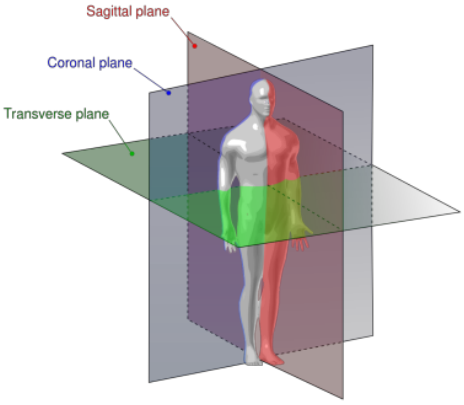
Human Structure & Function- Summary Notes

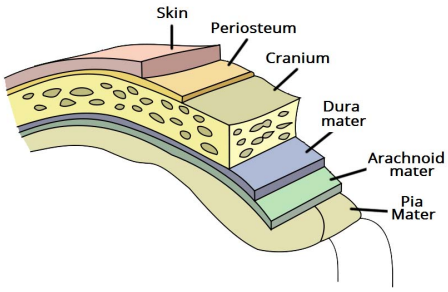
Anatomical Basics



- Planes of Anatomy
  - Coronal (fall forward & back)
  - Sagittal (fall left & right)
  - Transverse (through the belly button)
- Positioning
  - Anterior/Posterior (Front & Back)
  - Ventral/ Dorsal (Front & Back)
  - Medial/ Lateral (Mid-line & outside)
  - Superior/ Inferior (Top & Bottom)
  - Proximal/ Distal (Close to & further from origin)
  - ABduction/ADduction (move away & toward mid-line)

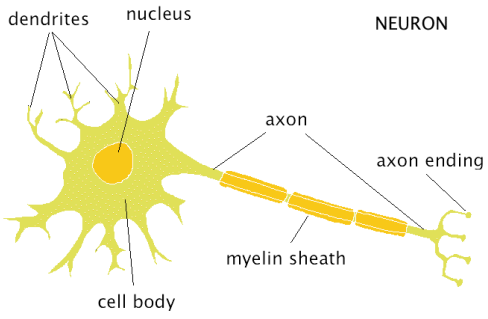
Neurological Basics

Brain & Spinal Cord



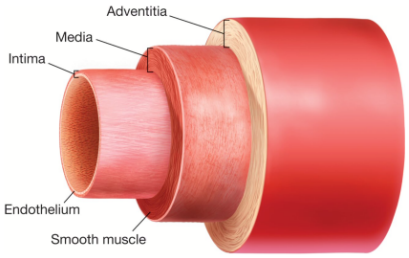
- Meninges
  - Three layers that protects brain and spinal cord
  - Dura Mater (Outer Layer)
    - Double sheet of connective tissue that folds between hemispheres (against skull)
  - Arachnoid (Middle Layer)
    - Tissue with spidery offshoots that span sub-arachnoid space
    - Subarachnoid space contains CSF to cushion the brain
  - Pia (Deep Layer & connects straight onto brain)
- Skull
  - Set volume ∴ it cannot move
  - If brain expands ∴ reduced blood flow & can lead to epidural haematoma
    - Nb- Bleeding into the Meninges can increase pressure within the skull and thus on the brain

Nervous System



- Neurons
  - Transmit action potentials (AP) from Dendrites to Axon terminal
  - Cell body is highly branched
  - Myelin Sheath insulates axon
  - Axons go to other cell bodies

Circulatory System Basics

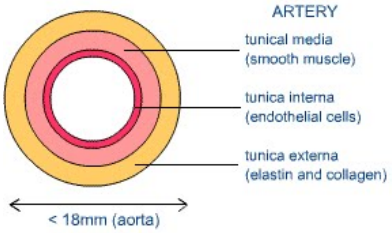


Blood Vessel Structure

- Intima→ endothelium that's thin and permeable
- Media→ smooth muscle that's elastic
- Adventia→ fibrous tissue that gives nerve and blood supply

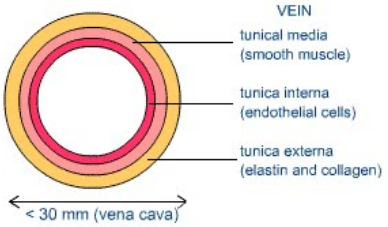
Arteries

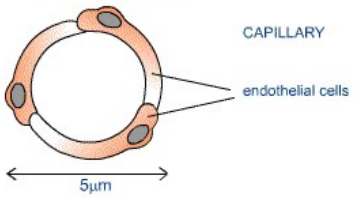
- Elastic→ Closer to heart and must withstand high pressure
- Smooth and muscular to reduce friction
- Anastomoses
    - A connection between two arteries that allows oxygenated blood to travel an alternate pathway
- End Arteries→ don't link with other arteries
- Thrombosis→ block in a blood vessel



