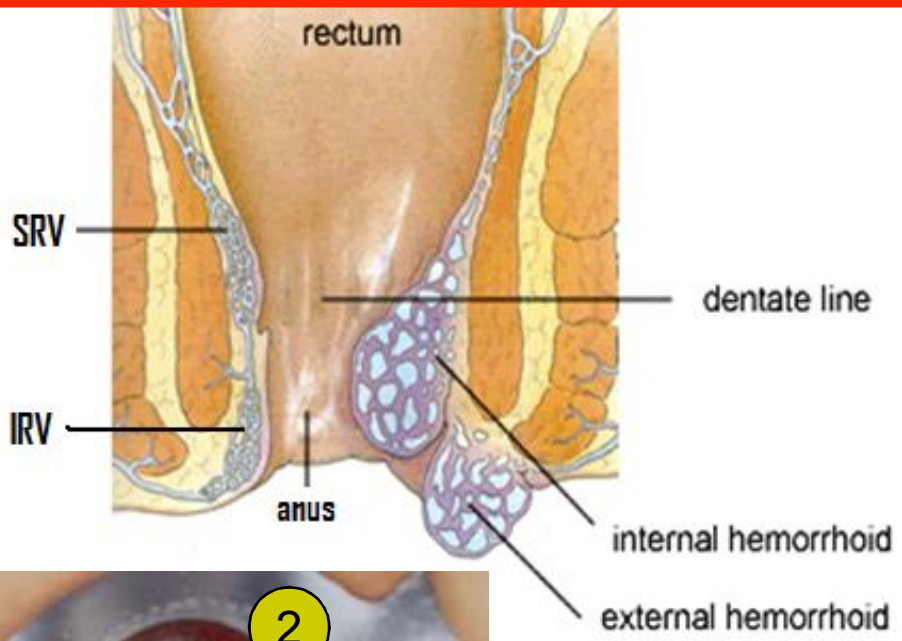
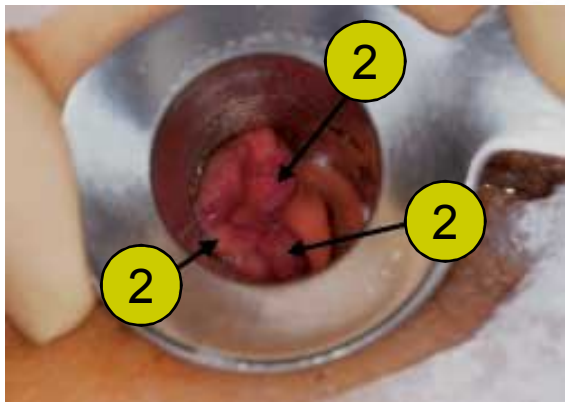
Internal hemorrhoids





2. Internal hemorrhoids are dilated tributaries of the **superior rectal veins (SRV)** above the pectinate line and are **not painful** because the mucosa is supplied by visceral afferent fibers.

- Internal hemorrhoids frequently develop during **pregnancy** because of pressure on the **superior rectal veins**.

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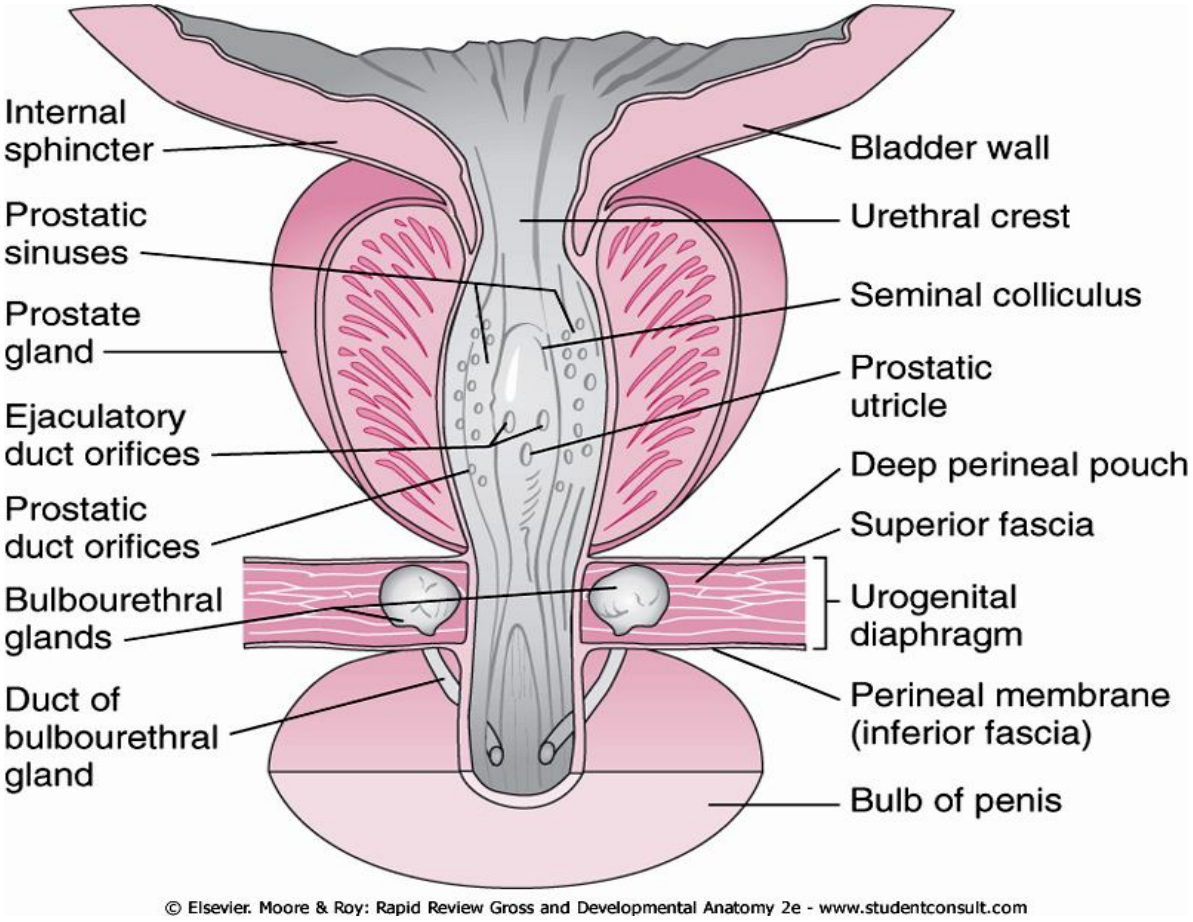
54. Perineal pouches: Contents of the deep pouch



The deep perineal pouch is formed by the fasciae and muscles of the urogenital diaphragm.

It contains:

1. Sphincter urethrae muscle
2. Deep transverse perineal muscle
3. **Bulbourethral (Cowper)** glands (in the **male only**) - ducts perforate perineal membrane and enters bulbar urethra.

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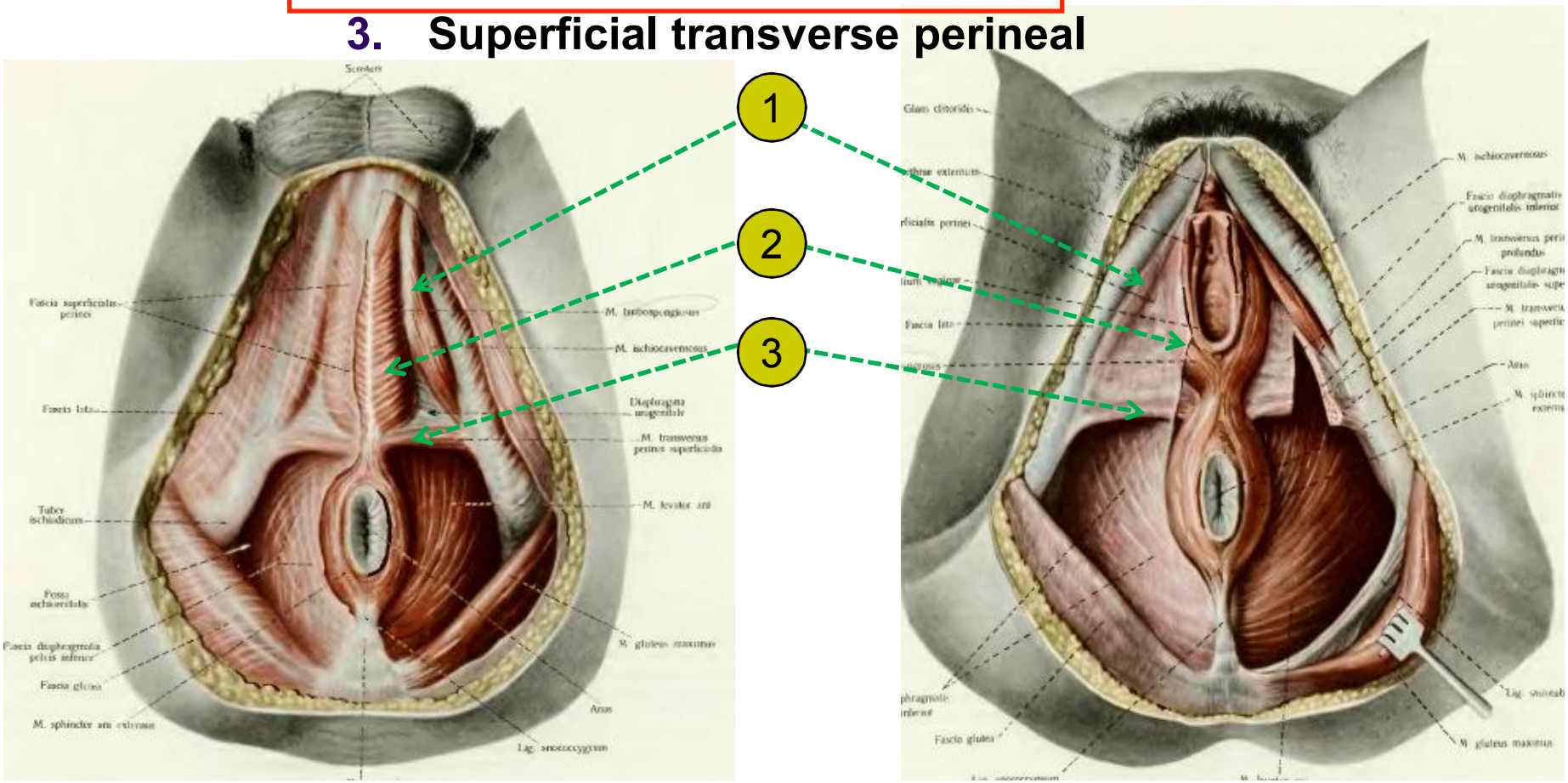
55. Superficial perineal pouch

1. Ischiocavernosus muscle
2. Bulbospongiosus muscle
3. Superficial transverse perineal



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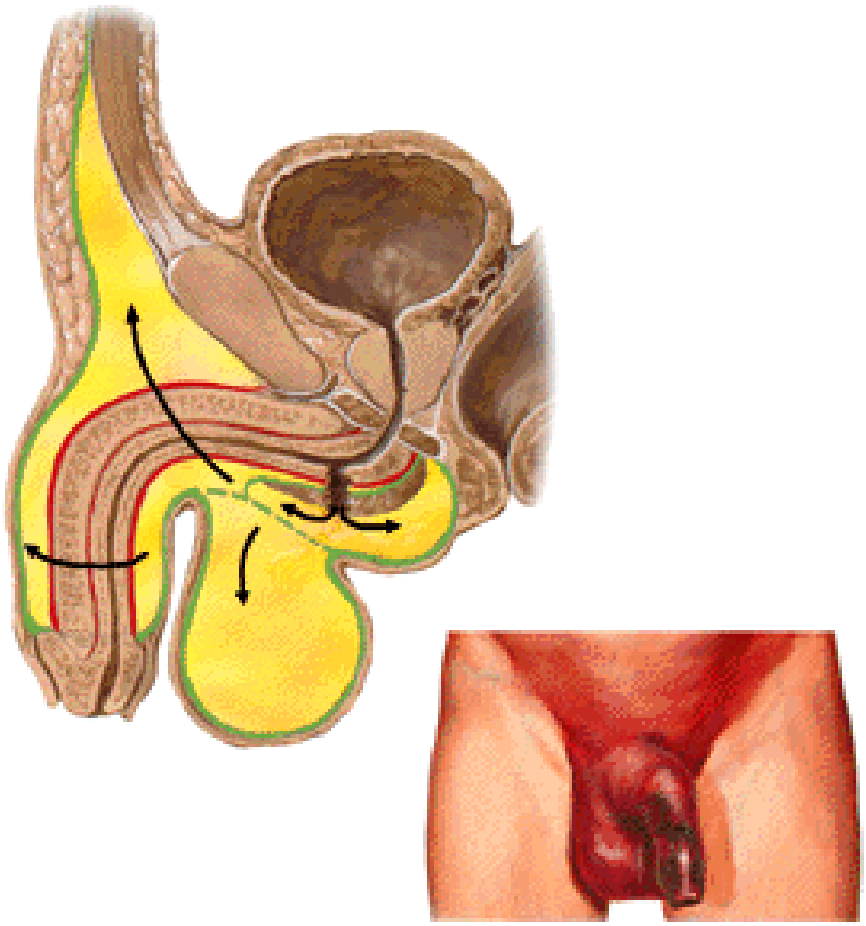
Urine leaks



- After a crushing blow or a penetrating injury, the **spongy urethra** commonly **ruptures within the bulb of the penis**, and **urine leaks** into the **superficial perineal pouch**.
- The **superficial perineal fascia keeps urine** from passing into the thigh or the anal triangle, but after distending the scrotum and penis, urine can pass **over the pubis** into the **anterior abdominal wall** deep to the deep layer of superficial abdominal fascia.

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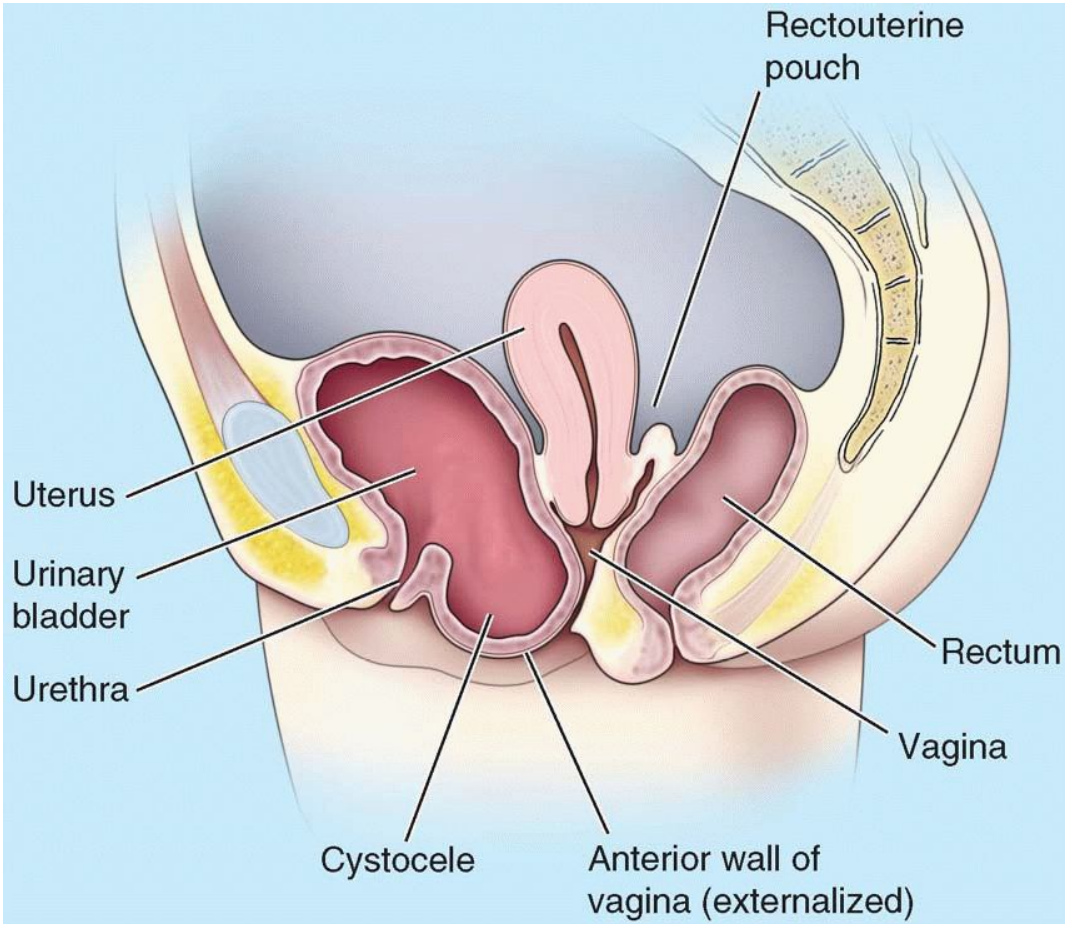
56. Cystocele (hernia of bladder)



- **Loss of bladder support** in **females** by damage to the pelvic floor during childbirth (e.g., laceration of perineal muscles or a lesion of the nerves supply) can result in **protrusion** of the **bladder onto the anterior vaginal wall**.
- When **intrabdominal pressure increases** (as when "bearing down" during defecation), the anterior wall of the vagina may protrude through the vaginal orifice into the vestibule

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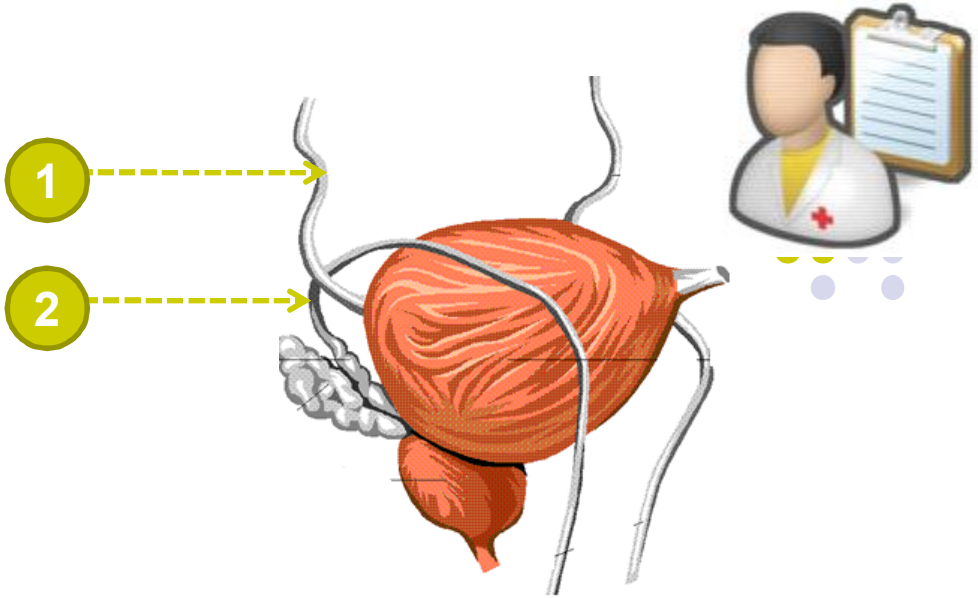
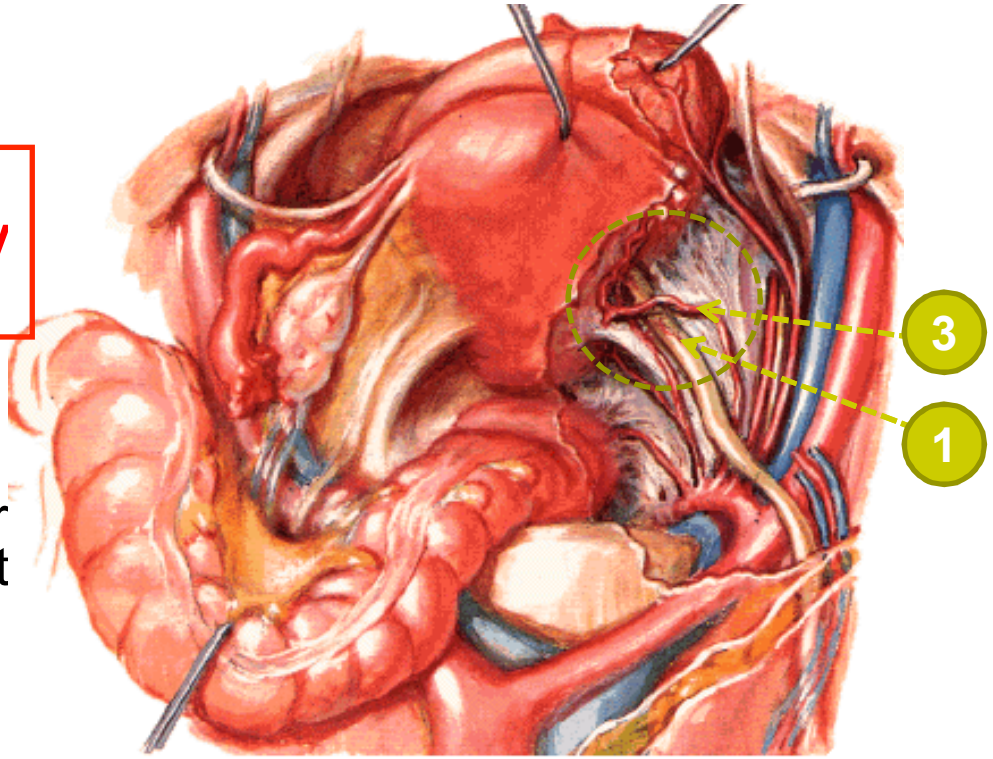
57. Ureter



- **Ureter [1]** crosses pelvic brim near bifurcation of common iliac artery
- **In male**, crossed superiorly by **ductus deferens [2]** near bladder
- **In female**, crossed anteriorly and superiorly by **uterine artery [3]** in base of broad ligament



- **N.B.** The **ureter can be damaged** during a **hysterectomy** or surgical repair of a prolapsed uterus because it lies posterior and inferior to the uterine artery.

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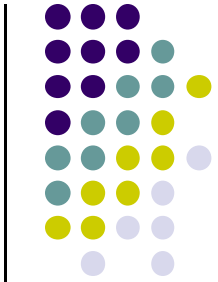
58. Nerve supply of pelvic viscera



Parasympathetic innervation:

- **Preganglionic** neurons are located in **sacral parasympathetic n. (S2-S4)** in the spinal cord.
- Their processes run into **pelvic splanchnic nerves** and relay with **postganglionic** neurons located inside of pelvic organs in the **intramural plexus**.

Sympathetic innervation:

- Sympathetic fibers of **preganglionic** neurons **T12-L2** segments (**IML**) come through the sympathetic trunk and form **sacral splanchnic nerves**.
- They contribute to the **inferior hypogastric plexus**, where **postganglionic** neurons are located. Branches of inferior hypogastric plexus reach organs wrapping around the branches of the internal iliac artery.

Sensory innervation:

- The sensory fibers from **S2-S4 dorsal root ganglions** comes together **with parasympathetic** and carry **pain** sensations from the organs.

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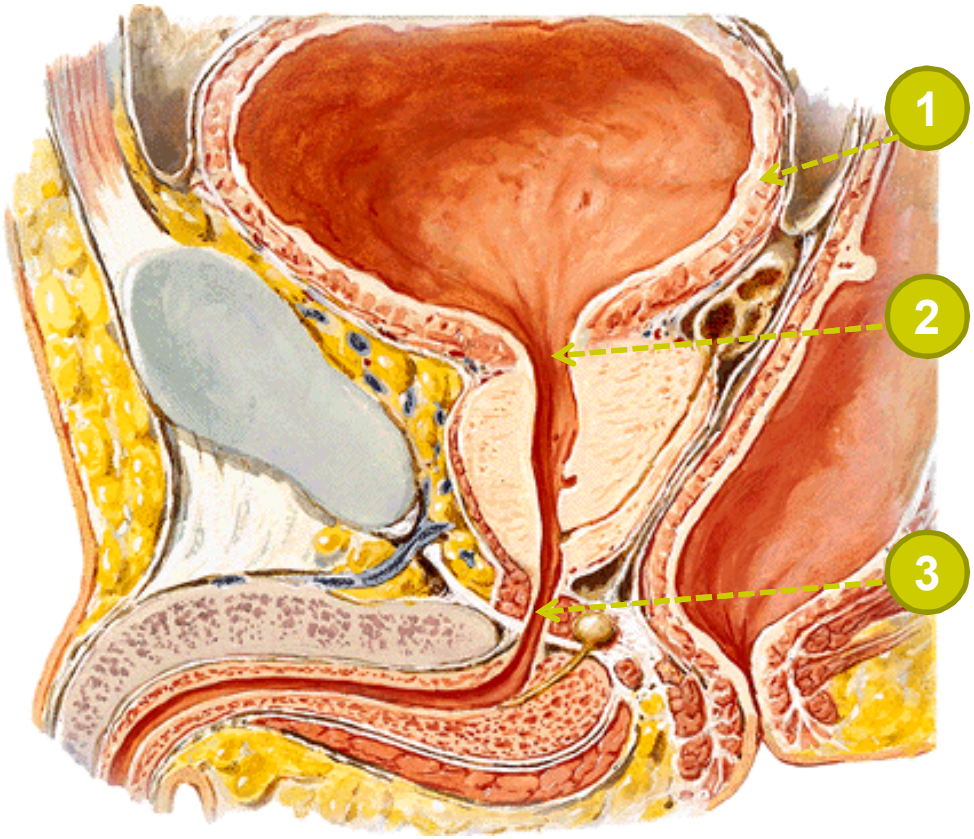
Micturition reflex



Facilitating emptying:

- **Parasympathetic** fibers (pelvic splanchnic nn.) **stimulate detrusor** muscle [1] contraction and involuntary relax internal sphincter [2].
- **Somatic motor** fibers (pudendal nerve) cause voluntary **relaxation** of **external** [3] urethral sphincter.