Veins

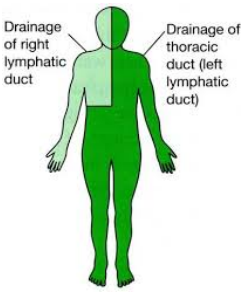
- Carry blood back towards the heart via venules then veins
- Thinner walls, with less muscle as blood isn't under as much pressure
- Valves
    - In perforating veins in the limbs (close to muscles)
    - So as to not lose blood down the vessels due to gravity
    - Muscles squeeze the blood up the vessels when they contract
- Venae Commintates→ veins over the top of arteries to obtain heat from arteries
- Thoracic Pump→ diaphragm contraction squeezes IVC thus sending blood up to the heart





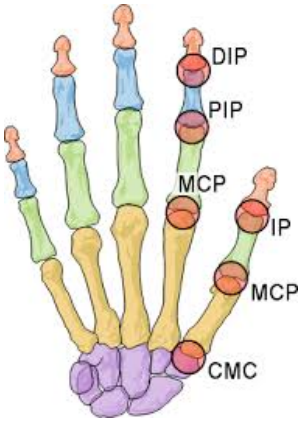
Lymph

- Tissue filled for plasma proteins
- Lymph Vessels
    - Carry foreign material to lymph nodes to be filtered
    - Return to circulation in the left and right Brachiocephalic veins
    - Thoracic Duct→ drains most of the body
    - Lymphatic Duct→ drains the right quarter of the body
- Lymph Nodes
    - Expose foreign material to antigens and the immune system
    - Sentinel nodes throughout the body at the neck, underarms and groin



Wrist

- Radio-carpal Joint is a condyloid joint that deviates the wrist
- Ulnar doesn't articulate at the wrist at all (Distal radioulnar joint)
- Scaphoid articulates with radius and some of the Lunate bone



Hand

- Intercarpal joints (between carpal bones) stabilize the wrist
- Carpo-metacarpal joint is condyloid joints
- Interphalangeal joints are hinge
- Thumb joint is a saddle joint

Muscles

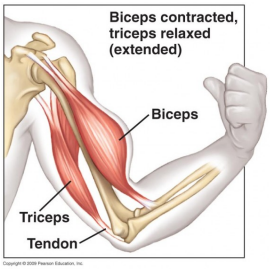
- Muscles in the same compartment have similar action and same nerve innovation

Shoulder/Scapula

- Pec Major/Minor→ joins to coracoid process as an extensor
- Deltoid→ fully surrounds the shoulder joint as primary mover
  - Rotator Cuffs→ from scapula and attaches to the head of the humerous (provide first 10^0 of shoulder abduction)
- Teres Major/Minor→ Inf Scap to the humerous

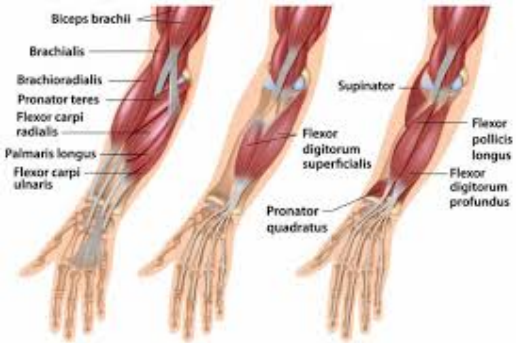
Arm

- Anterior Compartment (Flexors)
  - Bicep (2 heads with Coracoid and joint capsule origins)
  - Brachialis→ main flexor across elbow joint
- Posterior Compartment (Extensors)
  - Triceps with Long, Medial and Lateral heads
    - Joins to scapula at various locations

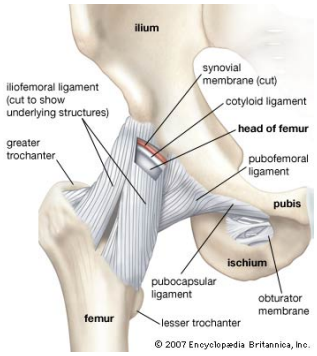


Forearm

- Anterior Compartment (Flexor of wrist and digits)
  - Superficial Layer (Flexor Carpi radialis/ulnaris for wrist deviation)
  - Intermediate Layer (Flexor Digitorium Superficialis with tendons through carpal tunnel)
  - Deep Layer (Flexor Digitorium Profundus)
  - 9 Tendons through the carpal tunnel
  - Common origin of medial epicondyle of humerous
- Posterior Compartment (Extensor of wrist and digits)
  - Superficial Layer→ Brachioradialis is prime mover but doesn't cross the elbow joint
  - Deep Layer→ Extensor Pollicis Longus/Brevis and abductor pollicis longus act on thumb and form snuffbox