Inhibiting emptying:

- **Sympathetic** fibers (sacral splanchnic nn.) inhibit detrusor muscle [1] and **stimulate internal** sphincter [2].

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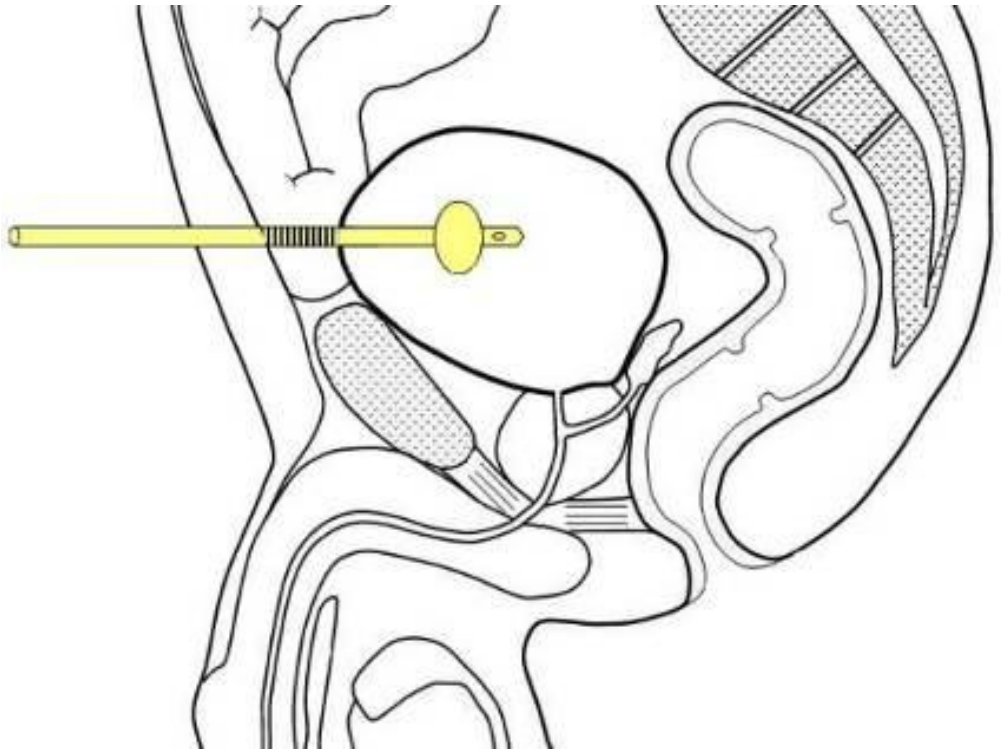
59. Paracentesis of urinary bladder



Suprapubic aspiration:

- **Urine can be removed** from the bladder without penetrating the peritoneum by inserting a needle **JUST ABOVE the pubic symphysis.**
- The needle passes successively through skin, superficial and deep layers of superficial fascia, linea alba, transversalis fascia, extraperitoneal connective tissue, and wall of the bladder.

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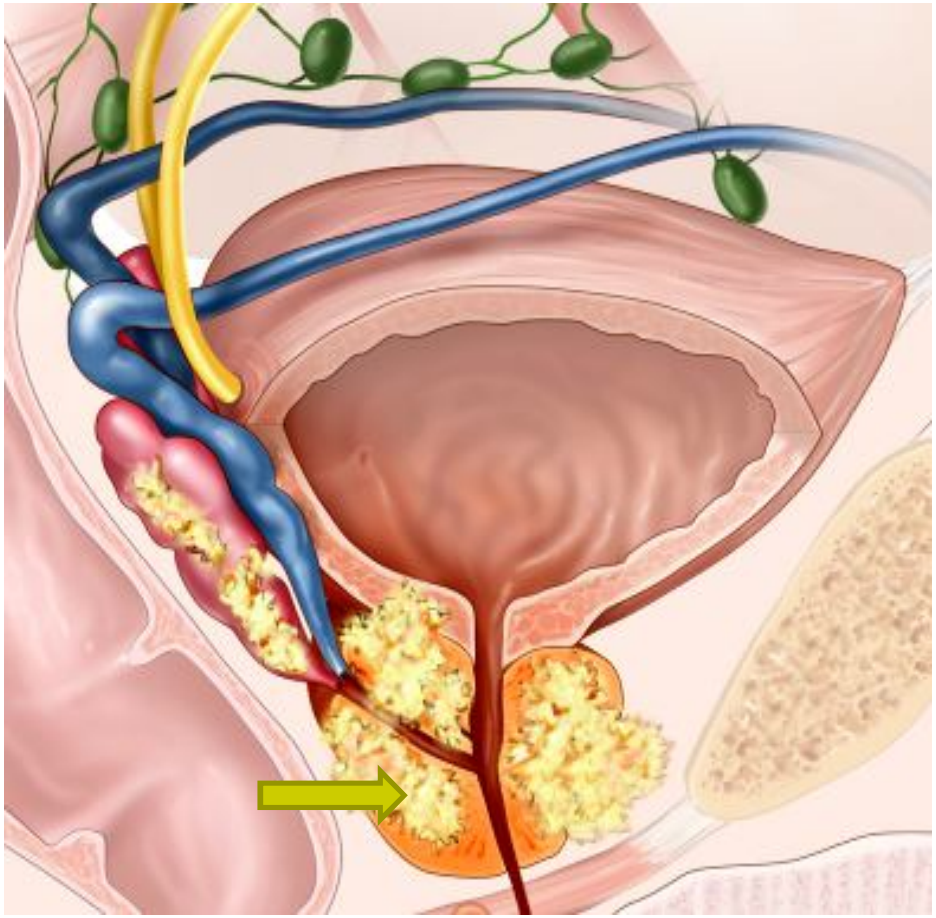
60. Prostate tumors
Prostate cancer



- It usually begins in the **posterior lobe** of the gland, and early stages are often asymptomatic.
- Later malignant enlargement of the prostate can narrow or occlude the prostatic urethra.

- **N.B.** Prostatic malignancies tend to **metastasize to vertebrae** and the **brain** because the **prostatic venous plexus** has numerous connections with the **vertebral venous plexus via sacral veins**.

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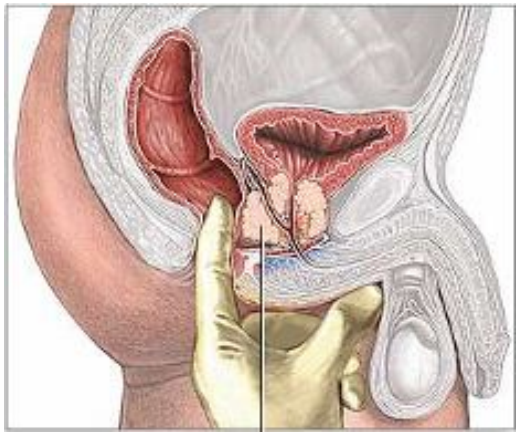
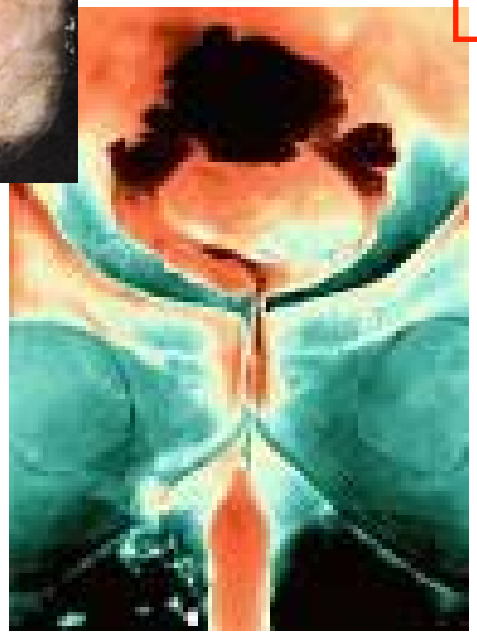
Benign hypertrophy of the prostate (BHP)





- **BHP** is common in **men after middle age.**
- **Prostate adenoma** (benign hypertrophy) usually involves **median lobe**.
- **BHP** is a common cause of **urethral obstruction**, leading to **nocturia** (need to void during the night), **dysuria** (difficulty and/or pain during urination), and **urgency** (sudden desire to void).
- The **prostate is examined** for enlargement and tumors by **DIGITAL RECTAL examination.**

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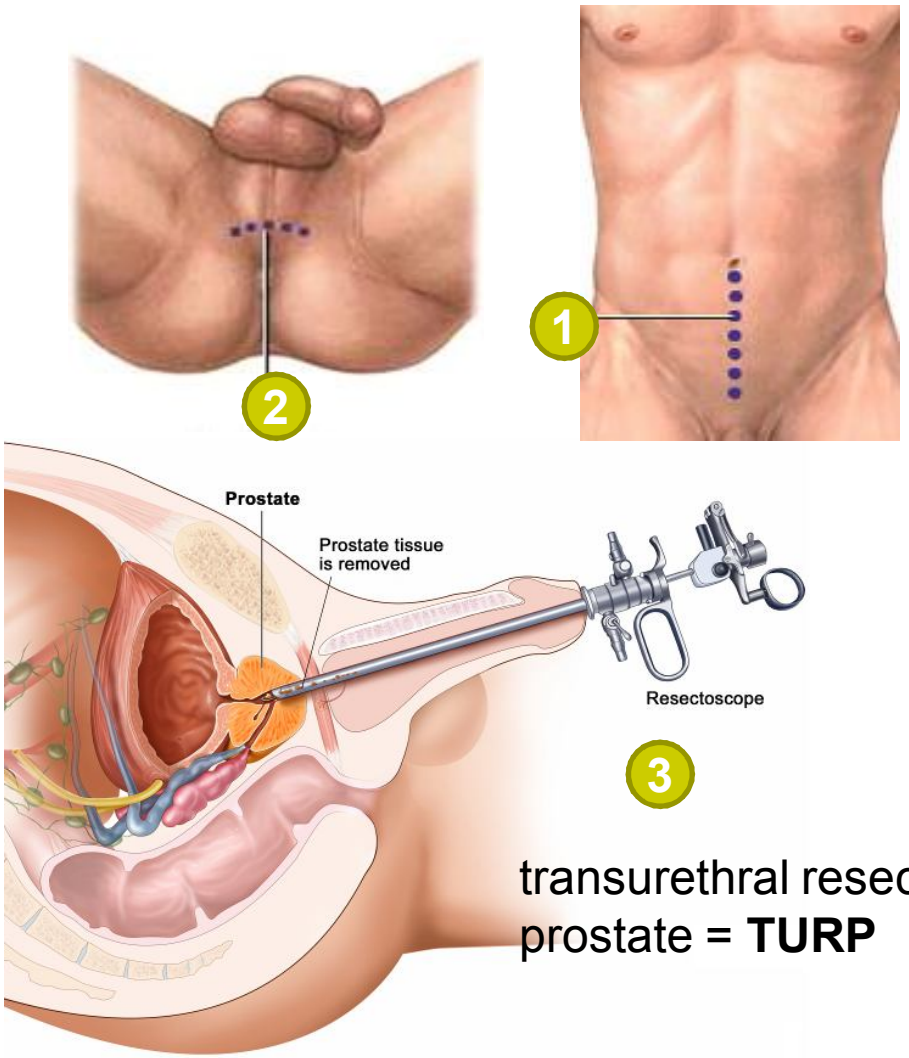
Prostatectomy



- A prostatectomy may be performed through a **suprapubic [1]** or **perineal [2]** incision or **transurethrally**.
- Because damage to nerves in the capsule of the prostate and around the urethra (**cavernous nerves**) **can cause impotence** and/or **urinary incontinence.**

transurethral resection of the prostate = **TURP**

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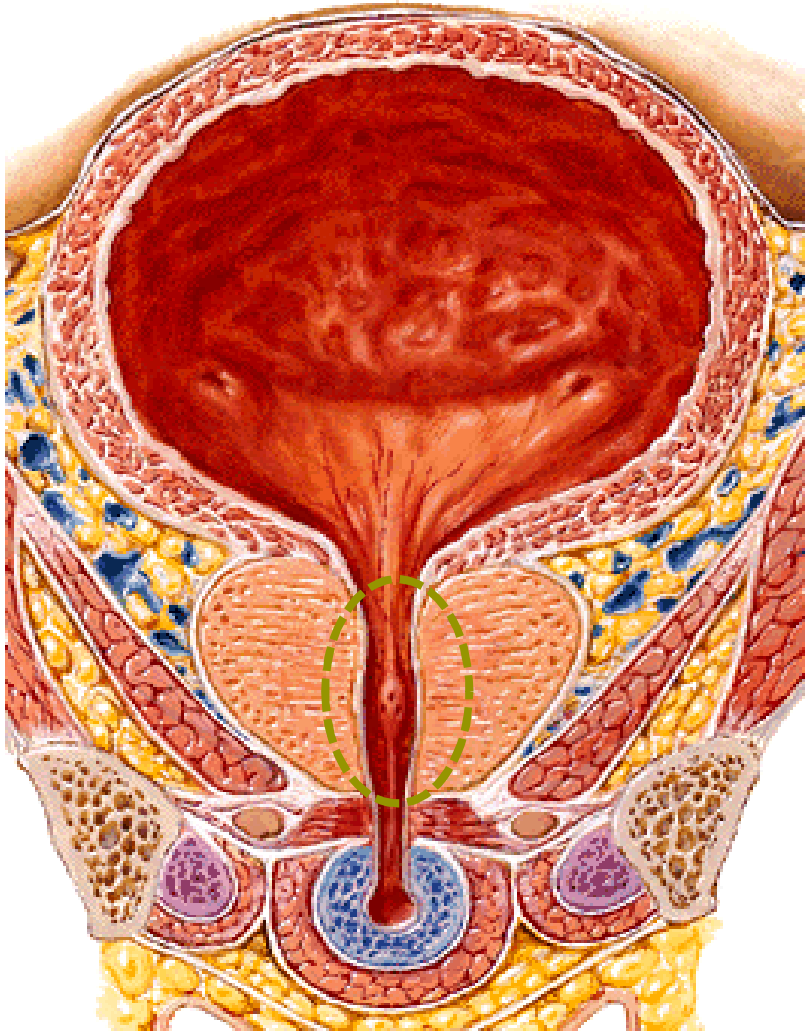
61. Male urethra
Prostatic part

- It is the **widest and the most dilatable part.**
- It is **spindle** shaped (middle part is dilated)
- Its posterior wall presents the following features:
  - Urethral crest - vertical ridge in the midline
  - Seminal colliculus- a spherical swelling in the middle of the urethral crest
  - **Openings of the 2 ejaculatory ducts** are seen on each side on the seminal colliculus
  - Ducts of the prostate gland open into the male urethra



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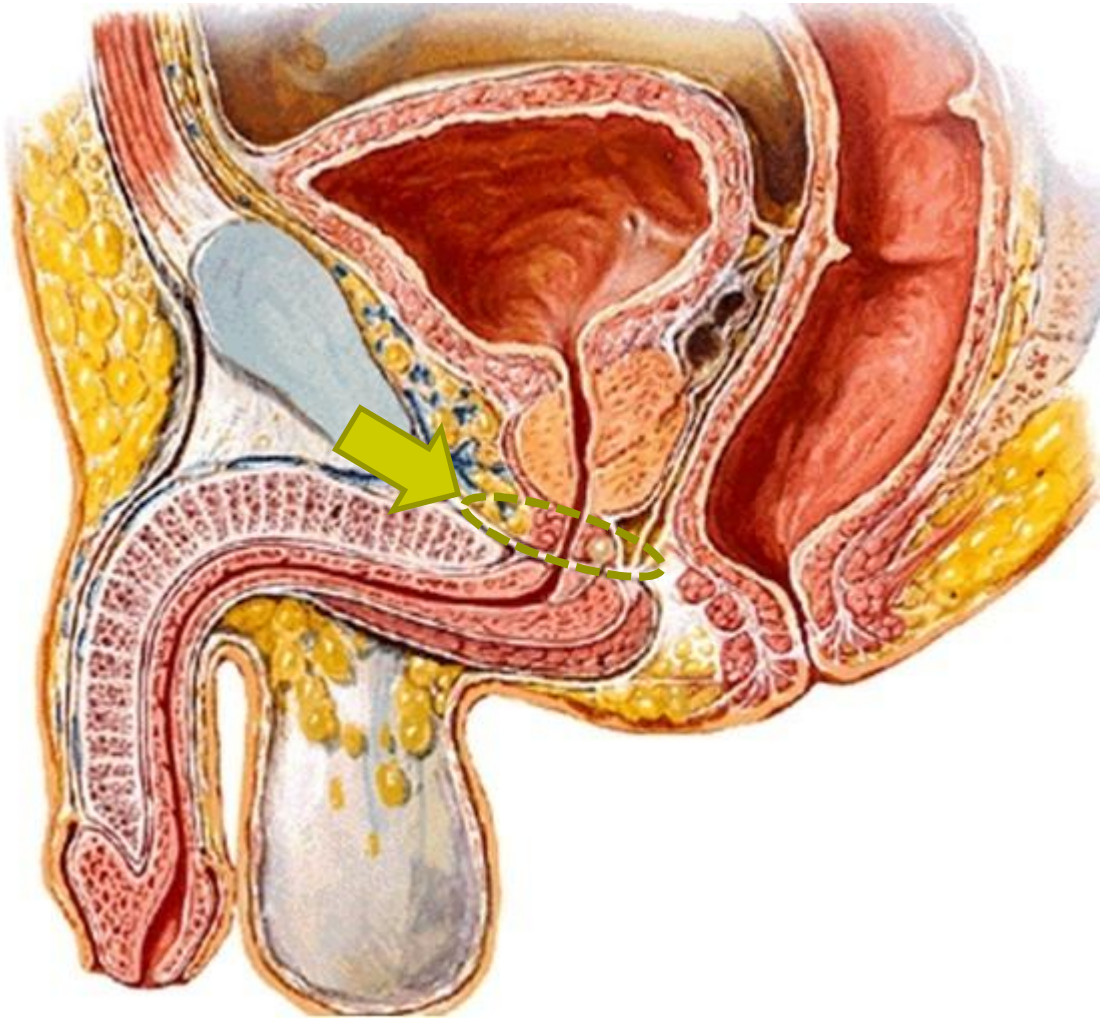
Membranous part



- Passes through the **urogenital diaphragm** to enter the bulb of the penis
- It is the **shortest, narrowest** and the least dilatable part
- It is surrounded by the **external sphincter** urethra
- **Bulbourethral glands** lie posterolateral to this part inside of urogenital diaphragm (**deep perineal pouch**)

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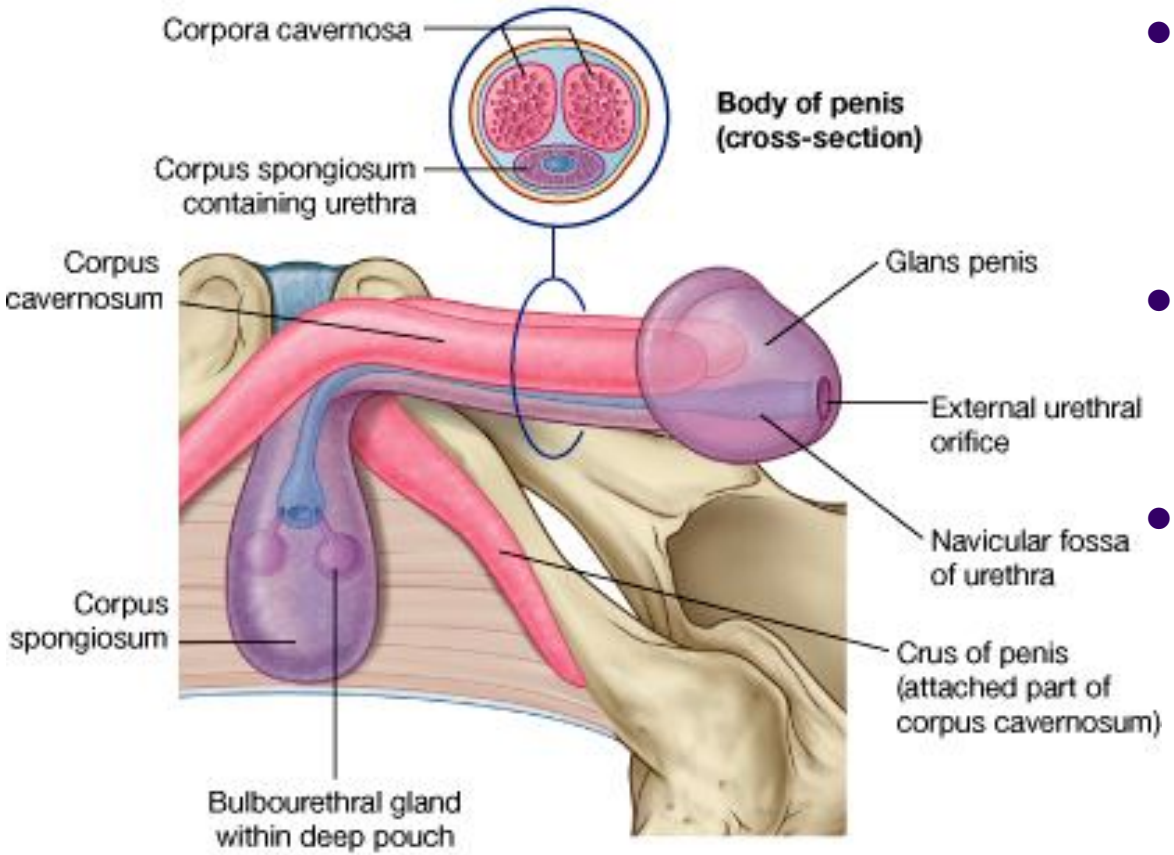
Spongy part



- Average 15 cm in length.
- Passes through the bulb and corpus spongiosum of the penis to open at the external urethral orifice on the tip of the glans penis.
- There are two dilatations – **bulbar fossa** (in the beginning) and **navicular fossa** (in the glans penis)
- Ducts of the bulbourethral glands open into the floor of the spongy part in its beginning

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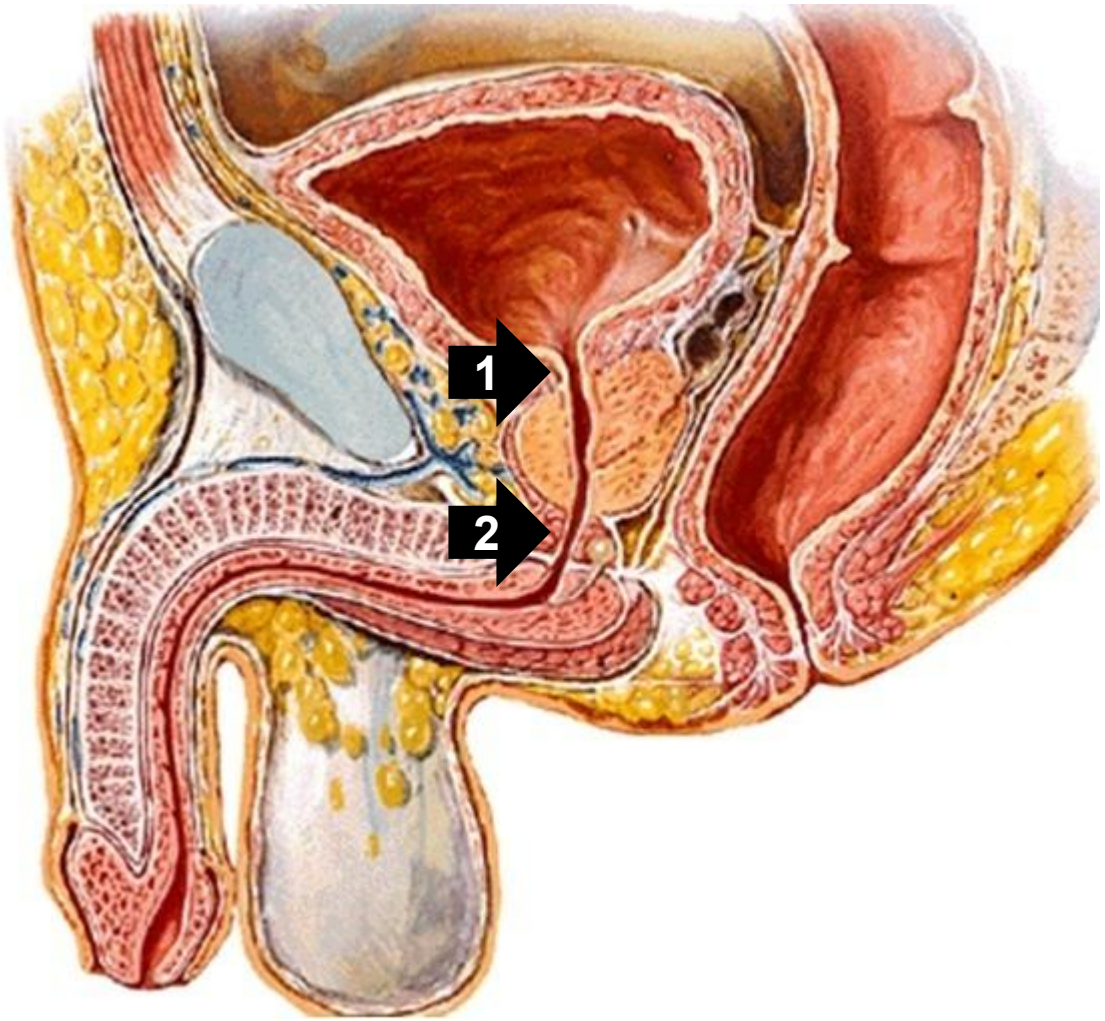
Sphincters of the urethra



1. **Internal** urethral sphincter is made of **smooth** muscles in the neck of the **bladder** and has **sympathetic** innervation

2. **External** urethral sphincter has **skeletal muscle fibers** and surrounds the **membranous** part of **urethra**, supplied by the perineal branch of the **pudendal nerve**

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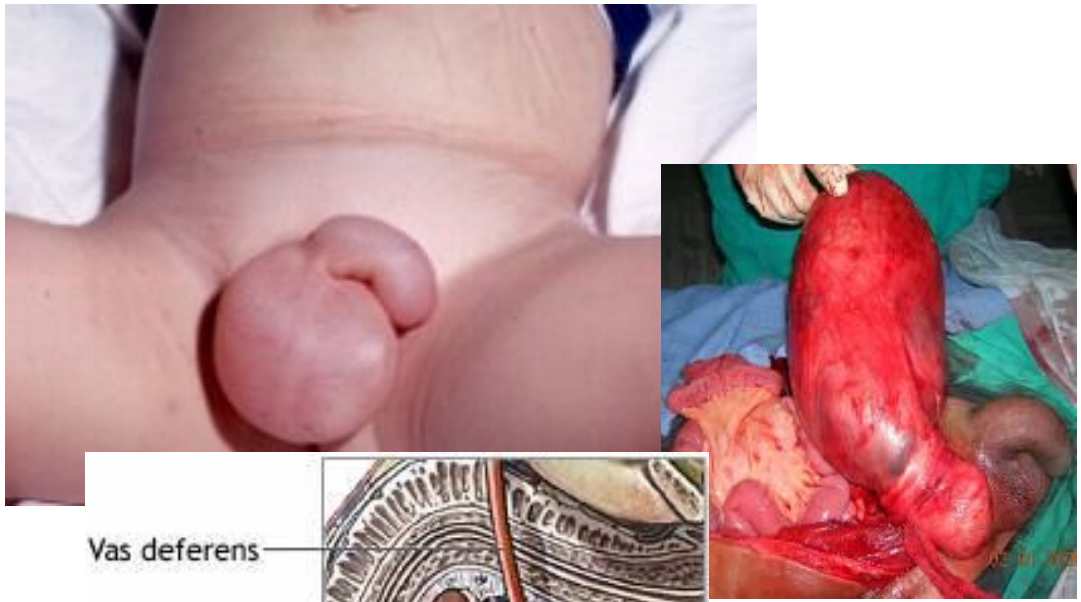
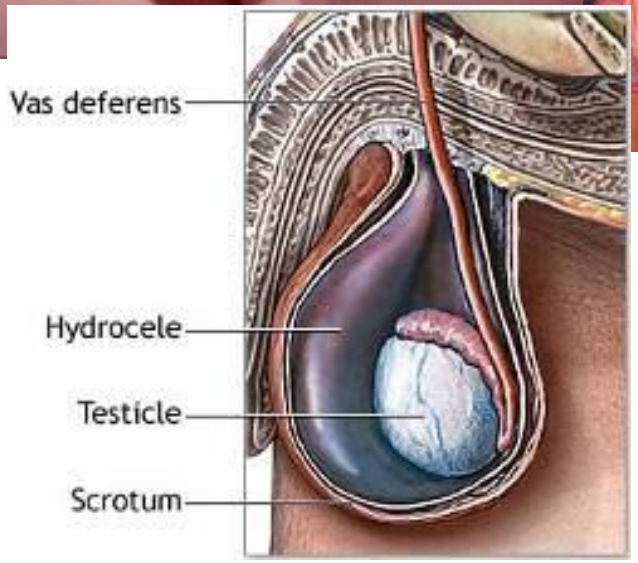
62. Hydrocele & hematocele





- The **tunica vaginalis** testis or other remnants of the processus vaginalis may form a **hydrocele** or **hematocele**.

- **With transillumination, a hydrocele produces a reddish glow**, whereas light will not penetrate other scrotal masses such as a **hematocele**, solid tumor, or **herniated bowel**.

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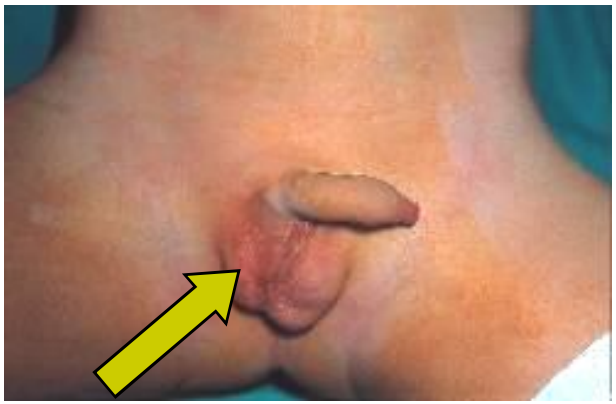
63. Cryptorchism



- **Undescended testes (cryptorchism)** occurs when the **testes fail to descend** into the scrotum. This normally occurs within **3 months** after birth.
- The undescended testes may be found in the abdominal cavity or in the **inguinal canal**.
- If neglected, **malignant transformation** may occur in the undescended testis.
- **N.B.** In case of cryptorchism, **spermatogenesis is arrested** and the spermatogenic tissue is damaged leading to permanent **sterility in bilateral** cases.

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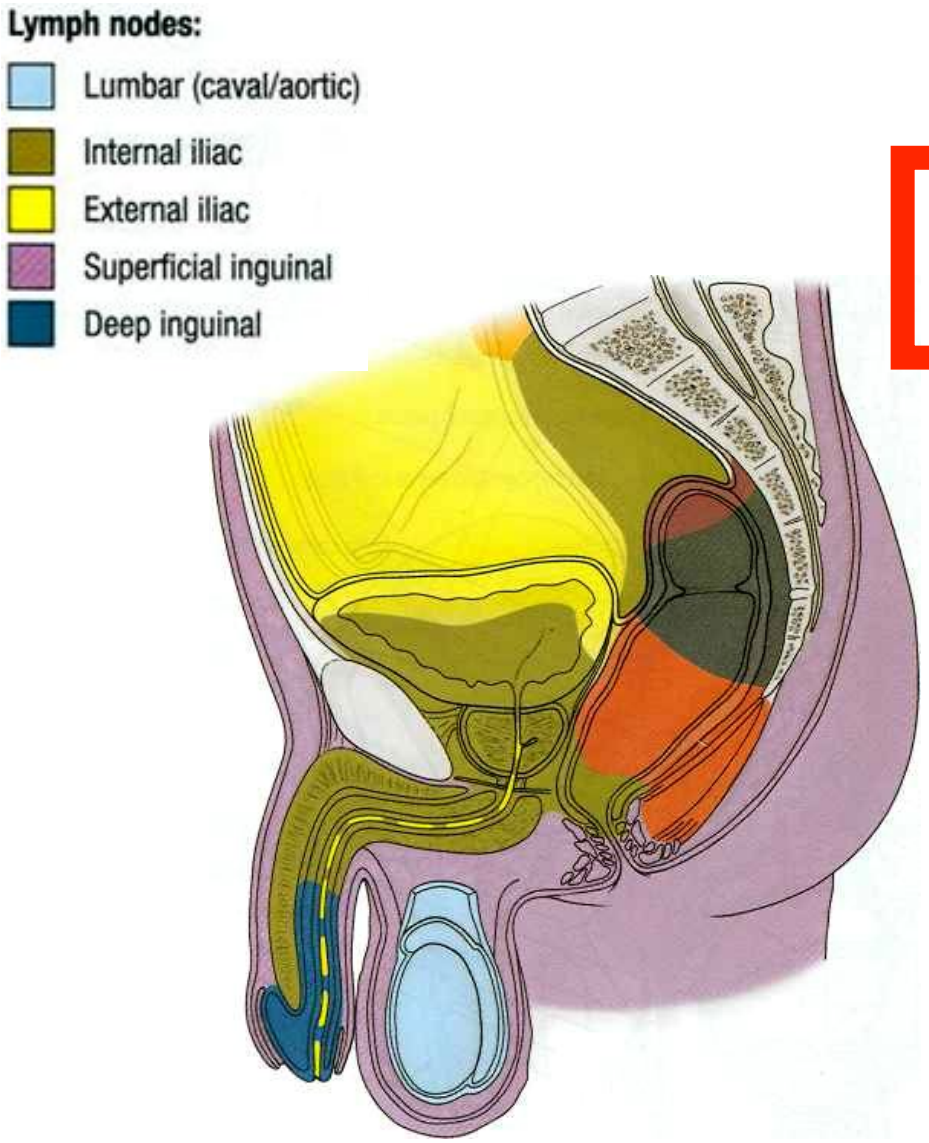
64. Lymphatic drainage of the male viscera



- **Testis** & **epididymis** – **lumbar** lymph nodes
- **Scrotum** – **superficial inguinal** nodes
- **Penis**:
  - skin - **superficial inguinal** nodes
  - glans – **deep inguinal** nodes
  - body and roots – **internal iliac** nodes
- **Prostate** gland & **bladder** - **internal iliac** nodes
- **Anal canal:**
  - above pectinate line - **internal iliac**
  - below pectinate line - **superficial inguinal** nodes

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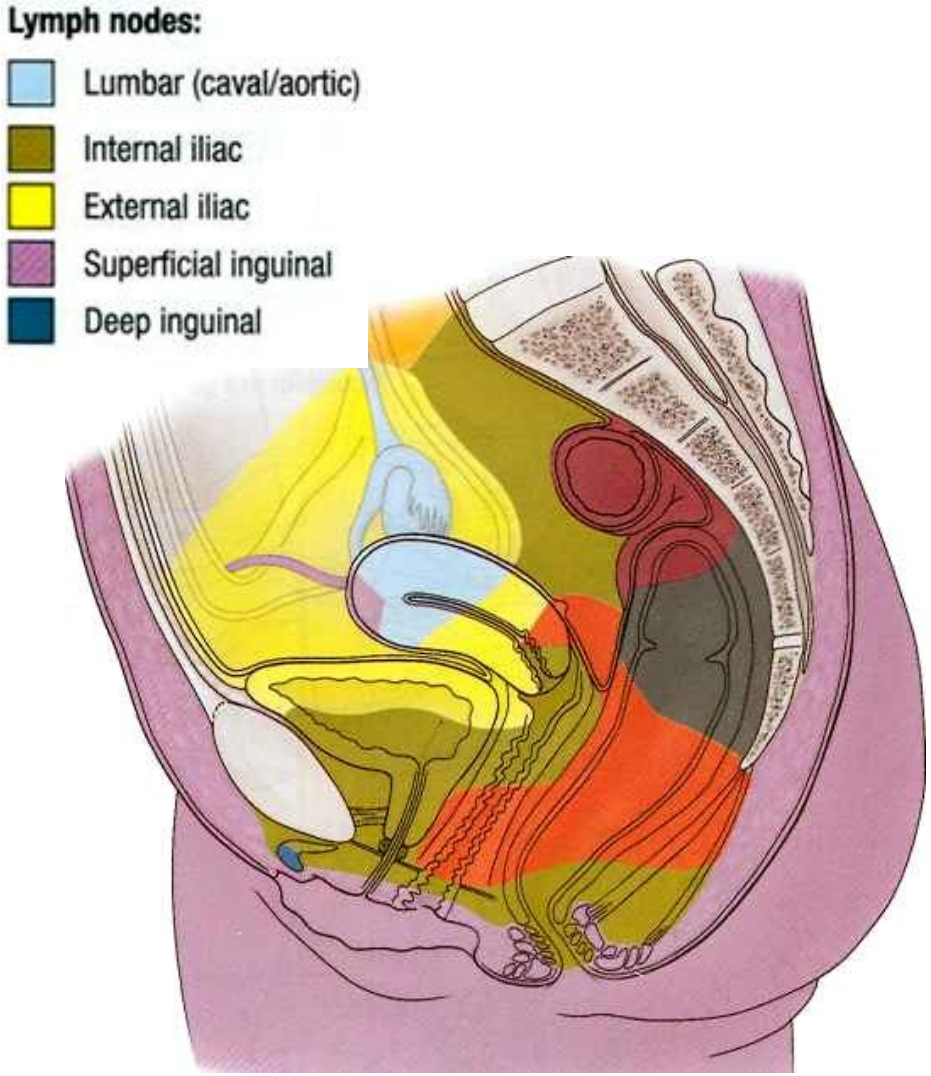
65. Lymphatic drainage from the female viscera



- **Ovary** and **uterine tubes** – to **lumbar** lymph nodes
- **Uterus:**
  - **lateral angle** and teres ligament – **superficial inguinal** lymph nodes
  - **fundus** and **upper** part of the **body** - **lumbar** lymph nodes
  - **lower** part of the **body** - **external iliac** lymph nodes
  - **cervix** - **external** & **internal iliac**
- **Vagina**:
  - Superior to hymen - to **external** & **internal iliac**
  - Inferior to hymen - to **superficial**
- **All external genitalia** (with exception - glans clitoris) - **superficial inguinal** lymph nodes

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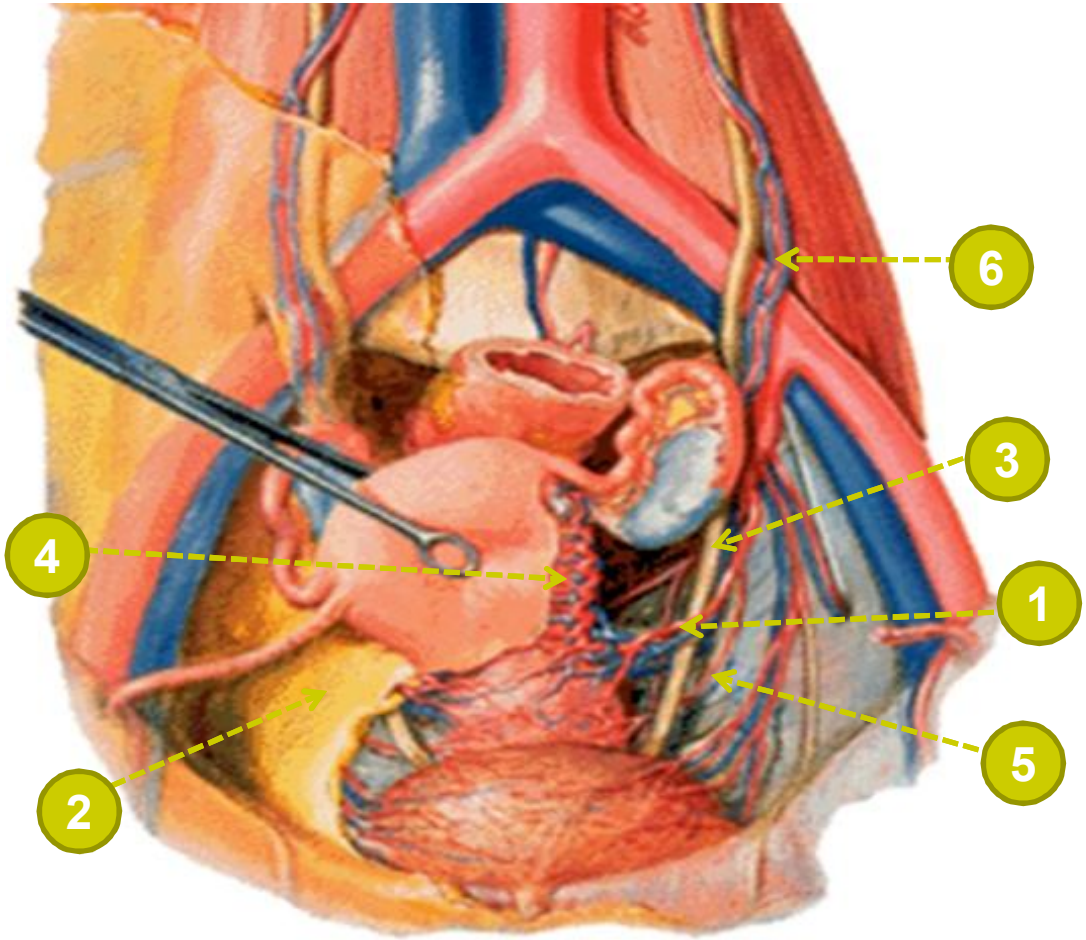
66. Arterial supply of the uterus



The **uterus** is almost exclusively supplied by the **uterine arteries [1] (from internal iliac artery)**:

- Crosses pelvic floor in **transverse cervical ligament** on the base of **broad ligament [2]**
- Near uterus, passes superior and anterior to **ureter [3]**
- Ascends along **lateral wall [4]** of uterus within broad ligament
- Vaginal branch anastomoses with **vaginal artery [5]**
- Ovarian branch anastomoses with **ovarian artery [6]**

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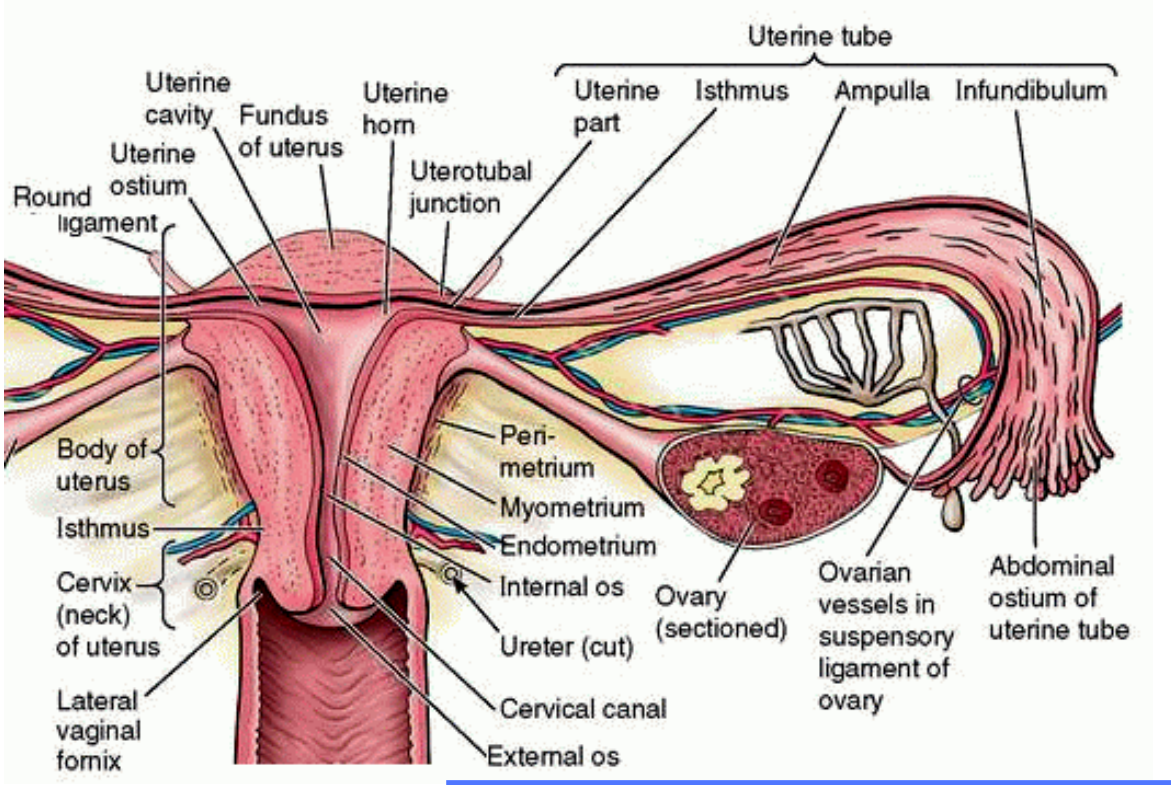
67. Parts of the uterine tube



uterus is amped w fun!

- **Uterine part**
  - Pierces uterine wall to open into uterine cavity
- **Isthmus**
  - **Narrowest** part of tube just lateral to uterus
- **Ampulla**
  - Medial continuation of infundibulum comprising about half of uterine tube
  - Usual site of **fertilization**
- **Infundibulum**
  - Funnel-shaped expansion of lateral end, fringed with fimbriae
  - Overlies ovary and **receives oocyte** at ovulation

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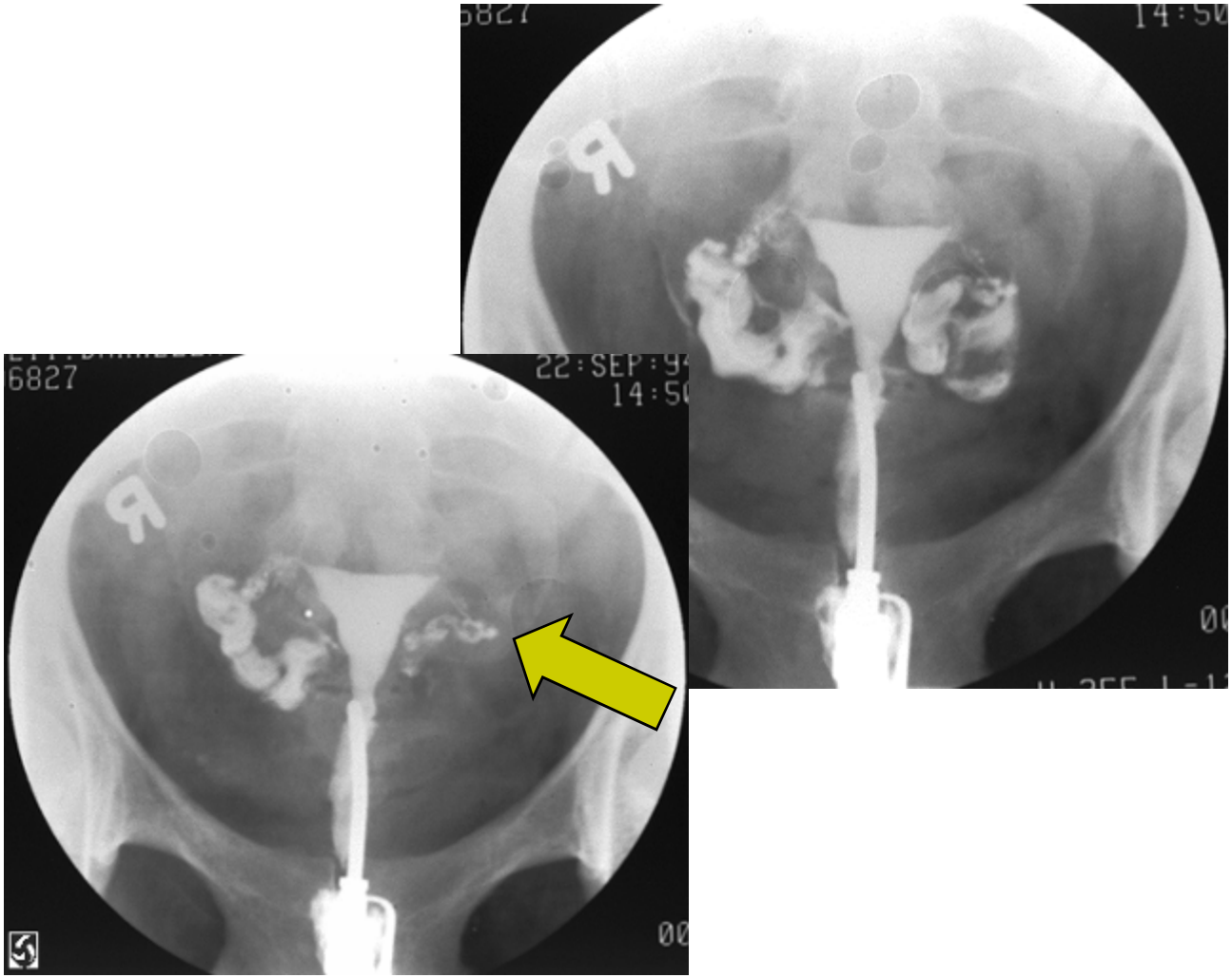
Hysterosalpingography



- The **instillation of viscous iodine through** the external os of the **uterine cervix** allows the lumen of the **cervical canal**, the **uterine cavity**, and the different parts of the **uterine tubes** to be visualized on X-ray.