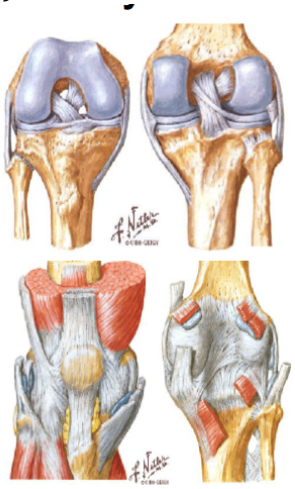


Hip Joint



- Ball and Socket Joint deepened by a Labrum 3 degrees of movement)
- Illiofemoral Ligament→ spins around the joint and screws femoral head into socket
- Due to blood supply, fractured neck of femur can cause death of femoral head
- Dislocation→ risk of damaging sciatic nerve

Knee Joint

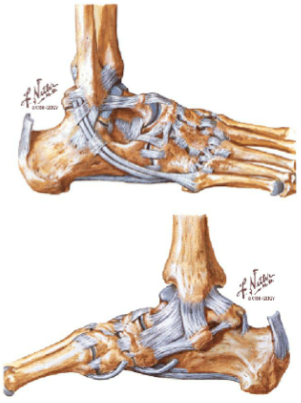


- Joins Femur with Patella and Tibia (stable at extension)
- Bursa→ decrease friction and can gather fluid ∴ swell easily
- Menisci→ x2 Fibrocartilagenous Discs on top of Tibial plateau (wedges)
    - Increase contact/SA between and act as shock absorbers and spread synovial fluid
- Ligaments→ create most of the stability at the knee joint
    - Cruciate's→ ACL/PCL (stops forward/backward slippage)
        - Name tells you where it attaches to tibia
    - Collaterals→ sits on the edge of the joint to stop sideways movement
        - Medial→ touches medial menisci and joint capsule
        - Lateral→ rounded and narrow and attaches to Fibula head
- Injury→ Unhappy Triad (ACL, MCL and Medial Menisci)
    - Can all be damaged with rotation of knee

Tibia/Fibula Joint

- Superior Joint→ strong ligaments with some gliding
    - Fibula does not articulate with Femur at all
- Inferior Joint→ Fibrous Syndesmosis with good stability

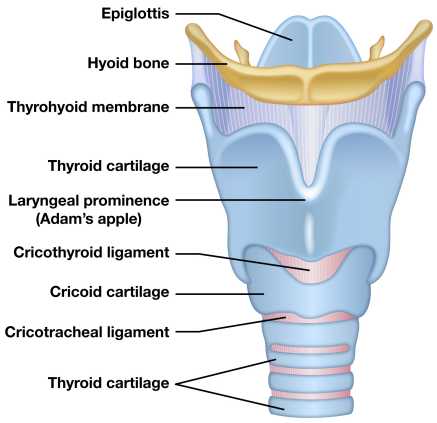
Ankle Joint



- Talo-Crural Joint→ Hinge Synovial Joint
    - Talus mainly articulates with Tibia but it also touches Fibula
- Collateral Ligaments
    - 3 Lateral (non continuous and very weak and separate)
    - 4 Medial (strong and provide great support)
- Sub-Tarlar Joint
    - Talus joining with other tarsals
    - This allows sideways movement of the foot (inversion and eversion)
- Movement→ Plantarflex (to ground) and Dorsiflex (true flexion)

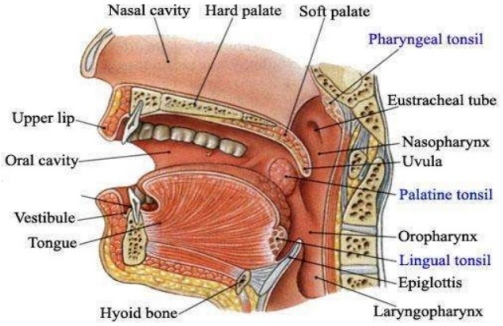
Larynx

- Joins pharynx to lower airways
- Epiglottis→ behind tongue and closes off trachea when swallowing
- Thyroid Cartilage→ Adam's Apple
- Cricoid Cartilage→ first full ring of cartilage adjoining to trachea
- Hyoid Bone→ above thyroid cartilage
- Tracheal rings→ Cartilage around trachea that is lacking in the posterior
- Vocal Chords/Ligaments
    - 2 Arytenoid Ligaments that attach to the thyroid cartilage
    - Make sound as ligs adduct
    - Has vocal fold of mucosa over the top of it