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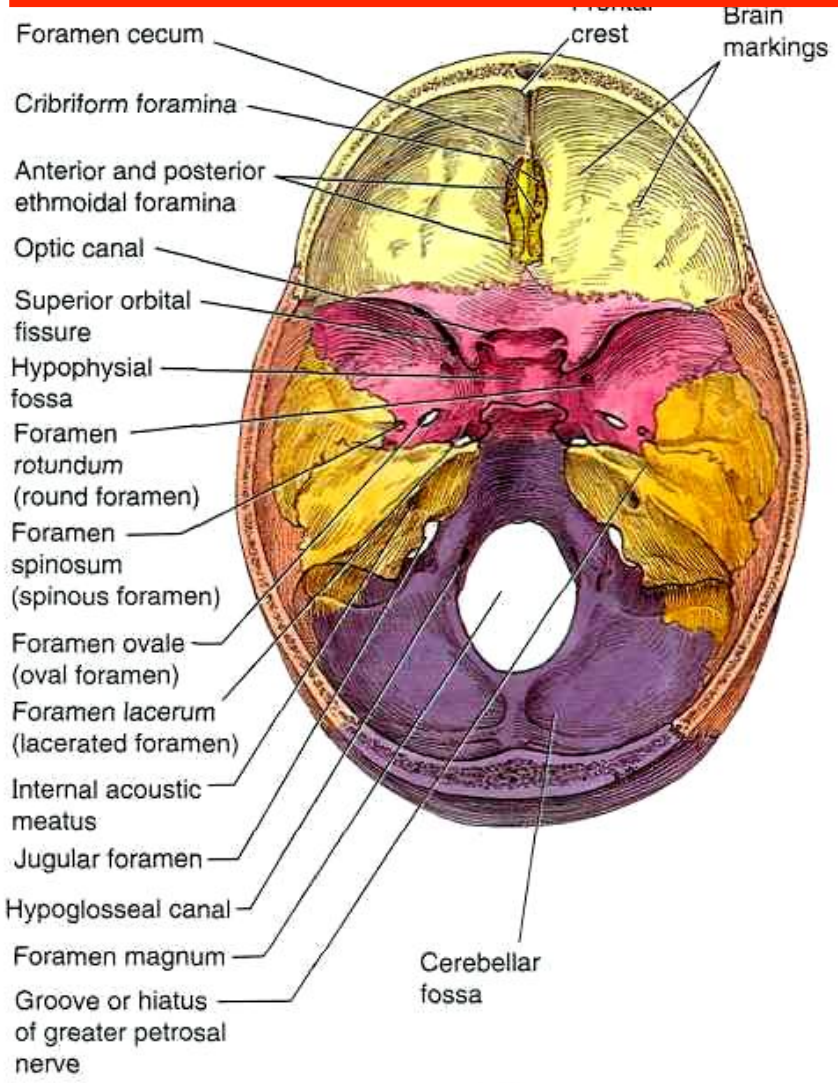
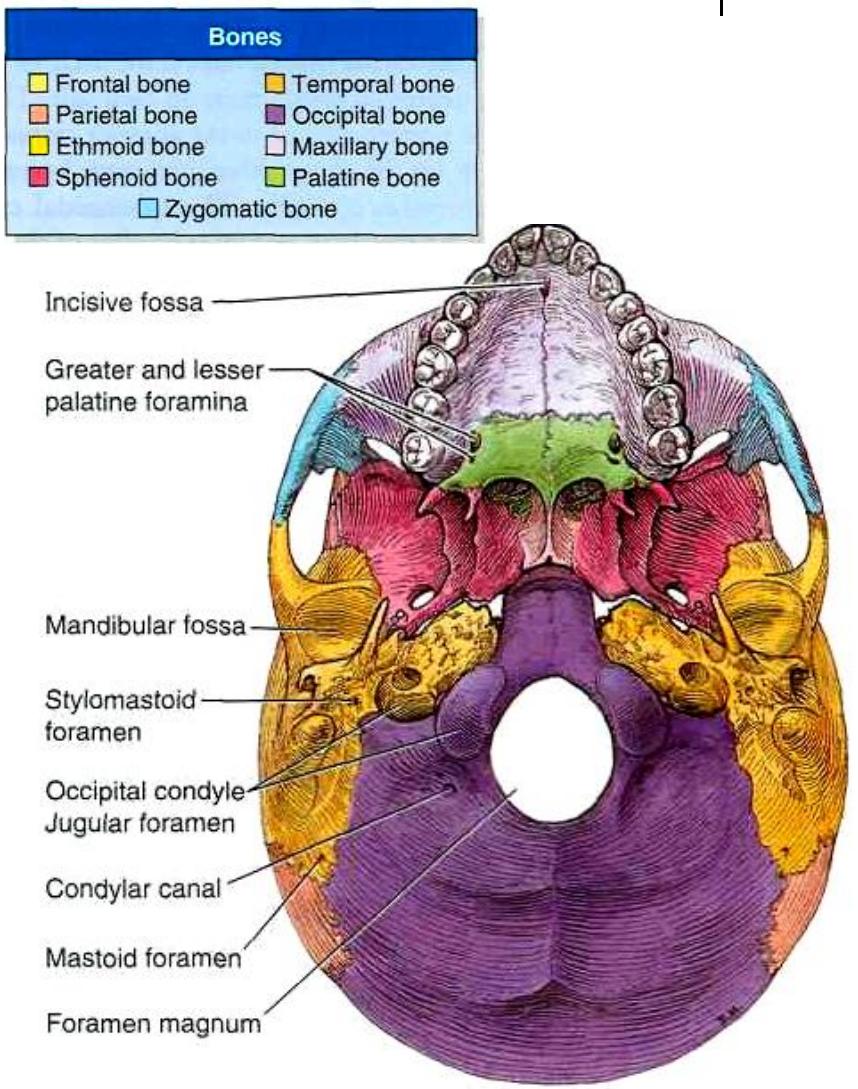
68. Foramina of the base of the skull





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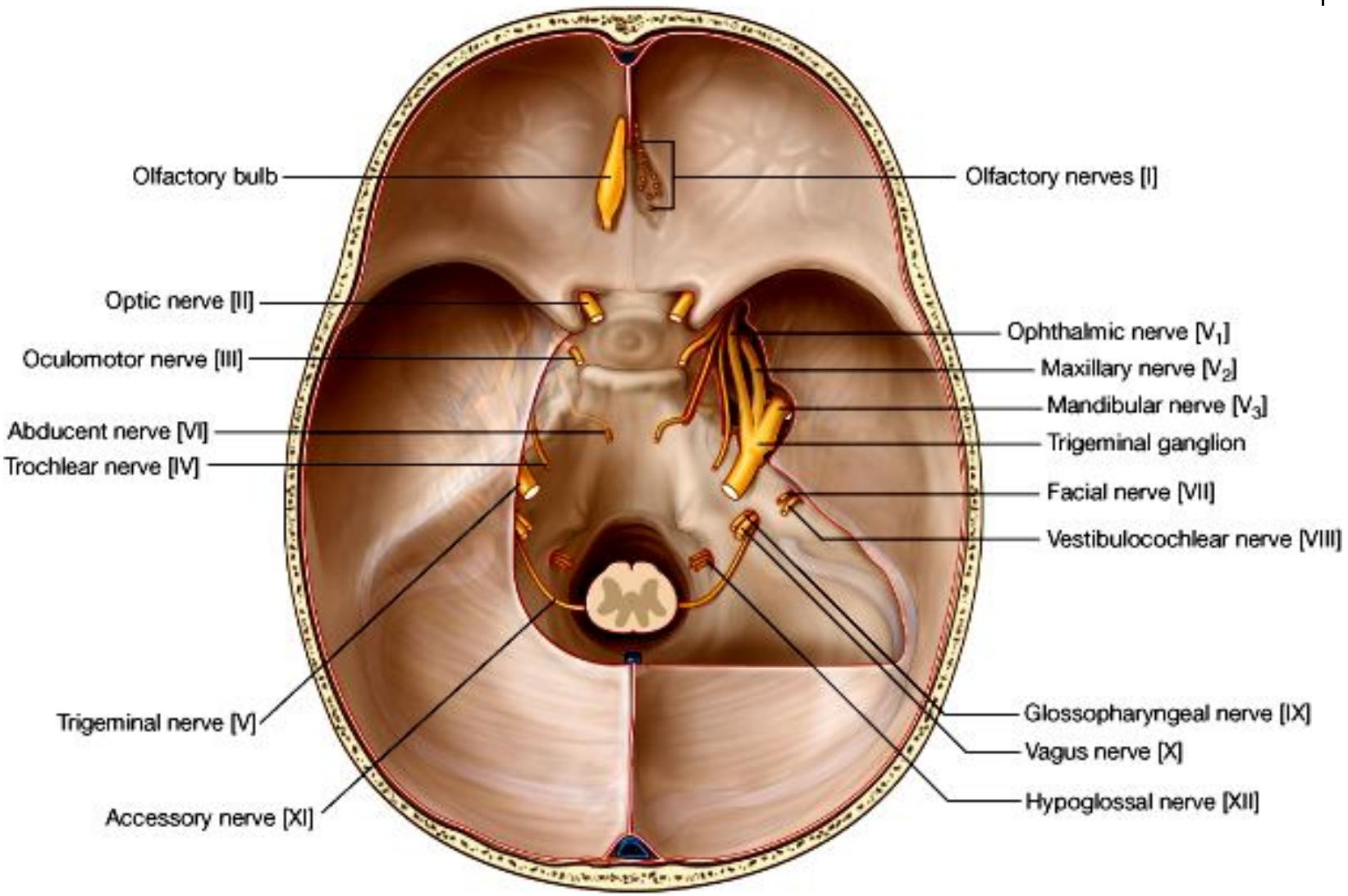
Exit of cranial nerves



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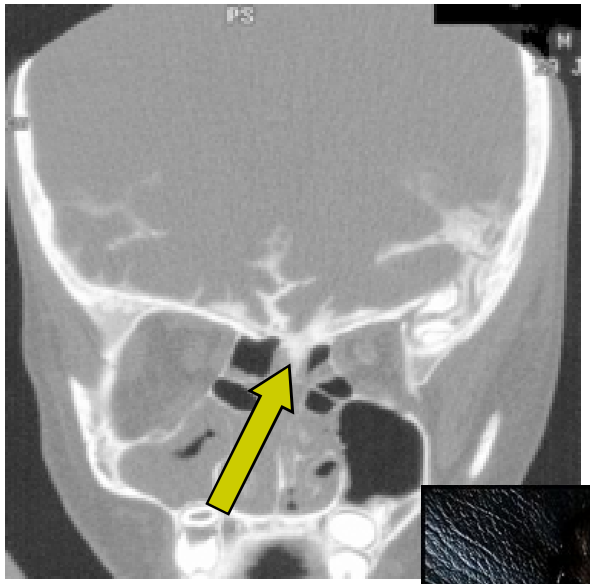
69. Fracture of the anterior cranial fossa



- **Fracture** of the **anterior cranial fossa (cribriform plate of the Ethmoid bone)** is suggested by **anosmia**, **periorbital bruising** (raccoon eyes), and **CSF leakage** from the **nose** (**rhinorrhea**).

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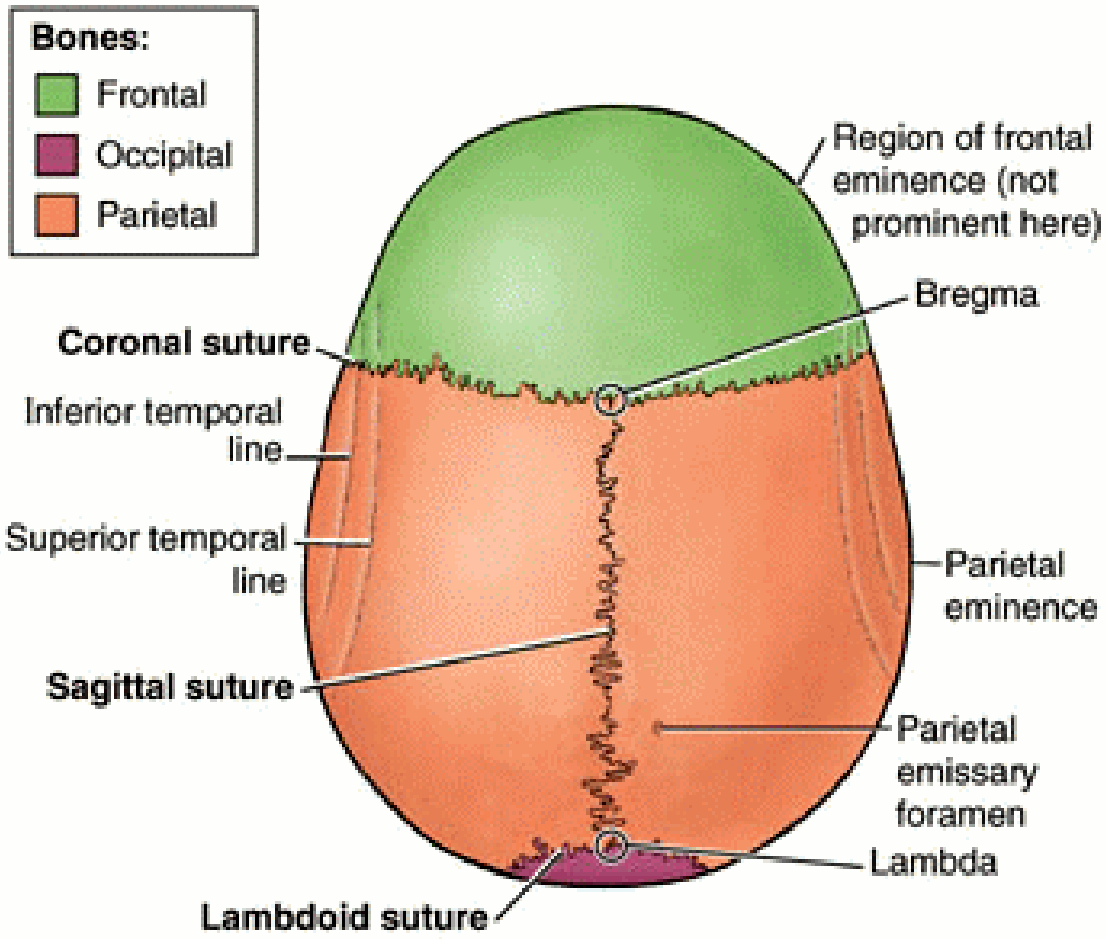
70. Development of skull
Sutures of neurocranium



- **Coronal suture:** lies between the frontal bone and the two parietal bones.
- **Sagittal suture:** lies between the two parietal bones.
- **Squamous suture**: lies between the parietal bone and the squamous part of the temporal bone.
- **Lambdoid suture:** lies between the two parietal bones and the occipital bone.

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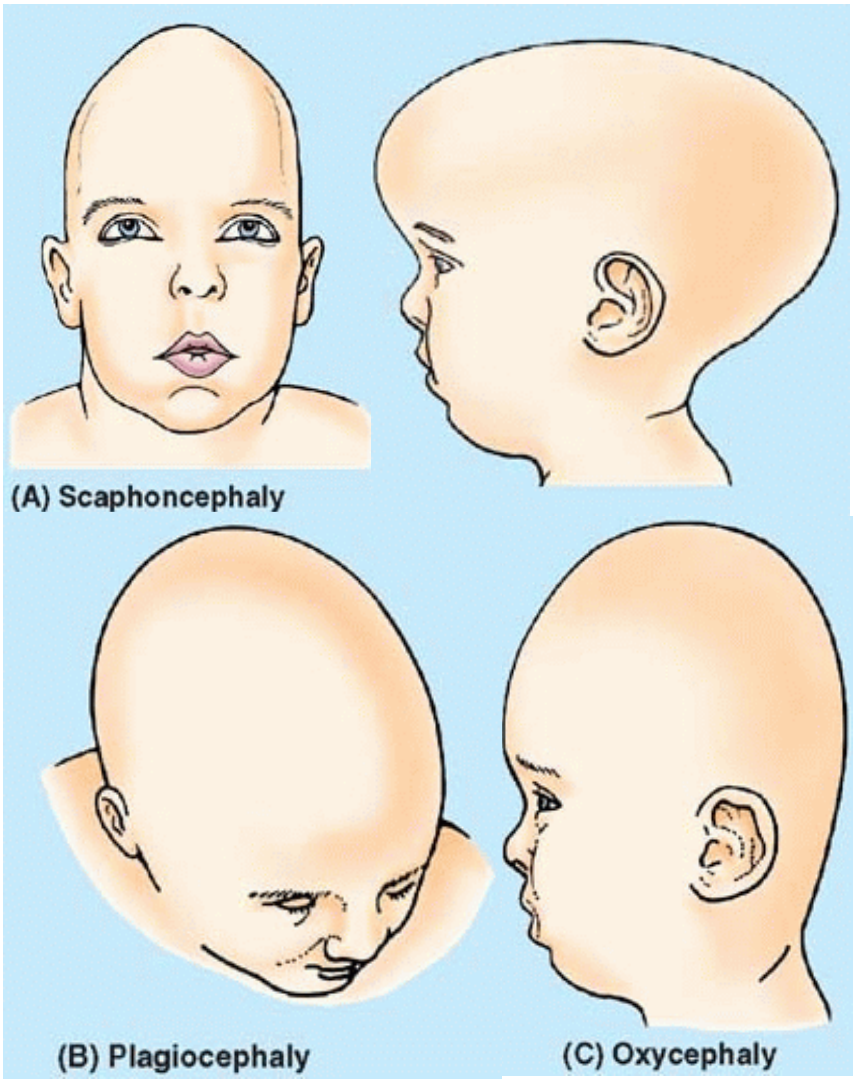
Cranial Malformations



- **[A] Scaphocephaly:** premature closure of the **sagittal suture**, in which the anterior fontanelle is small or absent, results in a **long, narrow, wedge-shaped** cranium.
- **[C] Oxycephaly**: premature closure of the **coronal suture** results in a **high, tower-like** cranium.
- When premature closure of the coronal or the lambdoid suture occurs on **one side only**, the cranium is twisted and asymmetrical, a condition known as **plagiocephaly [B].**

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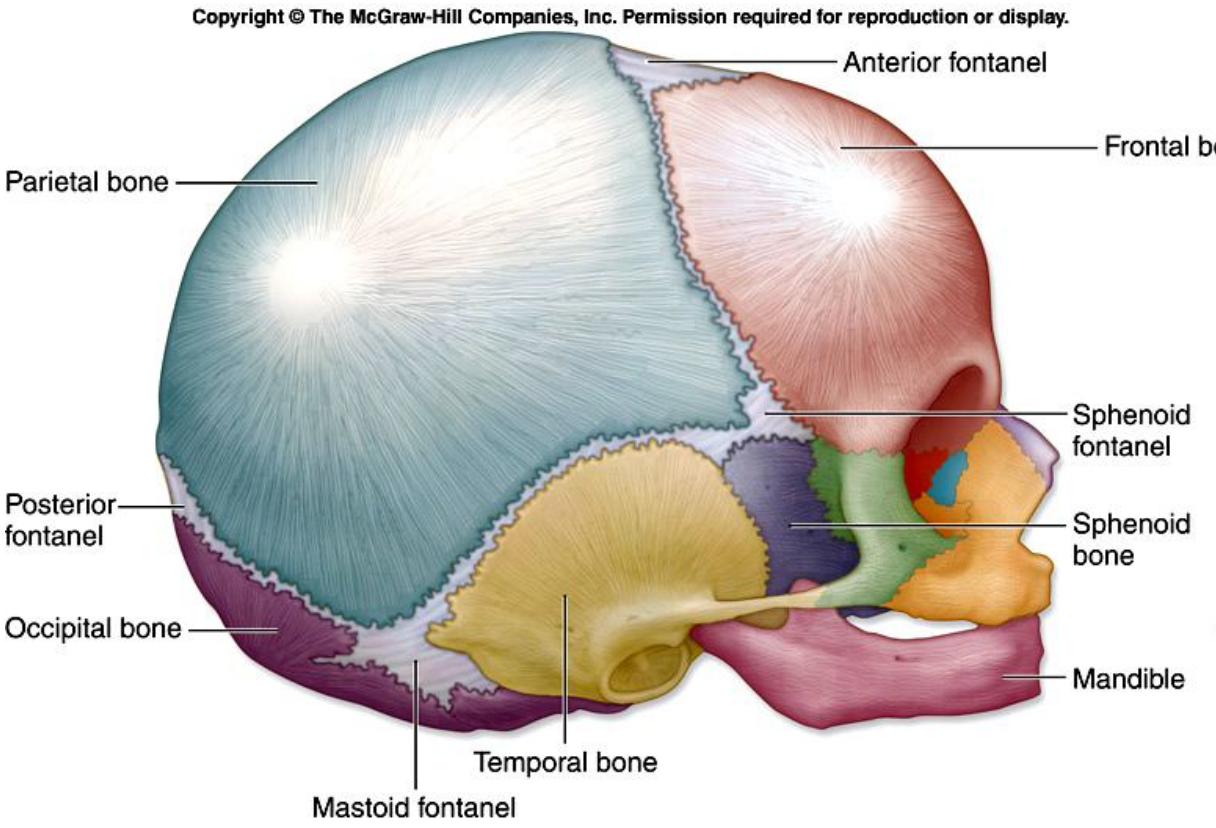
Fontanelles



Anterior fontanelle

- present at birth; closes at age **9 to 18 months**
- diminished size or absence at birth may indicate **craniosynostosis** or **microcephaly**.

Posterior fontanelle

- present at birth; usually closes by age **2 months**
- Persistence suggests underlying **hydrocephalus** or congenital **hypothyroidism**.

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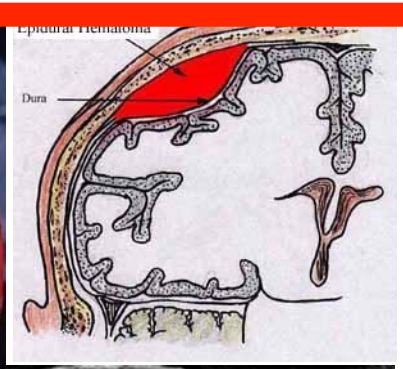
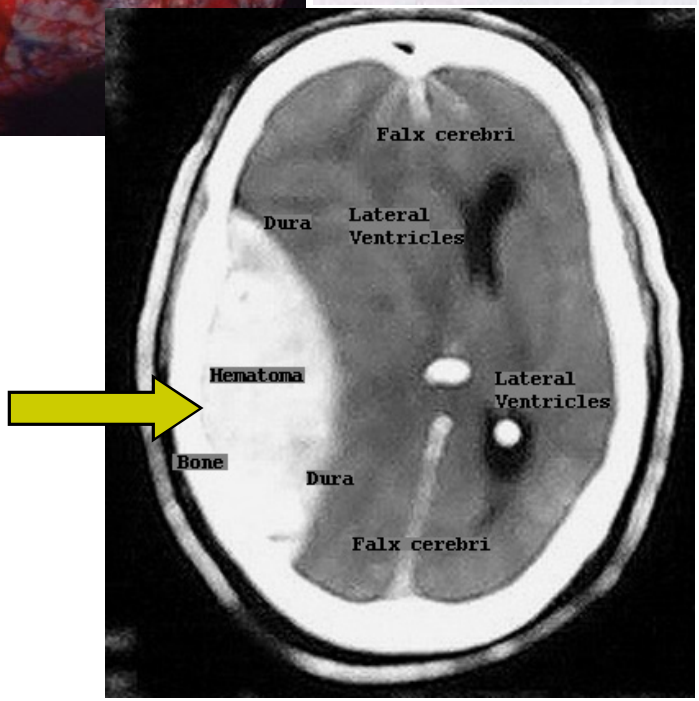
74. Epidural hematoma





- Skull fracture near **pterion** often causes epidural hematoma from torn **middle meningeal artery**.
- Unconsciousness and **death** are **rapid** because the bleeding dissects a **wide space** as it strips the dura from the inner surface of the skull, which puts pressure on the brain.
- An epidural hematoma forms a characteristic **biconvex pattern** on computed tomography images.