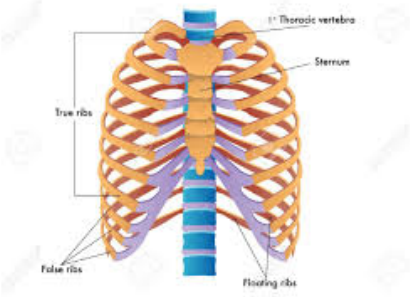
Pharynx

- Naso (superior), Oro (Middle) and Laryno (Inferior) all make up the pharynx
- X3 Constrictor Muscles close around posterior nasal and oral cavities to create the posterior border of the pharynx
- Adenoids→ part of the immune system at the back of Nasopharynx
    - If they swell they can block the auditory tube ∴ you cant equalize pressure
- Palatine Tonsils= "THE TONSILS"→ on lateral walls of oropharynx



Thoracic Framework

- For protection and assists with breathing (12 Ribs and Cartilages)
- Sternum→ Manubrium> Body> Xiphoid Process
- Costal Margin→ Joins the costal cartilages of Ribs 7-10
    - Joins the ribs to the Sternal Body
    - Ribs 11 and 12 have no costal cartilages (Floating)
- Ribs attach to Thoracic Vertebrae posteriorly (5th Ribs between T4 and T5 vertebral bodies)



- Typical Ribs→ Ribs 3-9
    - Head at vertebral end joins with Costal facet of vertebral body with strong ligaments
    - Costotransverse Joint is between Costal Tubercle and Transverse process of vertebrae (X3 strong ligs)
- Openings
    - Superior→ Manubrium border with 1st Rib and Costal Cartilage
        - Closed by Supraplexal membrance where needed

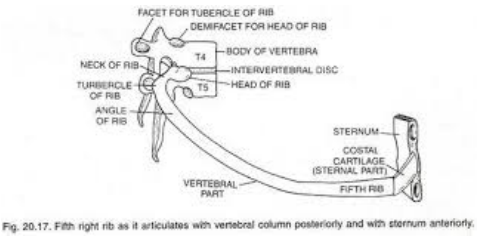
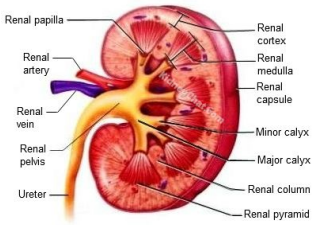


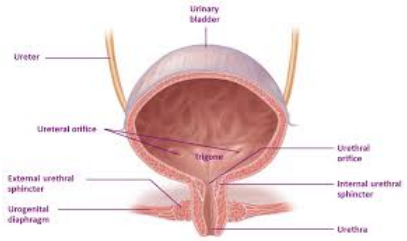
Fig. 20.17. Fifth right rib as it articulates with vertebral column posteriorly and with sternum anteriorly.

The Urinary System

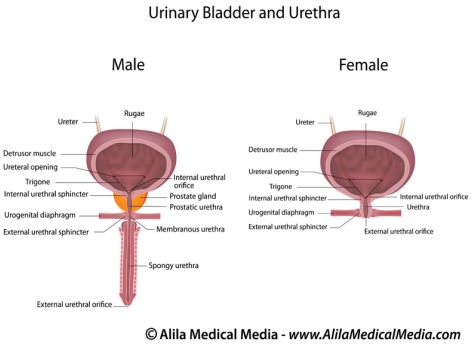
- Kidney
  - Solid viscera at L1-L3 with RHS slightly lower due to kidney
  - Sits against Psaos Major and surrounded by lots of fat in Renal fascia
  - Hilum
    - Faces antero-medially with spaces inside filled with fat (Renal Sinuses)
    - Renal Pelvis→ is continuous with ureter to bladder
    - Renal Artery→ splits to supply individual segments
    - Renal Vein→ Most Anterior and drains directly into IVC
  - Structure
    - Cortex (outside and fills the space between medulla
    - Medulla (Renal Pyramids that secrete urine into Minor then Major Calices then ureter)



- Ureter
  - Joins kidney to bladder by following Psaos major
  - On lateral wall of pelvis and enters obliquely through the bladder
  - Narrowings forming functional sphincters
    - Uteropelvic junction at kidney
    - Crossing the illiac crest
    - Passing through the bladder



- Bladder
  - Most anteriorly positioned viscera within the pelvis with strong muscular walls
  - Pyramidal shape with apex (ant) and base (post)
  - Sits Posteriorly against rectum or uterus
  - Trigone→ 2 ureters enter posteriorly and urethra exits anteriorly
    - Is an area of smooth muscle
- Urethra
  - Females→ short through pelvic floor ∴ more UTI's (4cm)
  - Males→ 4 segments that bends twice and is longer (through penis)
    - Pre-prostatic>Prostatic> membranous (through pelvic floor)> Spongy (through penis)
    - 2 sphincters whereas females only have 1



The Pelvis

The Pelvic Floor

- Closes off pelvis inferiorly by the Levator ani muscles
- Levator Ani
  - Puborectalis→ sling around anus creating the kink
  - Pubococcygeous and illiococcygeous
  - Urogenital hiatus form urethra and vagina (females) to pass through