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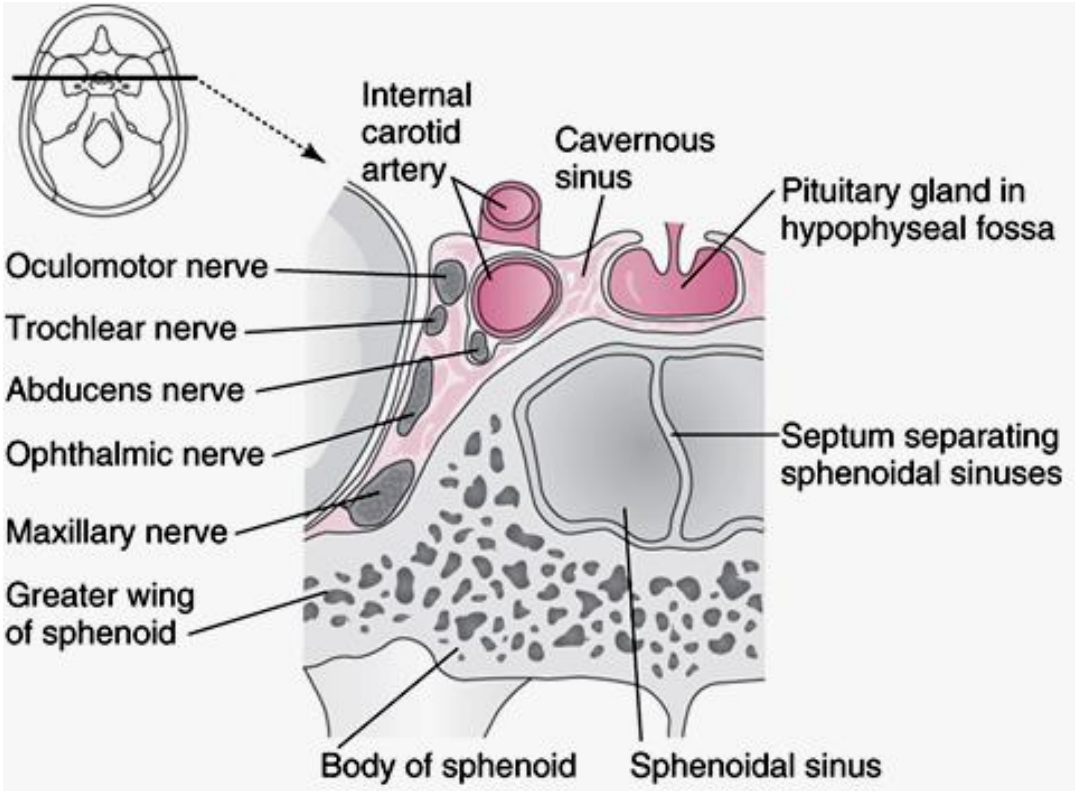
75. Infection of the Cavernous sinus



- Lateral to body of sphenoid bone and sella turcica, forming lateral wall of hypophyseal fossa

Related structures:

- Structures that pass **through** sinus:

1. **Internal carotid artery** and internal carotid plexus
2. **Abducens nerve** (CN VI)

- Structures on lateral wall of sinus:

1. **Oculomotor nerve** (CN III)
2. **Trochlear nerve** (CN IV)

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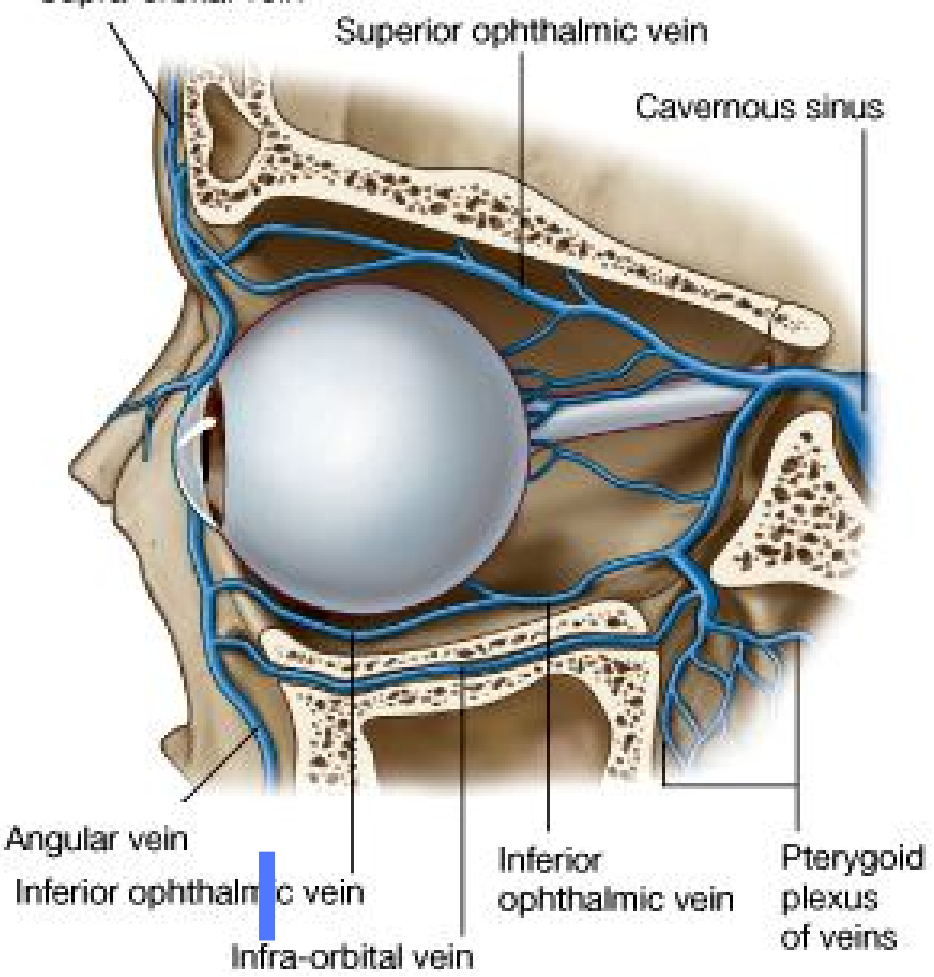
Ophthalmic Veins



- **Superior ophthalmic vein** – communicates anteriorly with the **facial (angular) vein**
- **Inferior ophthalmic vein** – communicates through the inferior orbital fissure with the **pterygoid plexus** of veins

❖ **Both veins** pass posteriorly through the superior orbital fissure and **drain into the Cavernous sinus**

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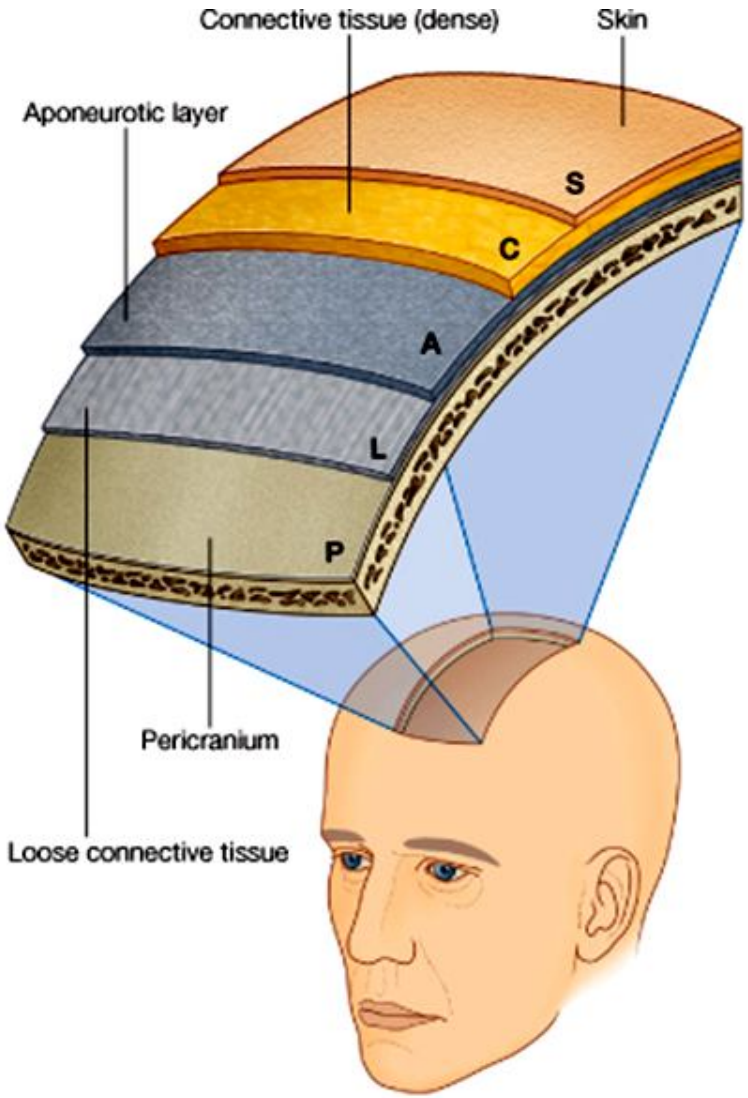
76. Layers of the scalp



1. **Skin** - contains numerous sweat glands, **sebaceous glands**, and hair follicles
2. **Connective tissue- Dense** superficial fascia containing nerves and **blood vessels**
3. **Aponeurosis** (Epicranial) -Fibrous epicranial aponeurosis connecting frontalis and occipitalis parts of **occipitofrontalis** muscle
4. **Loose areolar tissue -**Allows 3 more superficial layers **to move** over skull surface; somewhat like a sponge because it contains innumerable **potential spaces** capable of being distended with fluid resulting from **injury or infection**
5. **Pericranium -periosteum** covering the outer surface of the skull bones

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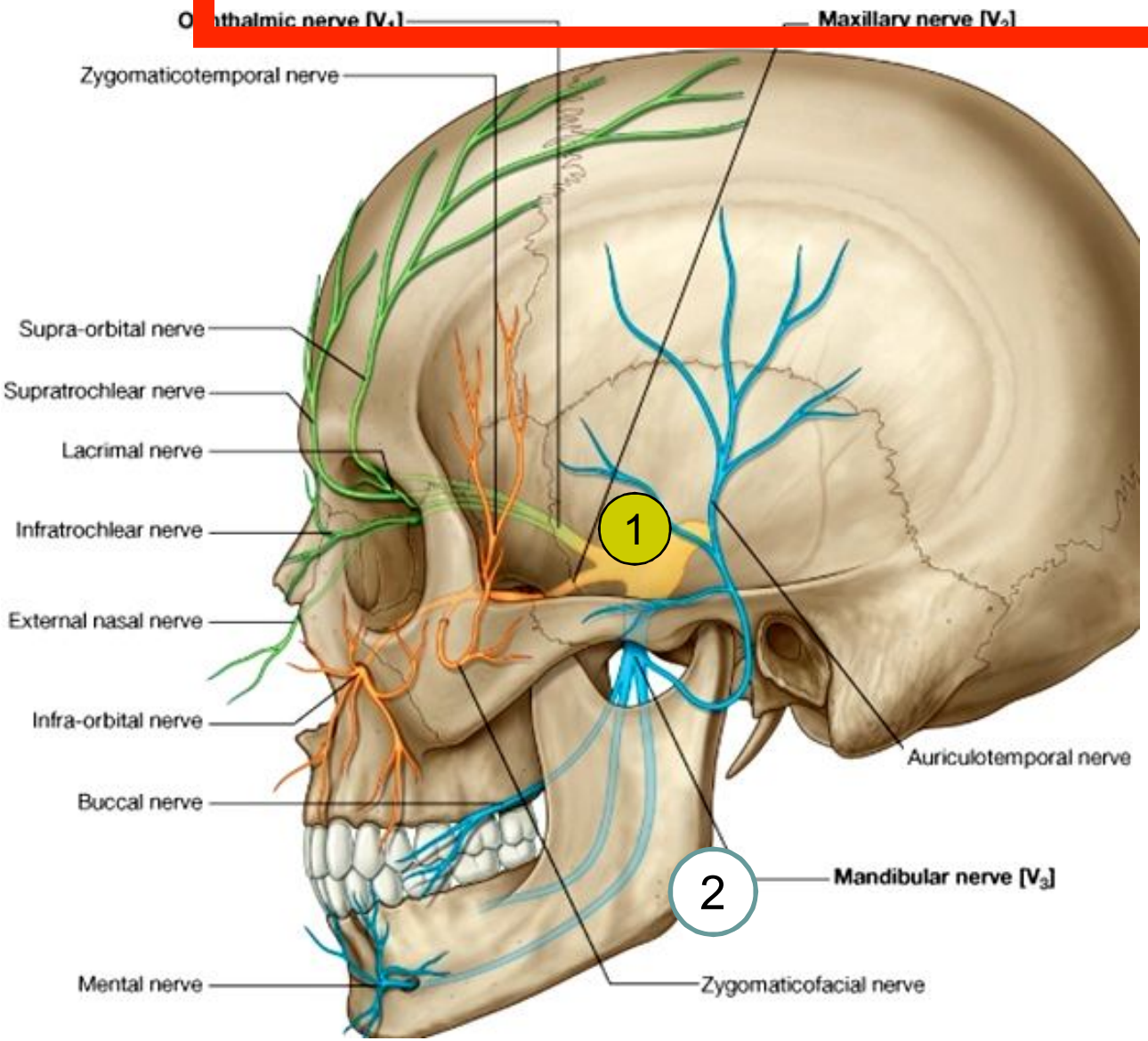
77. Innervation skin of the face



- Skin of face supplied by branches of the three divisions of the **[1] TRIGEMINAL NERVE (CN V)**
- **Except** for a small area over the **angle of the mandible** which is supplied by the **[2] great auricular nerve** (**C2-C3**) – **cervical plexus**

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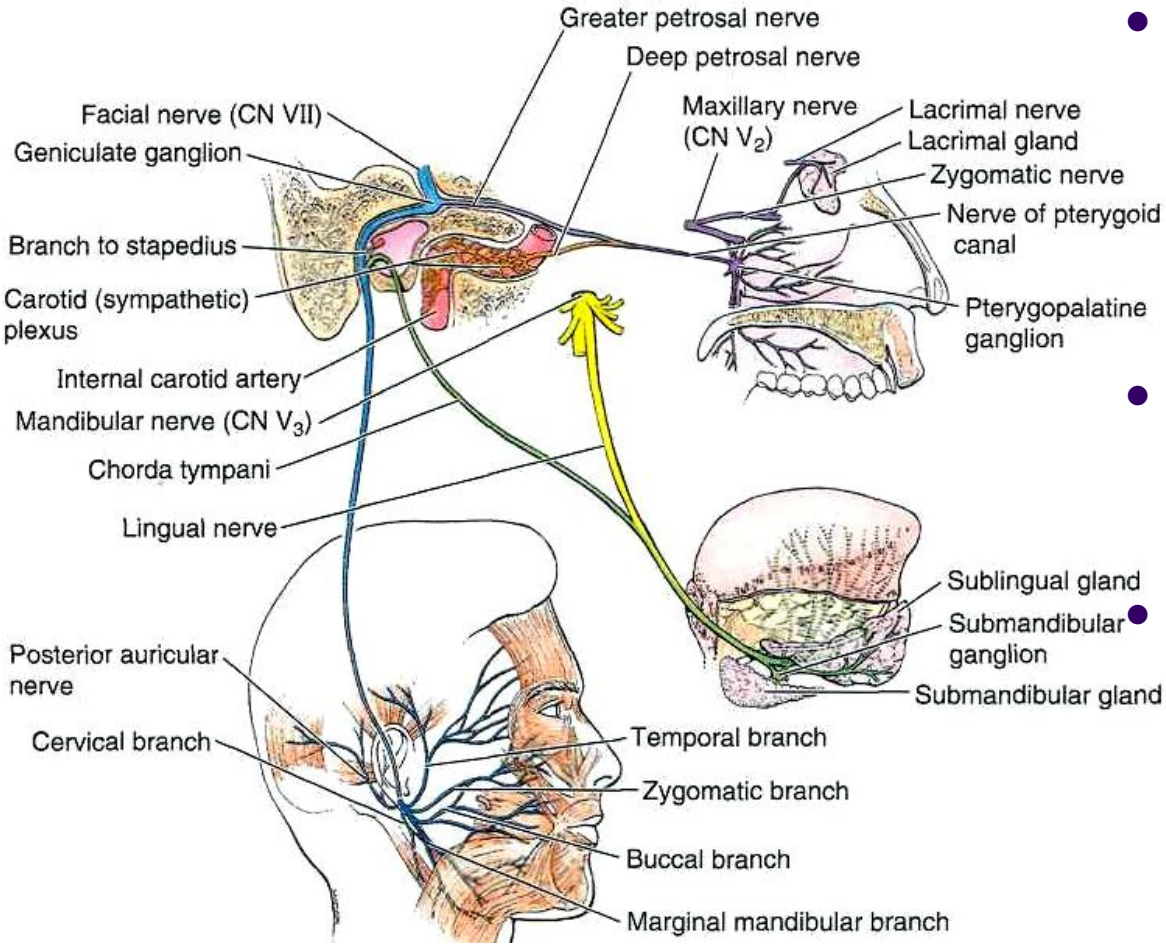
78. Facial nerve (CN VII)



- **FACIAL NERVE (CN VII)** - sole **motor supply** to the **muscles of facial expression** and certain other muscles derived from the embryonic 2nd pharyngeal arch
- **Sensory to the taste** buds in **anterior 2/3 of the tongue** through the **chorda tympani**
- **Secretomotor** (parasympathetic) to the **submandibular**, **sublingual**, palatine salivary glands, glands of nasal cavity and **lacrimal** gland

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Bell's palsy

- It is idiopathic **unilateral facial paralysis** (constitutes **75%** of all facial nerve lesions)
- Terminal branches of **CN VII** may be injured by **parotid cancer** or by **surgery** to remove a **parotid tumor**.
- An **infant's** facial nerve may be injured during a **forceps delivery** because the **mastoid** process has **not yet** developed and the stylomastoid foramen is relatively superficial.

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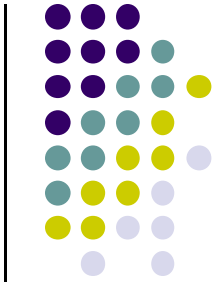
Lesions of CN VII



- Symptoms associated with **lesions of CN VII** are determined by the **location** of the lesion in the nerve.
- **Bels Manifestations:**
  - unable to **close** lips and eyelids on affected side
  - eye on affected side is **not lubricated (dry eye)**
  - unable to **whistle**, blow a wind instrument, or chew effectively
  - facial distortion due to contractions of **unopposed** contralateral facial muscles
- A lesion within the facial canal will also affect **taste** from the **anterior 2/3 of the tongue** carried by the **chorda tympani** and **loss of secretion** from **submandibular** and **sublingual** glands ipsilateral to the lesion

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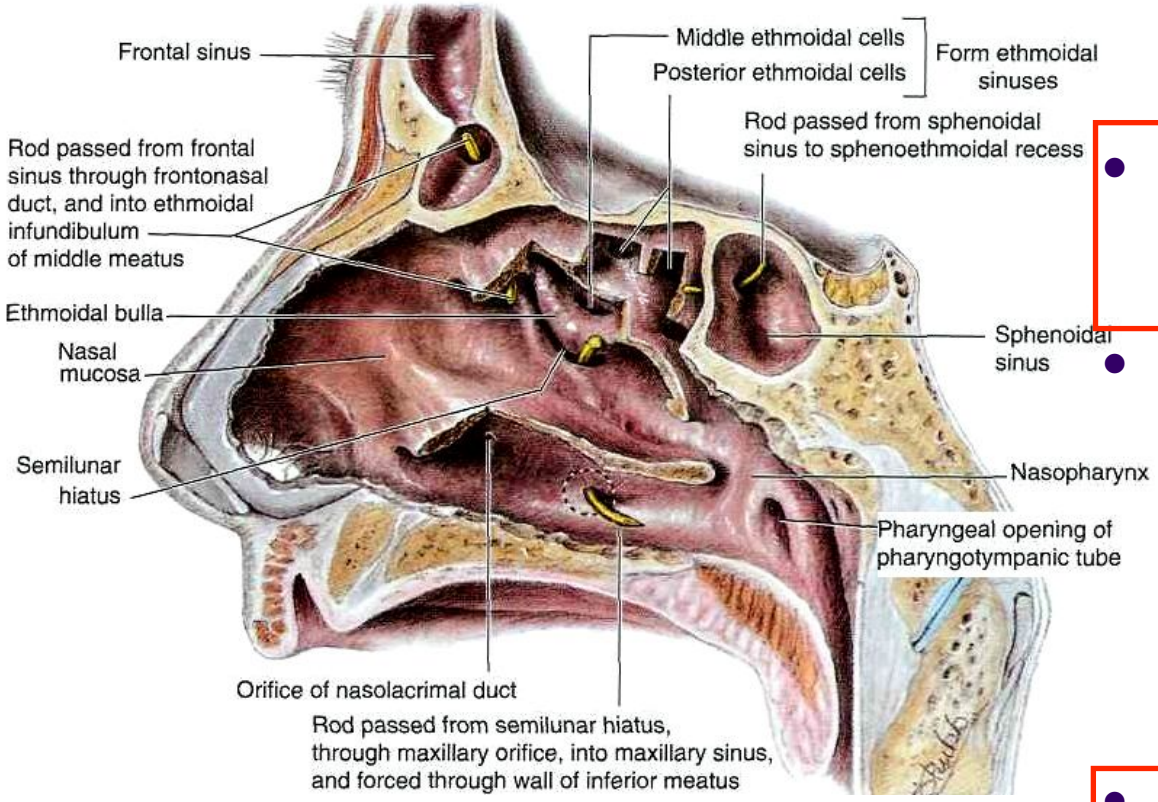
79. Communication of the paranasal sinuses



- **Sphenoethmoidal recess**
  - receives the opening of the **sphenoidal** air sinus
- **Superior meatus**
  - Receives opening of **posterior ethmoidal** air cells
- **Middle meatus**
  - Infundibulum, ethmoidal bulla and semilunar hiatus
  - Receives openings of **frontal** and **maxillary** sinuses and **anterior** and **middle ethmoidal** air cells
- **Inferior meatus**
  - Receives opening of **nasolacrimal** duct

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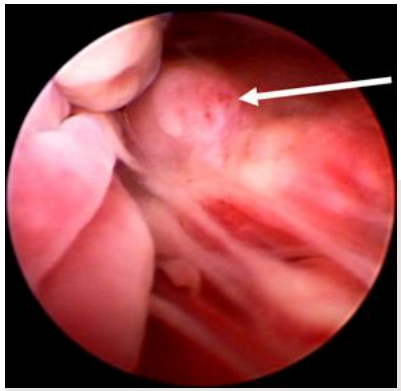
80. Epistaxis



- **Epistaxis** (nosebleed) most often occurs from the anterior nasal septum **(Kiesselbach's** area), where branches of the **sphenopalatine, anterior ethmoidal, greater palatine,** and **superior labial** (from facial) arteries converge.

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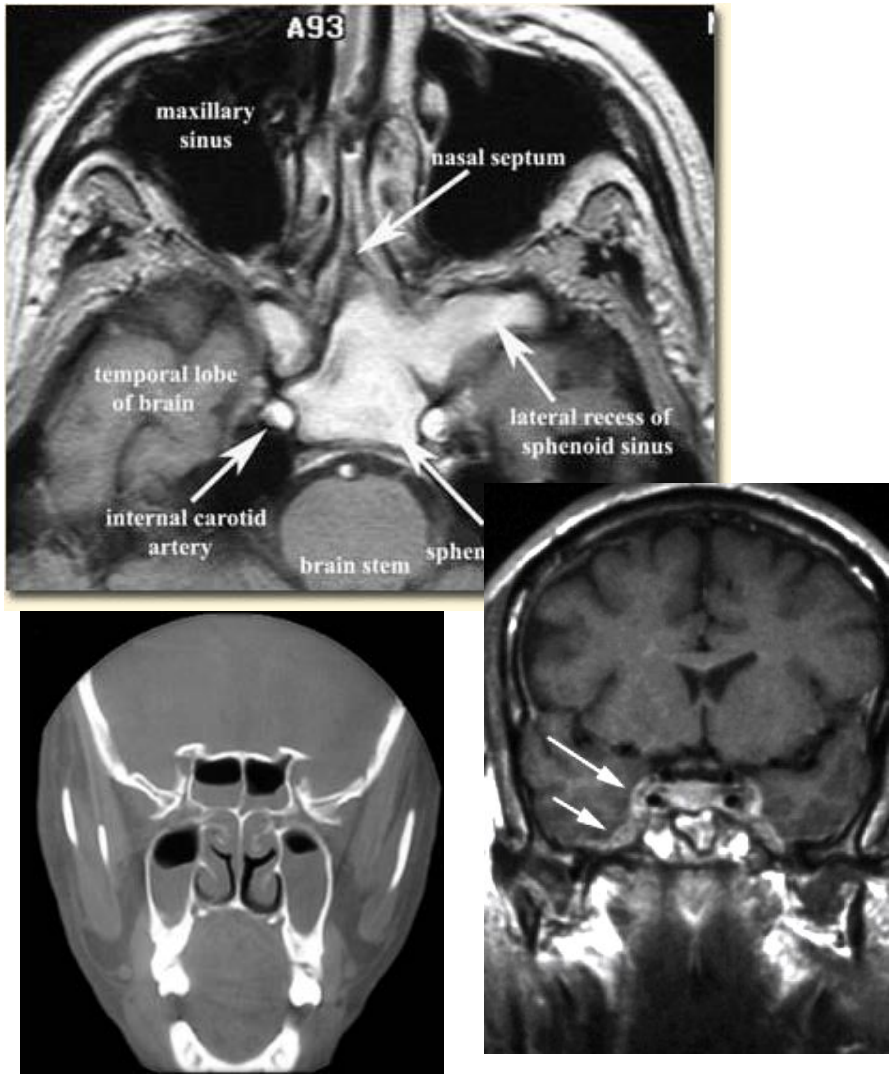
81. Sphenoiditis



- Relationships of the **sphenoidal sinus** are clinically important ; because of potential **injury during pituitary surgery** and the possible **spread of infection.**
- Infection can reach the sinuses through their ostia from the **nasal cavity** or through their floor from the **nasopharynx**.
- Infection may erode the walls to reach the cavernous sinuses, **pituitary gland**, **optic nerves**, or **optic chiasma**

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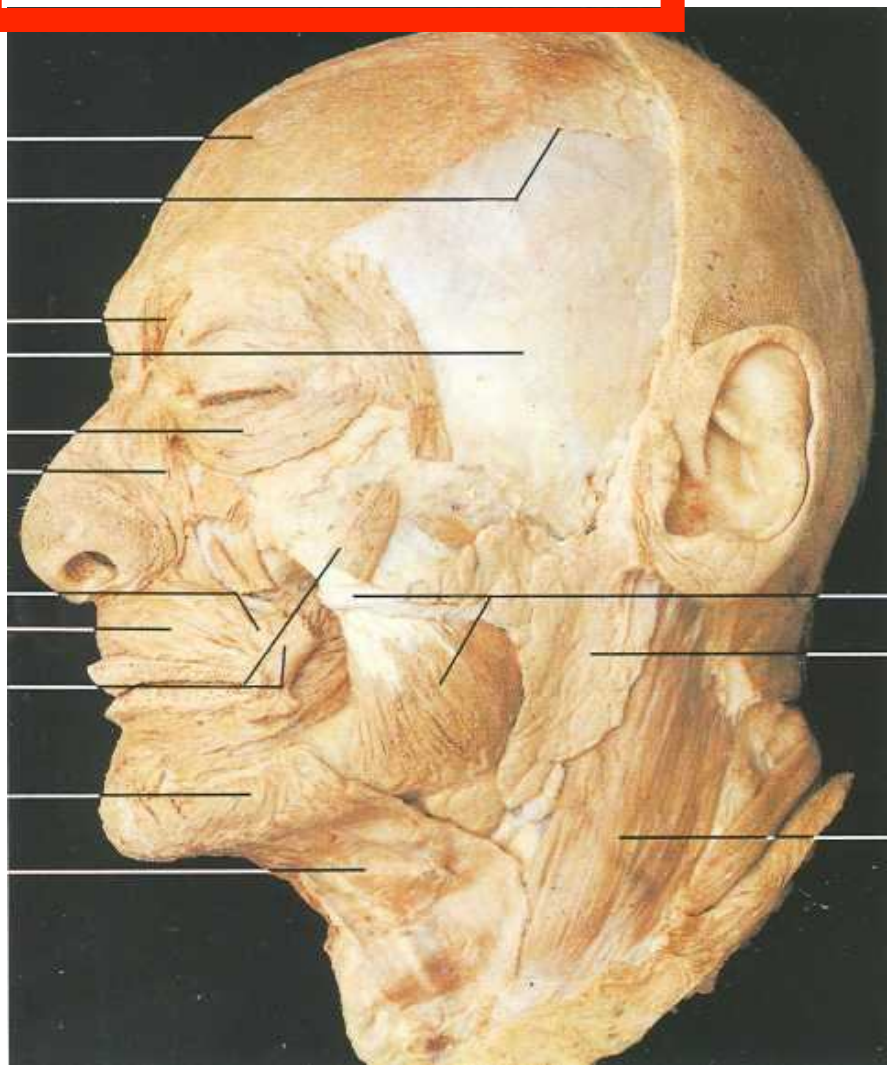
82. Cheeks



- Form the **lateral, movable walls** of the oral cavity and the zygomatic prominences of the cheeks over the **zygomatic** bones
- **Buccinator** – principal muscle of the cheek
- **Buccal pad of fat** – encapsulated collection of fat superficial to buccinator
- **Parotid duct** opens in inner surface of the cheek right **opposite 2nd upper molar** tooth

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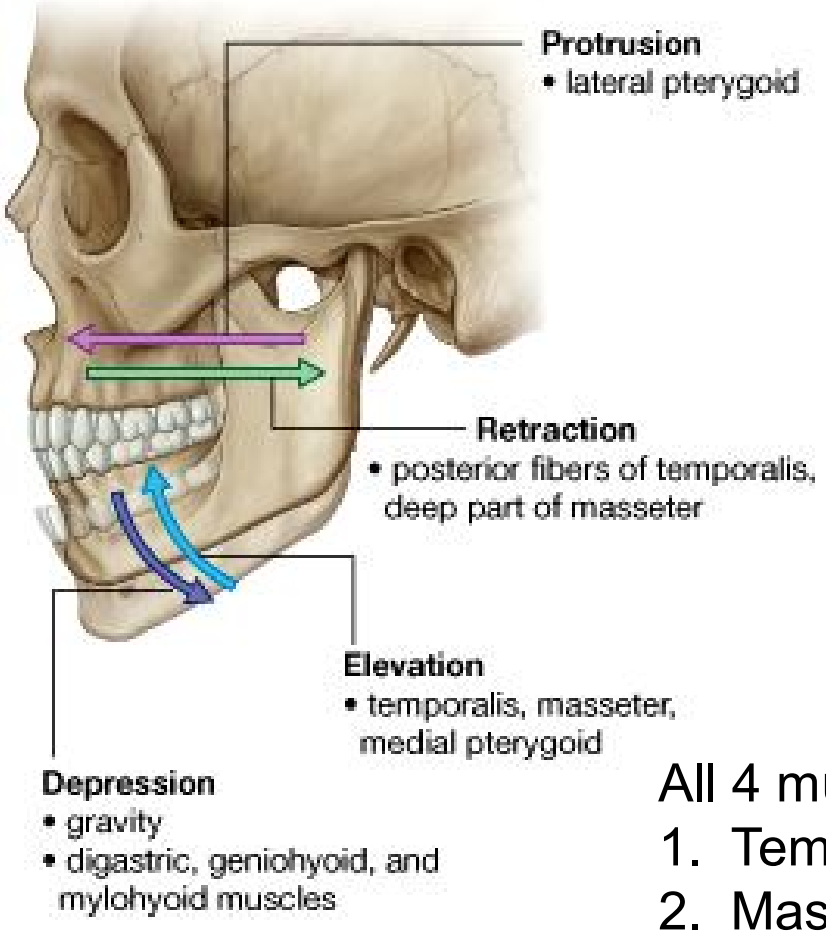
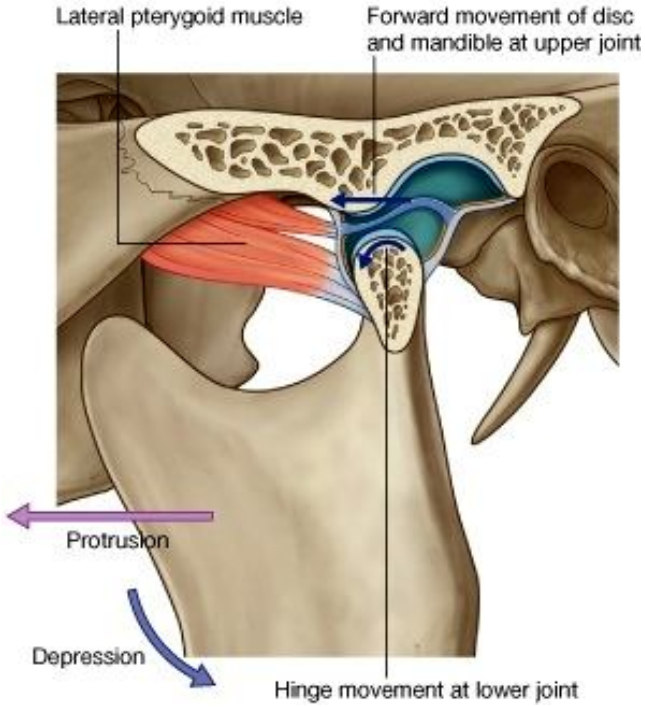
83. Movements at the TMJs





All 4 muscles of mastication are innervated by **V3**:

1. Temporalis – elevation & retraction
2. Masseter - elevation
3. Medial pterygoid - elevation
4. **Lateral pterygoid - protrusion**

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84. Lesion of CN XII

- A **lesion of CN XII** allows the contralateral, unparalyzed **genioglossus muscle** to pull the protruded tongue **toward** the paralyzed side (deviation of the tongue).

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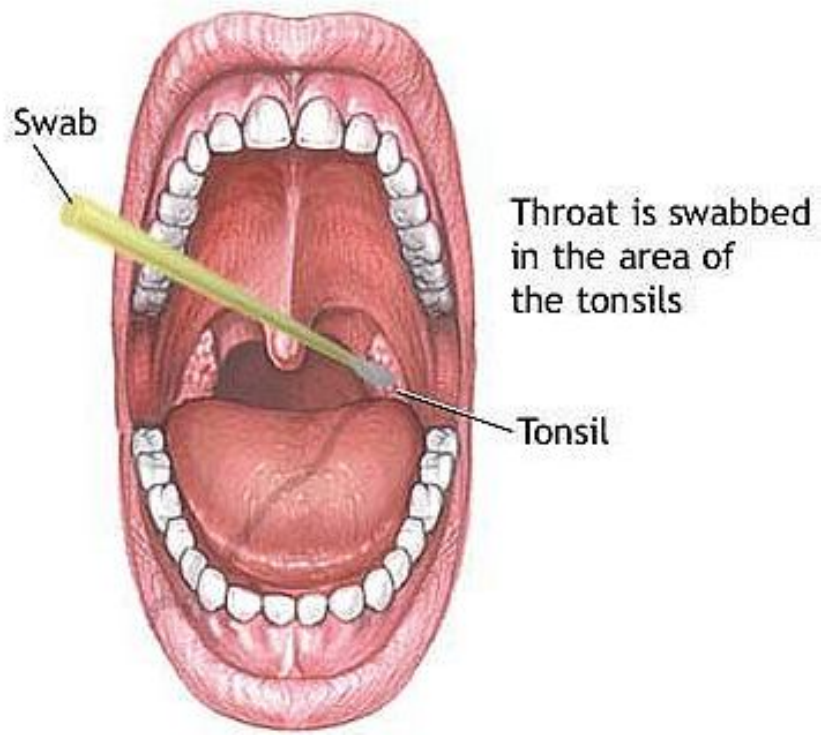
83. Gag reflex



- Touching the posterior part of the pharynx results in muscular contraction of each side of the pharynx - **gag reflex:**
  - **Afferent limb: CN IX**
  - **Efferent limb: CN X**
- Injury to the **glossopharyngeal nerve (CN IX)** will result in a **negative gag reflex**

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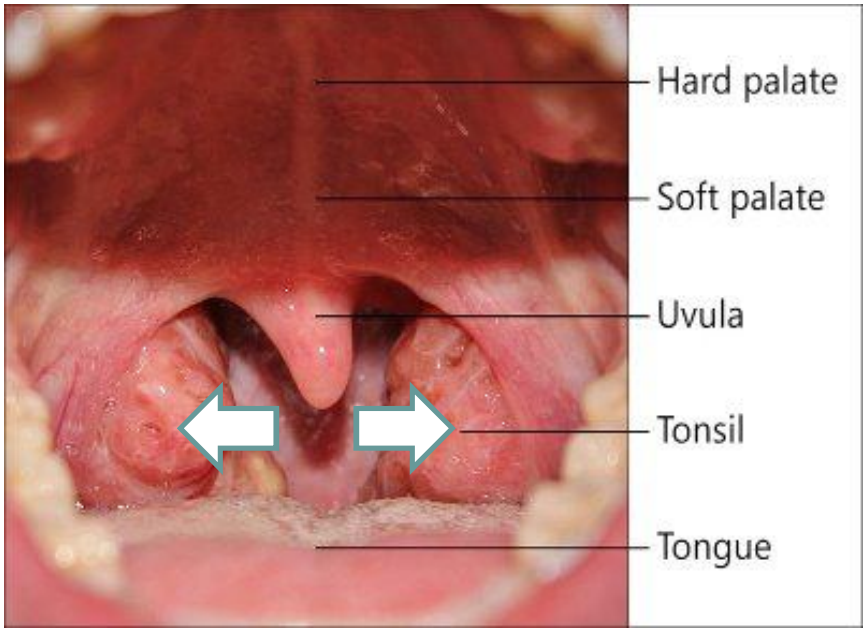
84. Tonsillitis



- During **palatine tonsillectomy,** the peritonsillar space facilitates tonsil removal, except after capsular adhesion to the superior constrictor.
- If the **glossopharyngeal nerve** is injured, **taste and general sensation** from the posterior 1/3 of the tongue are lost.
- **Hemorrhage** may occur, usually from the tonsillar branch of the **facial artery**; if the superior constrictor is penetrated, a high **facial artery** or tortuous **internal carotid** artery may be injured.

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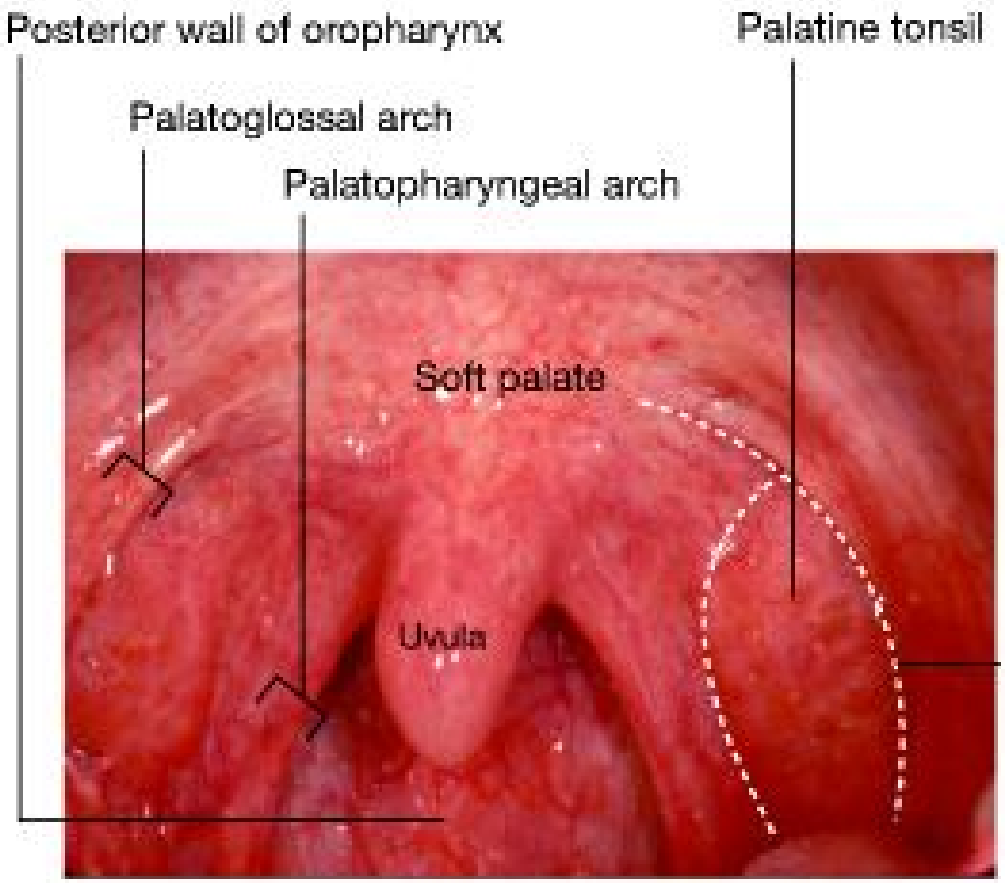
Palatine tonsils



- Receives **main blood supply** from **tonsillar branch of facial artery**
- Drained by **lymph vessels** mainly to **jugulodigastric lymph node**, which is **body's most frequently** enlarged lymph node
- **Nerve supply:** tonsillar plexus of nerves formed by branches of **CN IX** and CN X

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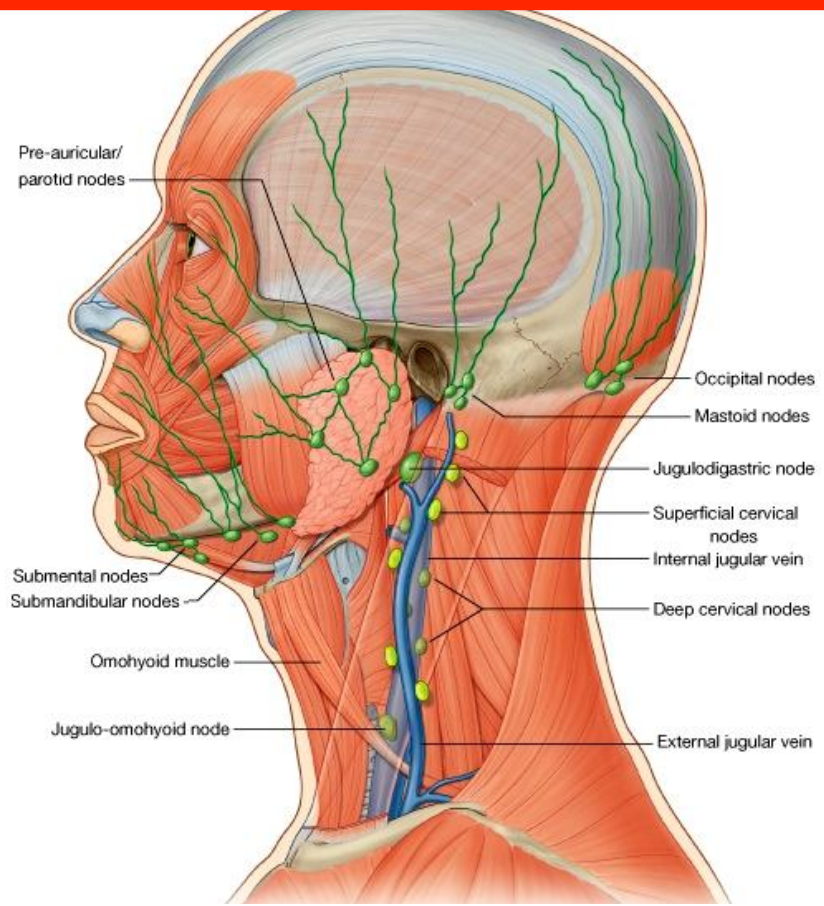
85. Lymph drainage from face structures



After **submandibular** & **submental** → drain lymph to **Deep cervical**

Submandibular lymph nodes

receive lymph from:

- front of scalp
- nose and adjacent cheek
- upper lip and lower lip **(except central part*)**
- frontal, maxillary, and ethmoid air sinuses
- upper and lower teeth **(except lower incisors*)**
- anterior 2/3 of tongue **(except tip*)**
- floor of mouth ,gums and vestibule

***to Submental lymph nodes**

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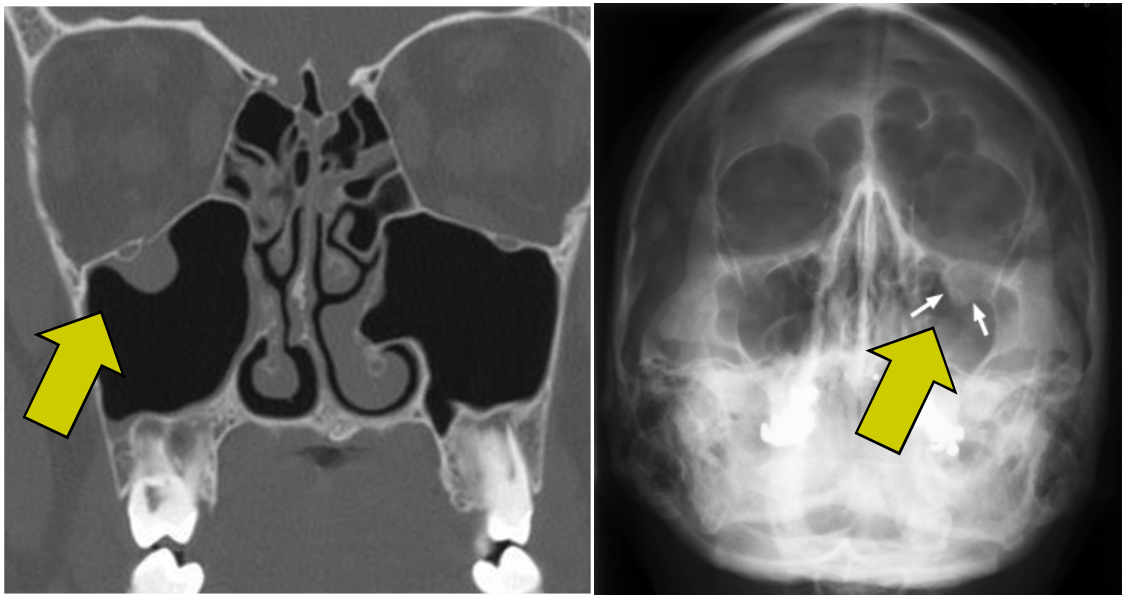
86. Blow-out fracture



- A blow-out fracture of the **orbital floor** typically is not involve the orbital rim and is caused by blunt trauma to the orbital contents (e.g., by a handball).
- Blow-out fractures may damage: **inferior rectus muscle**, **infraorbital nerve** and **artery** (**hemorrhaging**).
- Blow-out fractures are rare in **young children** because the maxillary sinus is small and the orbital floor is not a weak point.

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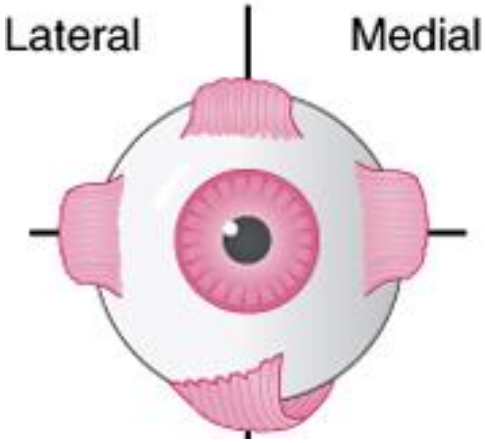
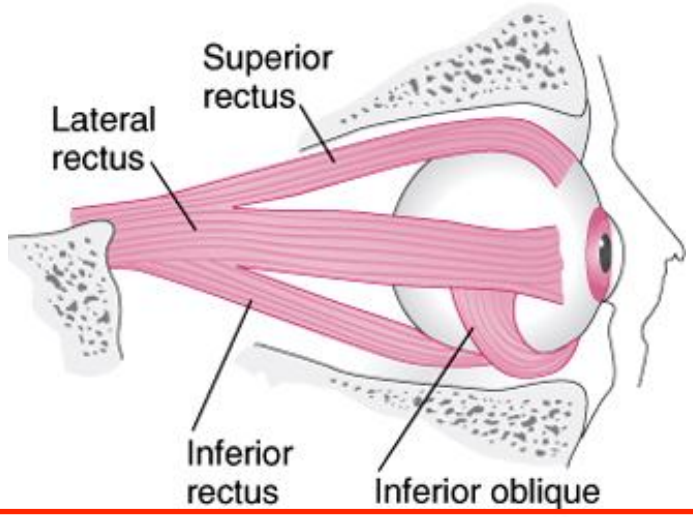
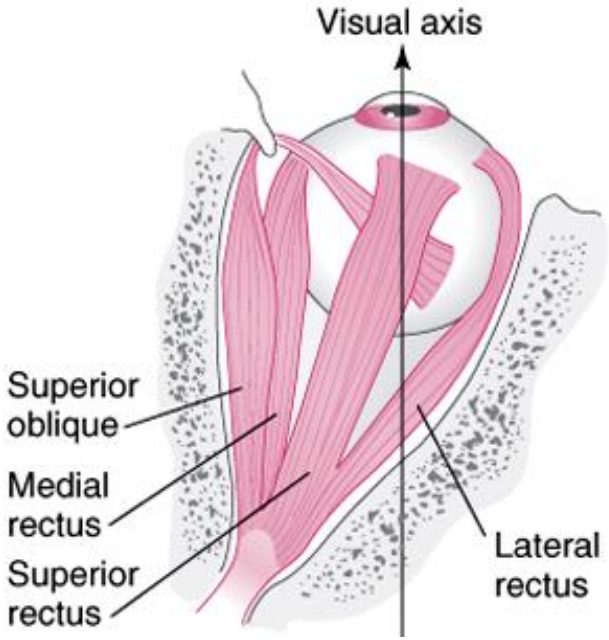
87. Muscles of the orbit







Muscle	Action	Innervation
Superior rectus	Elevates and adducts pupil	**CN** III
Inferior rectus	Depresses and adducts pupil	**CN** III
Medial rectus	Adducts pupil	**CN III**
Lateral rectus	Abducts pupil	**CN VI**
Superior oblique	Depresses and abducts pupil	**CN IV**
Inferior oblique	Elevates and abducts pupil	**CN III**
Levator pulpebra superior	Elevates upper eyelid	**CN III**

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Clinical Testing Actions of Extraocular Muscles

isolate first, then test directio

Muscle tested		Direction to move eye when testing muscle
Superior rectus		Look laterally and **upward**
Inferior rectus		Look laterally and **downward**
Lateral rectus		Look **laterally**
Medial rectus		Look **medially**
Inferior oblique		Look medially and **upward**
Superior oblique		Look medially and **downward**

- **Medial rectus** – ask the patient to look directly medially
- **Lateral rectus** – ask the patient to look directly laterally
- **Superior rectus** – ask the patient to look laterally, then superiorly
- **Inferior rectus** – ask the patient to look laterally, then inferiorly
- **Superior oblique** – ask the patient to look medially, then inferiorly
- **Inferior oblique** – ask the patient to look medially, then superiorly

- testing for eye movements where the single action of each muscle predominates

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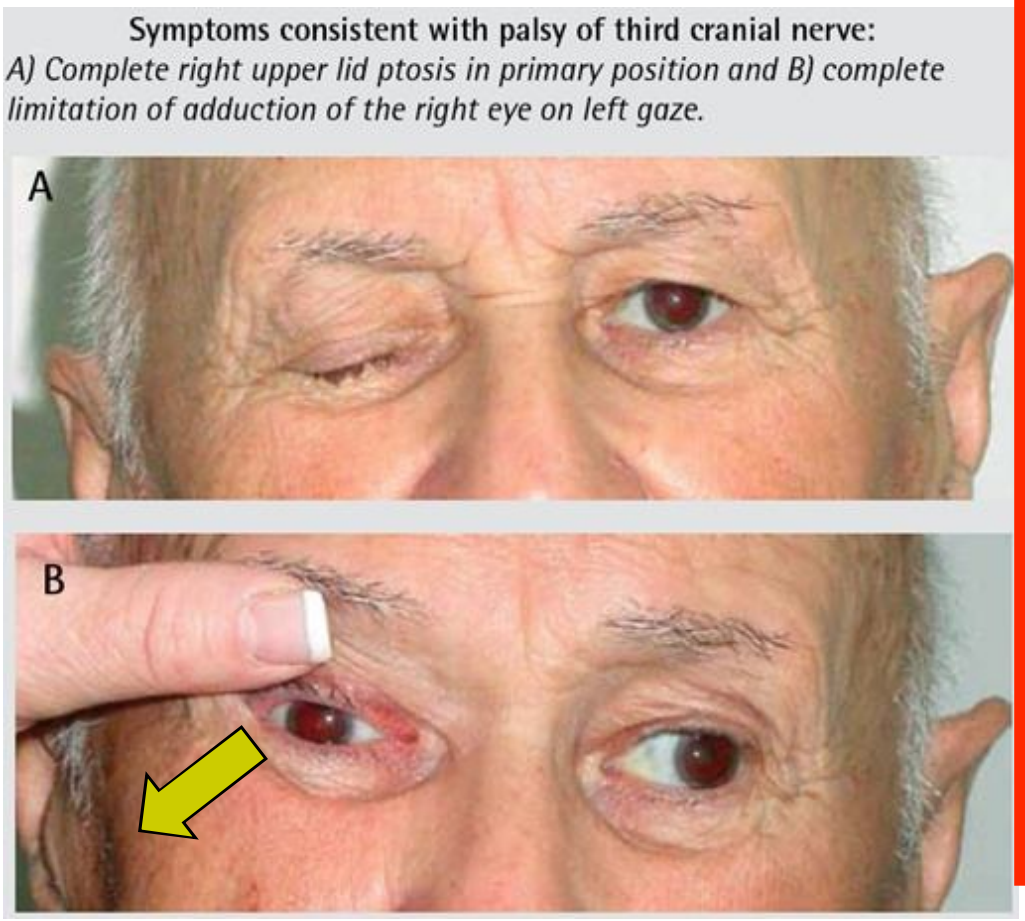
88. Oculomotor Nerve Palsy (external squint)



- It affects **most** of the **extraocular** muscles
- **Manifestations**:
  - **ptosis**,
  - fully **dilated pupil**,
  - and eye is fully depressed and abducted ("**down and out**") due to unopposed actions of superior oblique and lateral rectus, respectively.

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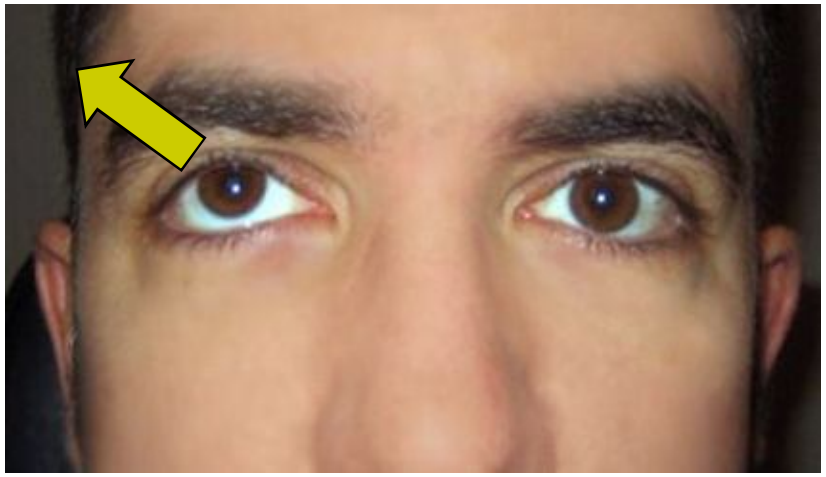
89. Trochlear Nerve Palsy



- Lesions of this nerve or its nucleus cause paralysis of the **superior oblique** and impair the ability to turn the affected eyeball infero-medially (pupil look **superio-laterally**)
- The characteristic sign of trochlear nerve injury is **diplopia** (double vision) when looking down (e.g., when **going down stairs**)
  - The person can compensate for the diplopia by inclining the head anteriorly and laterally toward the side of the normal eye.

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90. Abducens Nerve Palsy (internal squint)

- Injury to abducens nerve → paralysis of **lateral rectus** → inability to abduct the affected eye
- Affected eye is fully **adducted** by the unopposed action of the medial rectus that is supplied by CN III

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91. Corneal reflex

- **Corneal reflex** (blinking) in response to touching the cornea
- It involves reflex connections between sensory **afferent fibers** in the **ophthalmic nerve** (**CN V**1) that make synaptic connections with **motor fibers** of **facial nerve** (**CN VII**) which supply orbicularis oculis muscle.

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92. Horner syndrome

- **Penetrating injury** to the neck, **Pancoast tumor, or thyroid carcinoma** may cause **Horner syndrome** by interrupting **ascending preganglionic sympathetic fibers** anywhere between their origin in the upper thoracic spinal cord and their synapse in the **superior cervical ganglion.**
- It includes the following signs:
  - Constriction of the pupil (**miosis**)
  - Drooping of the superior eyelid (**ptosis**),
  - Redness and increased temperature of the skin (**vasodilation**)
  - Absence of sweating (**anhydrosis**)

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93. Otitis Media

- **Hearing** is **diminished** because of pressure on the eardrum and reduced movement of the ossicles.
- **Taste** may be **altered** because the **chorda tympani** is affected.
- **Infection** spreading **posteriorly** cause **mastoiditis.**
- **Infection** that spreads to the **middle cranial fossa** can cause **meningitis** or temporal lobe abscess, and **infection** moving through the **floor** may produce **sigmoid sinus thrombosis.**

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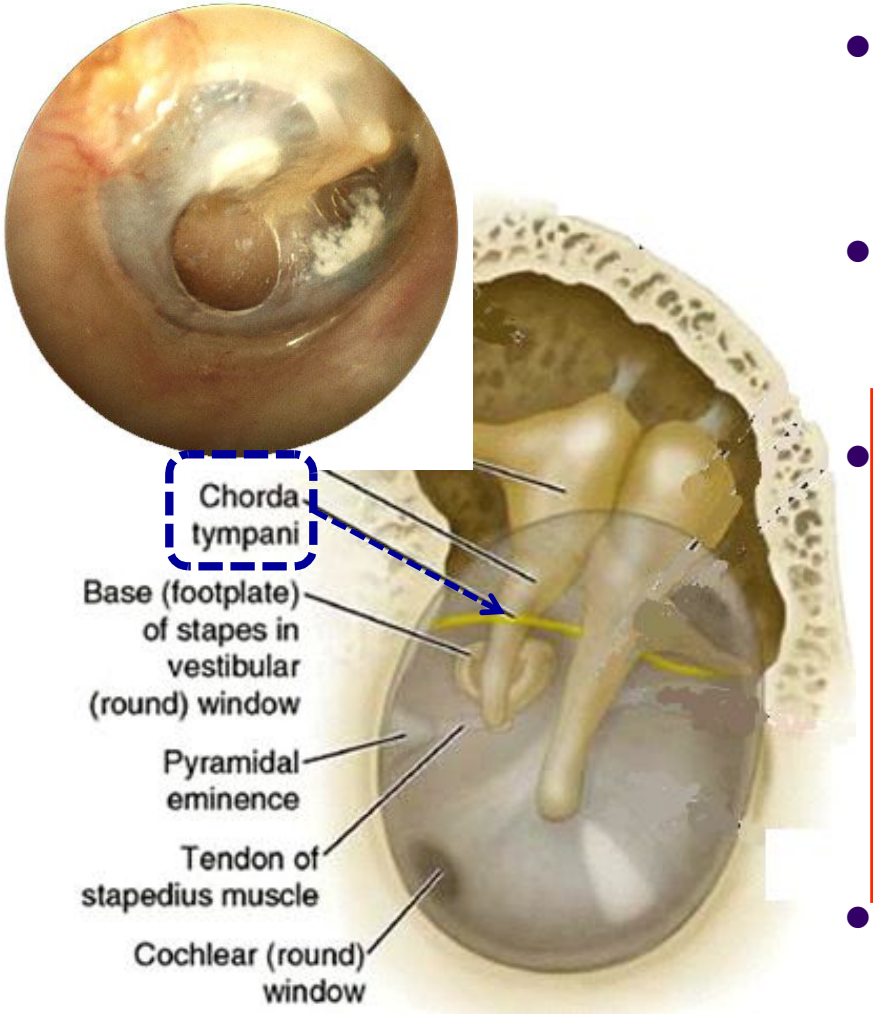
Perforation of the Tympanic Membrane



- May result from **otitis media** and is one of several causes of middle ear (conduction) **deafness**
- Causes: **foreign bodies** in external acoustic meatus, excessive pressure (as in diving), **trauma**
- Because **chorda tympani** directly relates to the posterior surface of the **tympanic membrane** it **may be damaged** and resulting in loss of **taste** over **anterior 2/3** of the tongue and secretion of the **sublingual** and **submandibular glands**
- Minor perforation heal spontaneously; large ones require surgical repair

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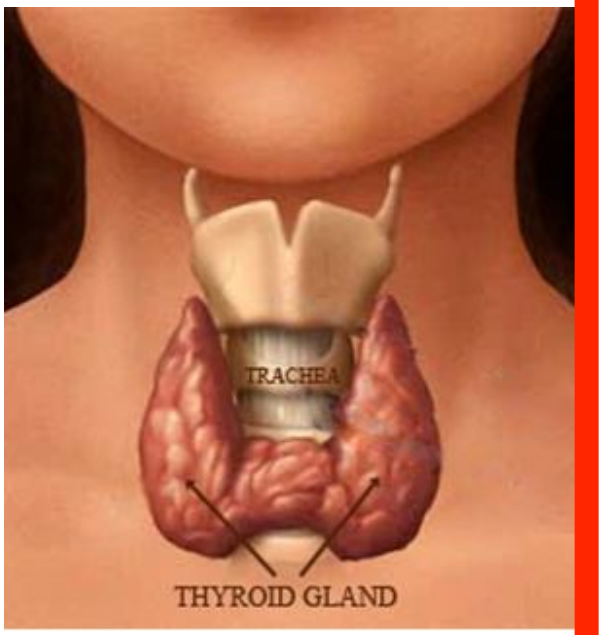
94. Thyroid and parathyroid glands



Hormones:

- The **thyroid gland** is the body's largest endocrine gland. It produces **thyroid hormone**, which controls the **rate of metabolism** (**increase the temperature of the body**), and **calcitonin**, a hormone controlling calcium metabolism (**reduce blood calcium Ca2+**). The thyroid gland affects all areas of the body except itself and the spleen, testes, and uterus.
- The hormone produced by the **parathyroid glands**, **parathormone** (**PTH**), controls the metabolism of phosphorus and calcium in the blood (**increase Ca2+ level**). The parathyroid glands target the skeleton, kidneys, and intestine.

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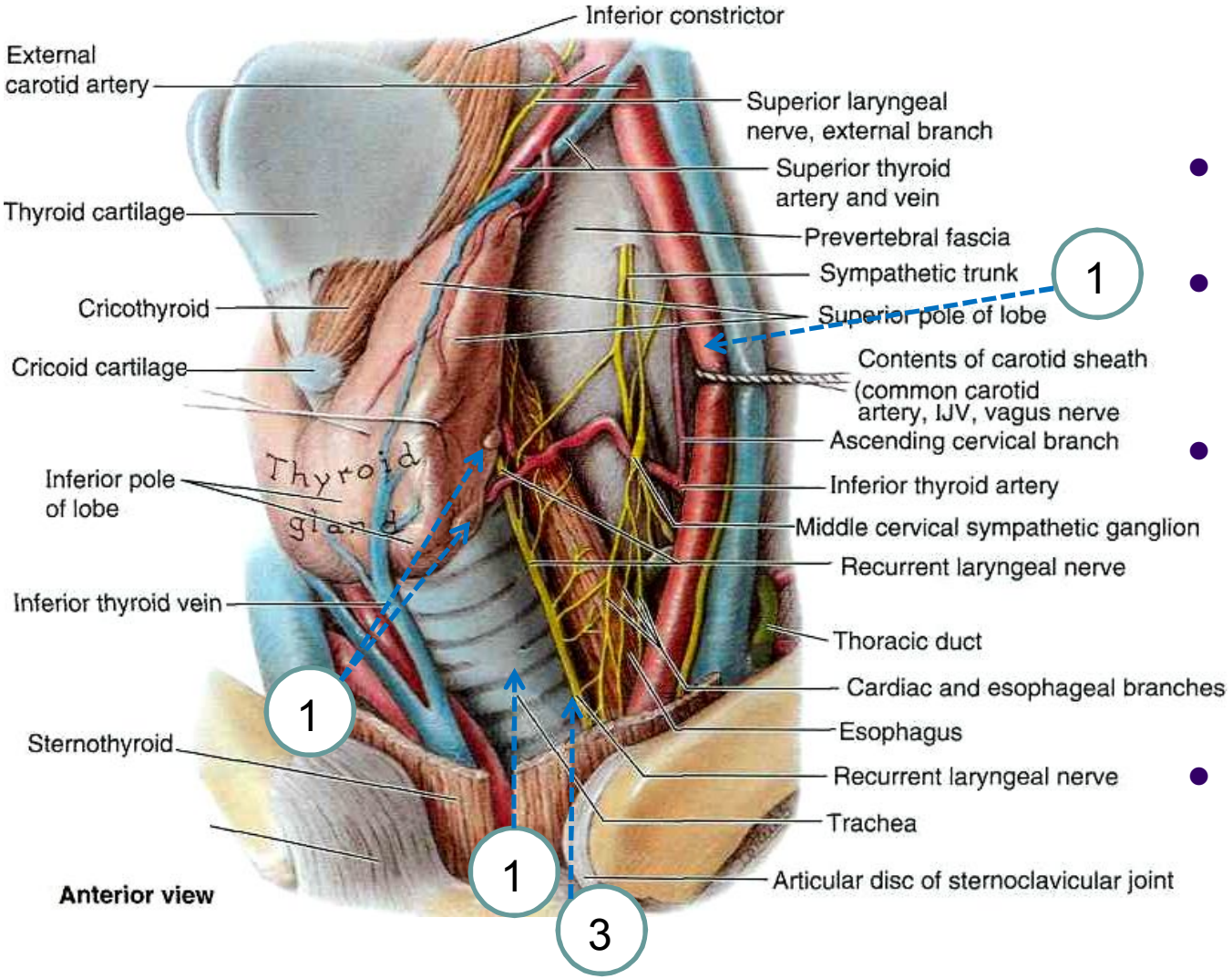
Anatomical relations of the thyroid gland



- **Anterolateral** – infrahyoid muscles
- **Posterolateral** – **common carotid artery [1]**
- **Medial** – larynx, **trachea [2]**, pharynx, esophagus, cricothyroid muscle, **recurrent laryngeal nerve [3]**
- **Posterior** – **parathyroid glands [4]**

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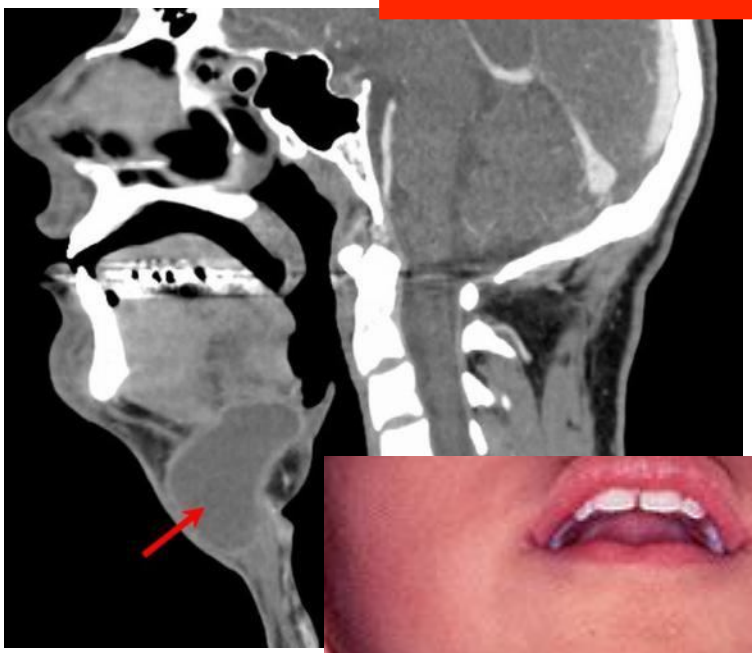
Median cervical cyst



- Usually presents as a **painless midline mass** on the anterior aspect of the neck at the level of the hyoid bone and **moves during swallowing**.
- Remanent of the **thyroglossal canal** (thyroid gland originally from epithelium of the tongue).
- Must be differentiated from a thyroid mass
- Treatment: **surgical excision**

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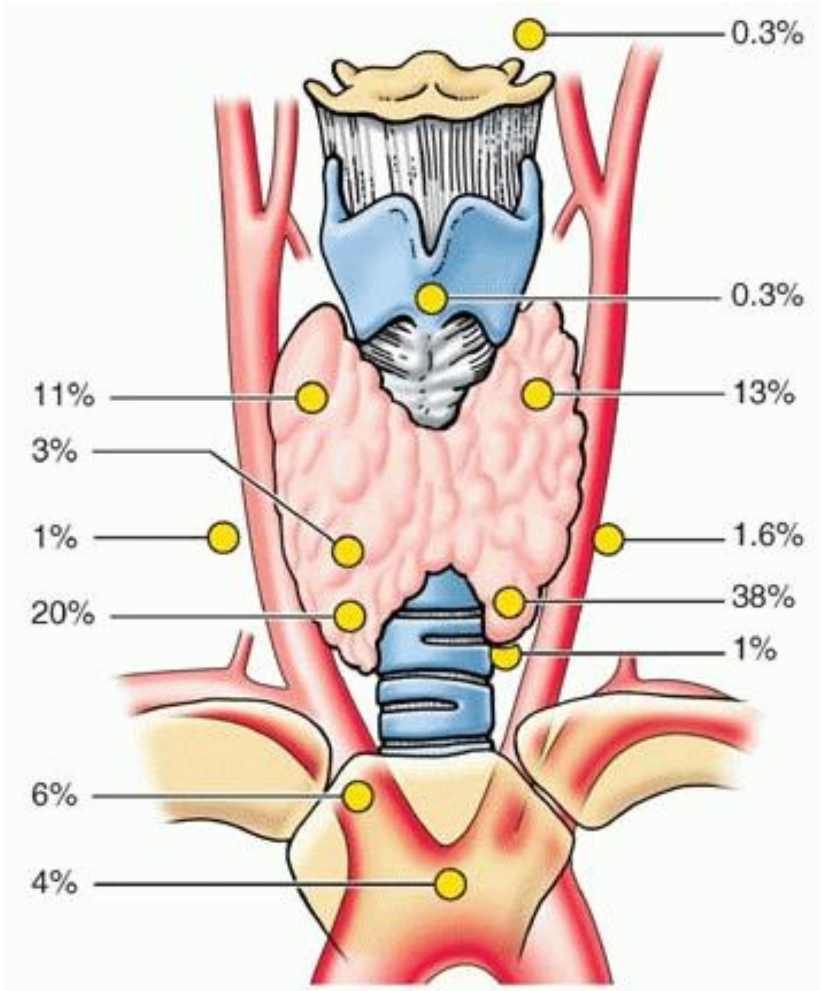
Variation of parathyroid glands position



- The **superior parathyroid** glands, more constant in position than the inferior ones.
- The **inferior parathyroid** glands are usually near the inferior poles of the thyroid gland, but they may lie in various positions
- In 1-5% of people, an **inferior parathyroid** gland is deep in the superior mediastinum **within the thymus** because of **common embryonic origin**.

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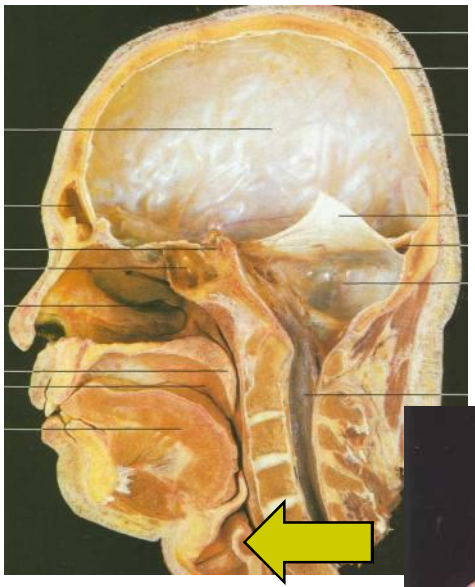
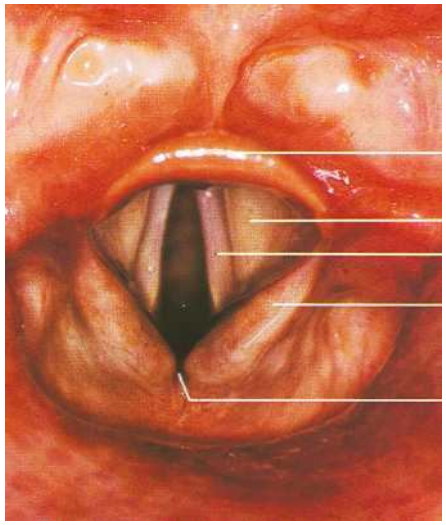
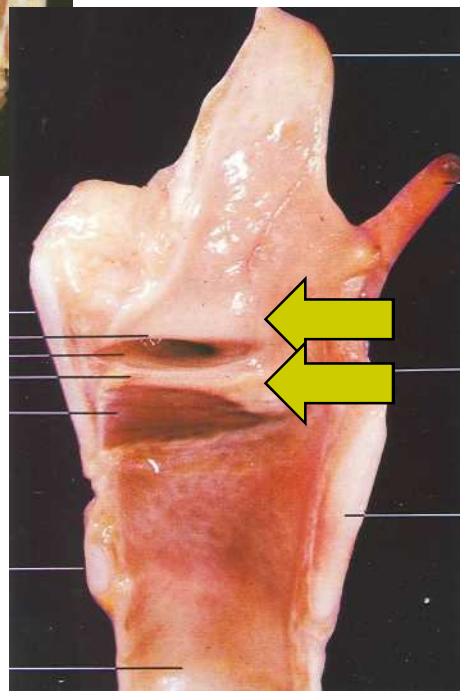
95. Larynx:







- Cavity of the Larynx - 2 Folds:
- **Vestibular folds** (false vocal cords)
- **Vocal folds** (true vocal cords)

- **Rima vestibuli** – gap between the vestibular folds
- **Rima glottidis** – gap between the vocal folds anteriorly and vocal processes of the arytenoid cartilages posteriorly

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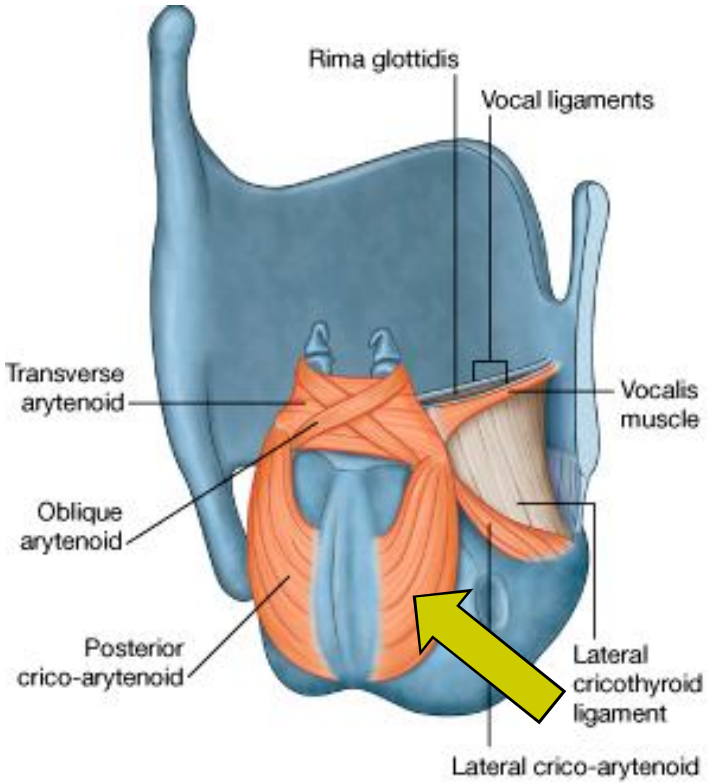
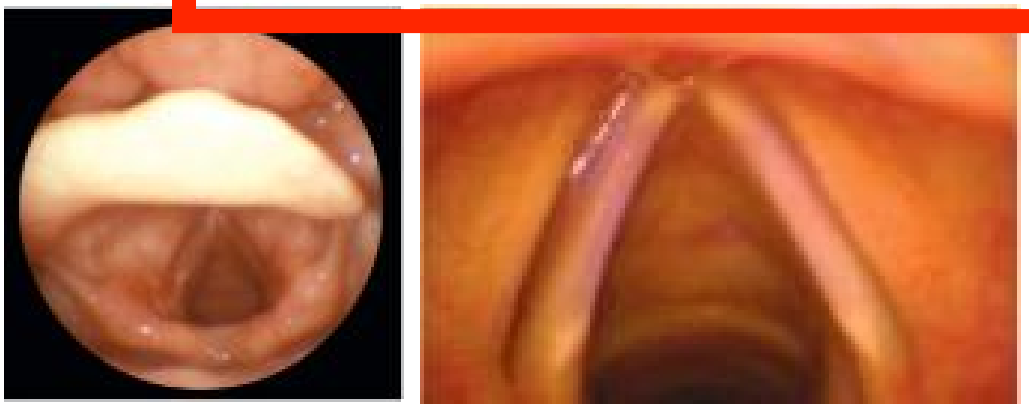
Muscles of the Larynx



Abductors

- **Posterior cricoarytenoid** – abducts vocal folds (the only abductors of the vocal folds)



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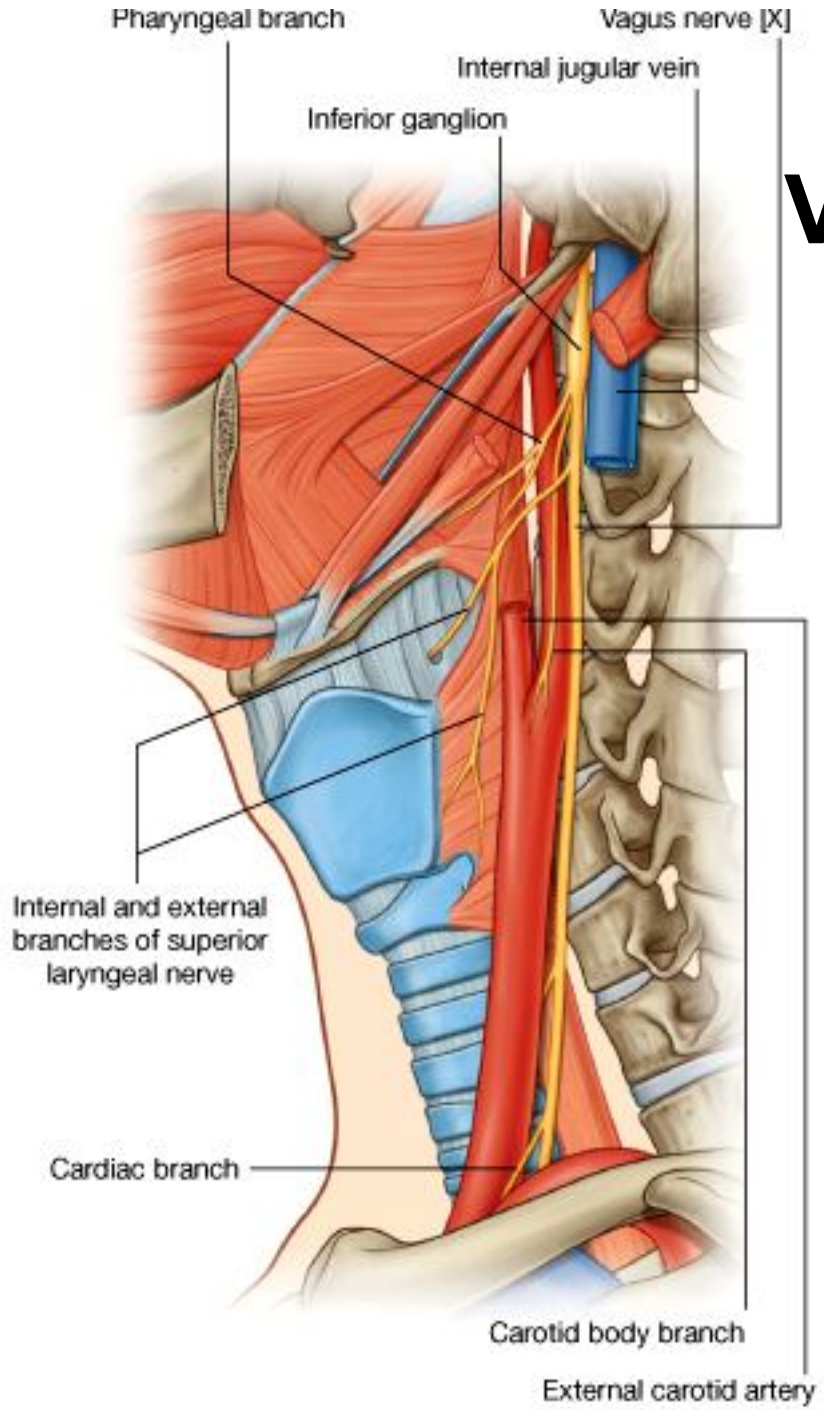

Vagus Nerve (CN X)

Superior laryngeal nerve:

divides into internal and external laryngeal nerves

- **Internal laryngeal nerve** – sensory; supplies floor of piriform recess and mucous membrane of larynx **above** of the **vocal folds**
- **External laryngeal nerve** – motor; supplies the **cricothyroid** muscle

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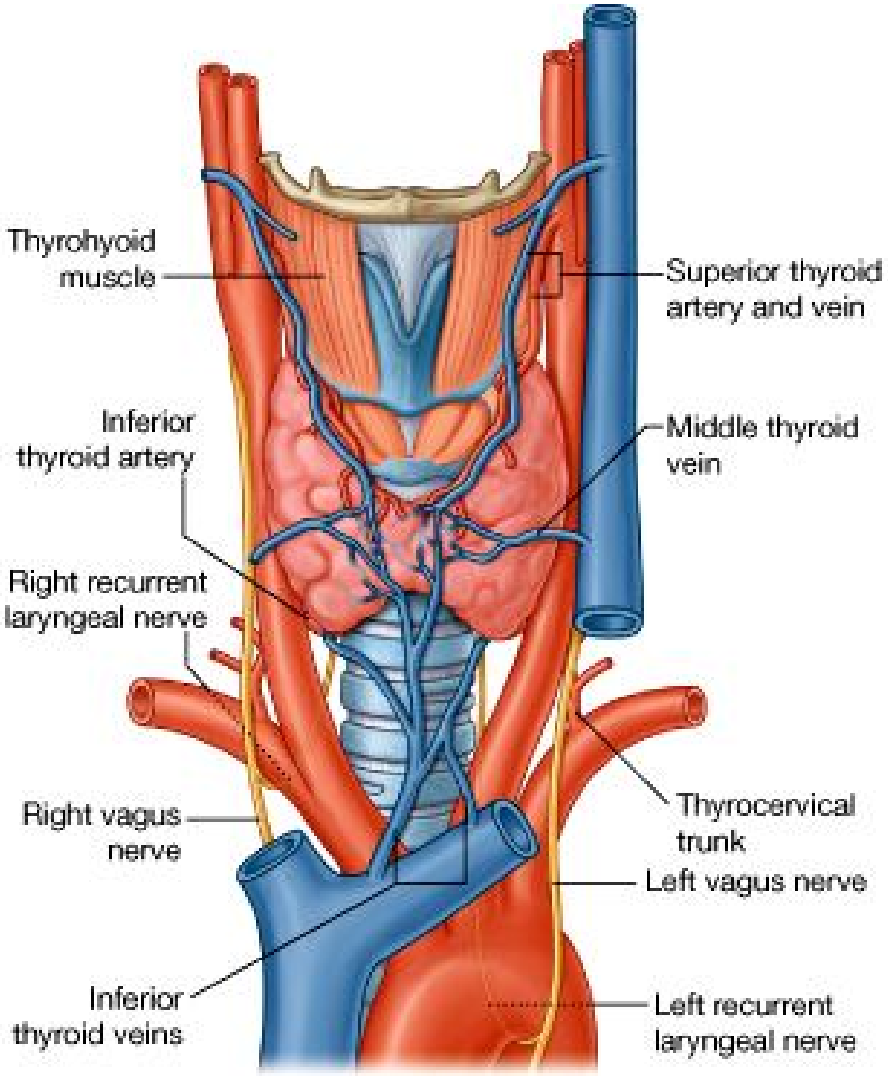
Vagus Nerve (CN X)



Recurrent laryngeal nerve:

- supplies **all muscles of larynx**, **except** cricothyroid; **mucous membrane** of larynx **below vocal fold**; mucous membrane of upper trachea
  - **right recurrent laryngeal nerve** → hooks around the *right subclavian artery*
  - **left recurrent laryngeal nerve** → hooks around the *arch of the aorta* posterior to the ligamentum arteriosum
  - ascends in the neck in a **groove** between the trachea and esophagus

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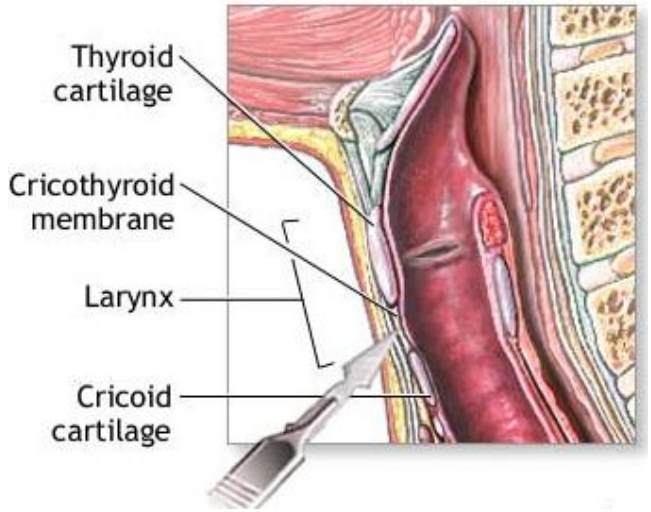
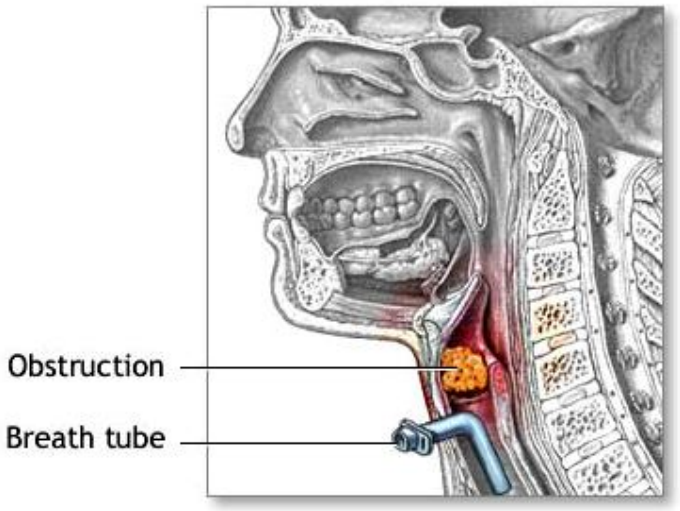
96. Cricothyrotomy





- A **cricothyrotomy** is an emergency procedure that relieves an **airway obstruction** .
- In case of swallowed **foreign bodies** or **abnormal tissue growths.**
- A hollow needle is inserted into the midline of the neck, **just below the thyroid cartilage** (needle cricothyrotomy).
- More frequently, a small incision is made in the skin over the **cricothyroid membrane**, and another one is made through the membrane **between the cricoid and thyroid cartilage**. A **tube** that enables breathing is inserted through the incision.
- Cricothyrotomy is generally followed by a surgical **tracheosotomy**, if there is need for a prolonged use of a breathing tube.

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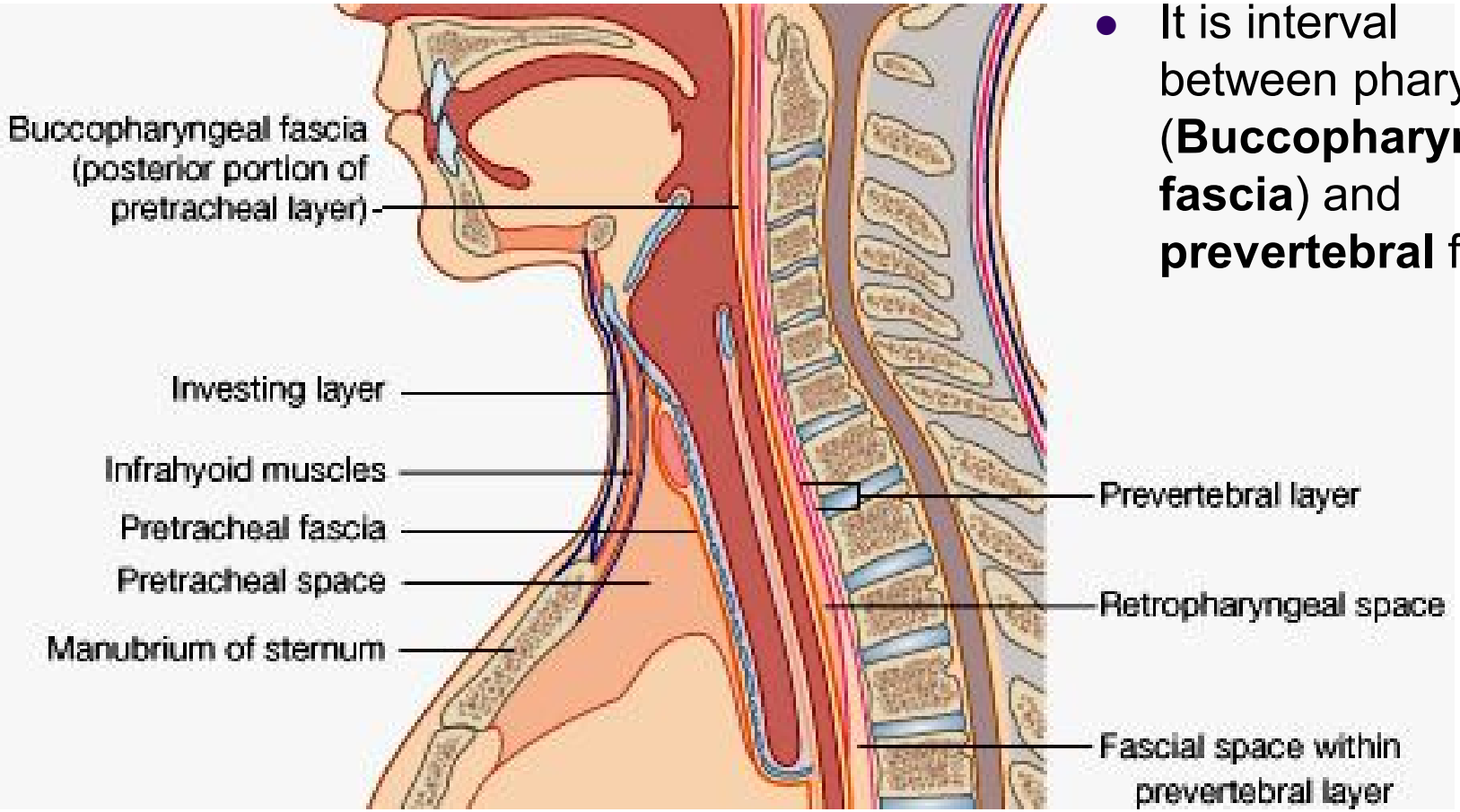
97. Retropharyngeal space



- It is interval between pharynx (**Buccopharyngeal fascia**) and **prevertebral** fascia

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above thyroid, it is only internal carotid, and below is common carotid

98. Carotid sheath

- Derived from all 3 layers.
- Encloses :
1. **Common and internal carotid arteries**,
2. **Internal jugular vein**
3. **Vagus nerve**
- some deep cervical lymph nodes, carotid sinus nerve, sympathetic nerve fibers (carotid periarterial plexuses)

internal larygeal accompany superior larygenal artery

external laryngeal nerve accompanives superior thyroid artery

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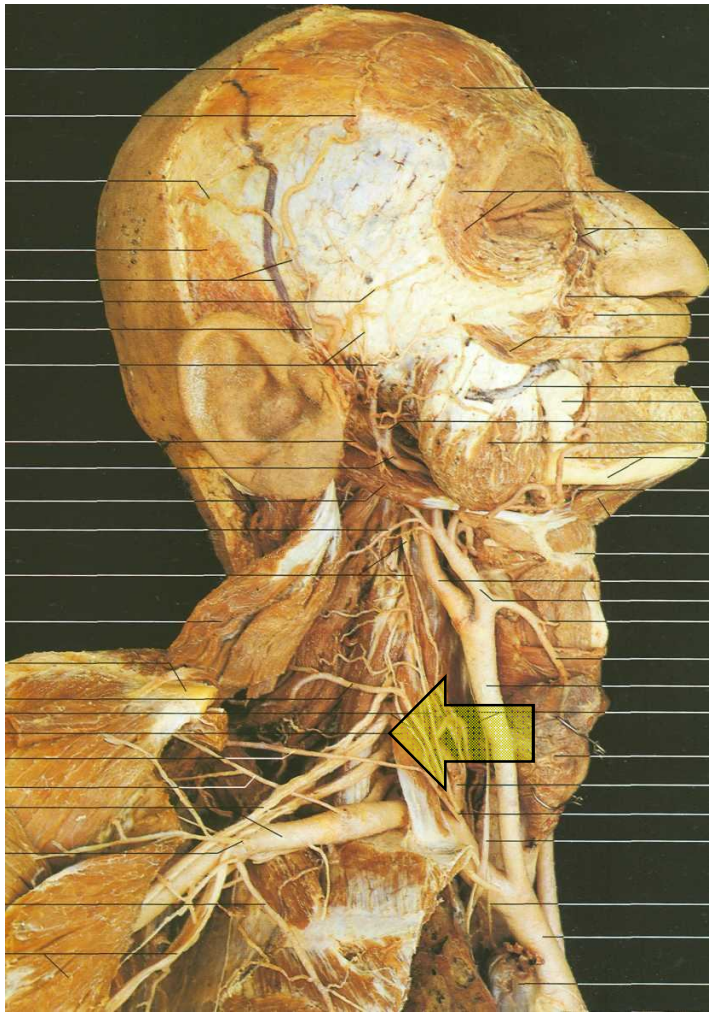
99. Axillary sheath



- Derived from the **prevertebral fascia**
- Encloses the **axillary vessels** and **brachial plexus** as they emerge in the interval between the scalenus anterior and medius muscles – **Interscalenus space**
- Extends into the axilla

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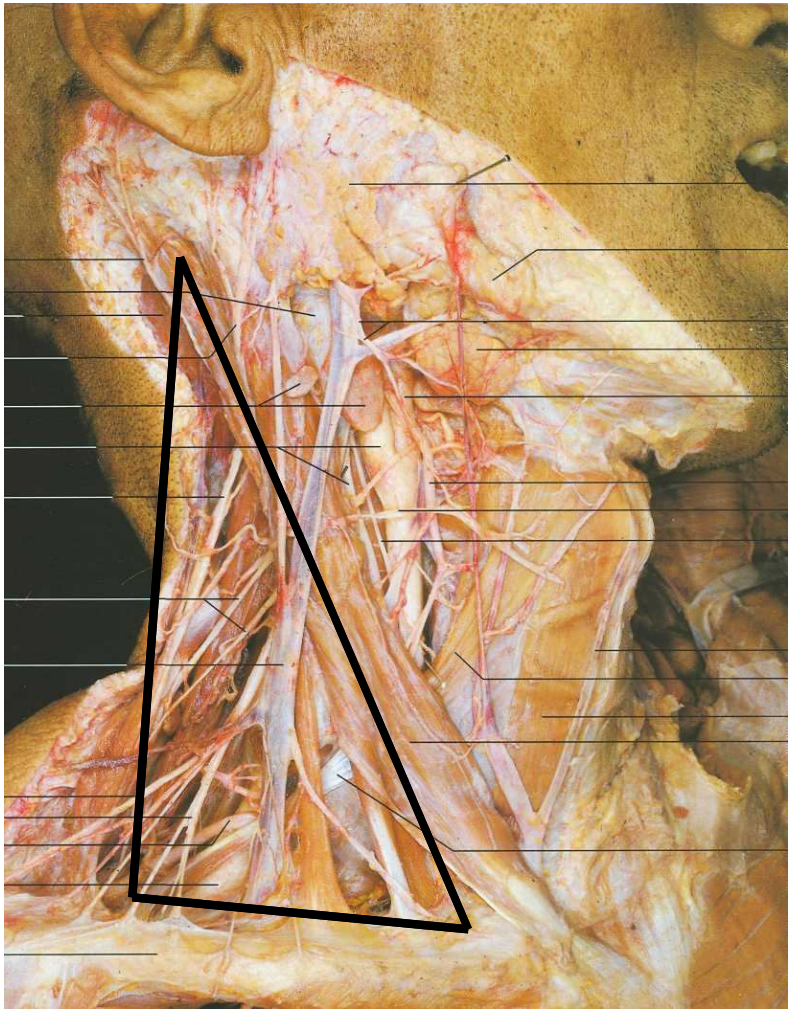
100. Posterior Triangle of the Neck



Summary:

- **Scalene muscles**
- Veins – **external jugular** vein, **subclavian vein**
- **Arteries** –occipital artery
- Nerves – **accessory nerve (XI)**, **trunks of the brachial plexus**, branches of cervical plexus, **phrenic nerve**
- Lymph nodes – **superficial cervical** nodes along external jugular vein

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Good Luck!

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