

- layers of the heart: pericardium
- deep ↓ superficial listings
- ▷ endocardium: innermost lining of the heart, covers all the structures inside the heart that ~~regulate~~ blood flows along side
- ▷ endometrium, provide a slippery, protective surface inside the heart
- ▷ myocardium: inside the walls of heart (where studs are found in the walls of your house)
- ▷ cardiac muscle tissue
- ▷ generate contractions w/ ~~autonomous~~ autorhythmicity, to pump blood
- ▷ epicardium/visceral pericardium: outside of the heart, considered both a layer of the heart AND a layer of the pericardium
- ▷ mesothelium (SS - epithelia)
- ▷ secretes serous fluid into pericardial cavity, slippery
- ▷ Pericardium:
- ▷ pericardial cavity: space & serous fluid very thin, lubricates to prevent friction w/ movement of the heart
- ▷ parietal pericardium: outer layer lining in the pericardial cavity, inner layer of pericardial sac
- ▷ mesothelium, secrete serous fluid into pericardial cavity, slippery
- ▷ fibrous pericardium: outside layer of pericardial sac
- ▷ dense irregular CT, strong in all directions to protect the heart, anchors the heart in place in the mediastinum
- ▷ forms a protective wall; limits the movement of the heart
- ▷ cardiac skeleton - dense irregular CT binds atria & ventricles together, anchors & valves in place - strong wall against where the cardiac muscle contracts, insulates the contraction of the atria from the ventricles to allow for the pause between their contractions CCT not excited

Heart overview

- Ex: Generates contractions that pump blood throughout the body (delivering nutrients, picking up wastes from the tissues of the body), to maintain pressure in the cardiovascular system
- Size & Position of the heart
 - Roughly the size of a loose fist - female heart slightly smaller than male heart
 - Size of heart does chng w/ age, elastic fibers in the heart that stretch w/ time (and disease)
 - Position: ventral body cavity, in the thoracic, in **mediastinum** (space between the left/right lung @ the center of the thoracic cavity, also includes trachea, esophagus, great vessels)
 - the base of the heart is also the broadest plane toward top; Apex is the "point" near the bottom of the heart
 - apex points toward the left side of the body. less lung tissue on the left to accommodate the apex of the heart.
- cardiac notes
 - heart is up against the diaphragm below it
 - Ex of the heart: double pump
 - Right side: Pulmonary circuit - pumps blood from the right ventricle → lungs via pulmonary arteries to collect oxygen; return to the left side of the heart via the pulmonary veins
 - arteries move blood AWAY from the heart
 - veins always move blood ~~away~~ TOWARD the heart
 - Red = oxygen rich
 - blue = oxygen poor
 - Left side: Systemic circuit - pumps blood from the left ventricle out to the tissues of the body via aorta? (its many branches to deliver nutrients to the tissues, then return to the right side of the heart via sup. & inf. vena cava)

never let monkeys eat bananas

* Types of muscle attachment

- Indirect: Tendons - dense reg. CT w/ collagen running in parallel to make a strong connection to the bone (penetrating fibers of periosteum) - collagen fibers intermingled to form the connection
- * Bone responds to tugging of tendons which builds up bone tissue (tubercles, trochanters + spines)
- * Direct: collagen fibers form epimysium/fascia intermingling w/ penetrating fibers of periosteum of bone = connect the muscles to the bone [tugging causes fiber tears - not always raised, always rough]

* Blood supply + nerves

- ▷ extensive network of blood/nerves w/in CT of muscle
- ▷ nerves branch to connect to each SMF
- ▷ capillaries [tiny + nutrient exchange] in loose CT of endomysium coiled like phone cord - coiled spring shape allows it to compress during contraction, stretch during extension w/o breaking

* Microscopic functional anatomy

- ▷ Sarcolemma = PM of a SMF cell of skeletal muscle
- * motor end plate: the ~~neuro~~ neuromuscular junction
- zoomed out view of a motor neuron axon & its interface w/ an SMF via multiple branches of axon terminals. includes several neuromuscular junctions
- Neuromuscular junction: zooms in on one specific axon terminal end & its interface specifically w/ the PM of SMF
- the neuromuscular junction is a specific type of synapse
- synaptic knob: end of axon terminal of motor neuron

CHC > expanded ~~message~~

Joint Injuries

- * Stretched firm ligaments (stretch = sprain) - dense CT
- ▷ heals very slowly
- ▷ immobilize, surgery if firm, physio/chiro churning
- ▷ by breaking up scar tissue - introduce movement to
- ▷ reinforce joint, strengthen muscle around joint (strengthen
- ▷ muscle around joint, increase muscle tension while
- ▷ it heals)
- * Torn cartilage - maybe surgery; no healing in
- ▷ cartilage
- * Herniated intervertebral discs - maybe surgery
- ▷ to remove the bulged piece - pinches spinal nerve
- * Dislocations - stretching/tearing of ligaments
- ▷ fibrous capsule of joint (fibrous CT) - always
- ▷ lead strer to dislocate again
- * Arthritis
- * Osteoarthritis - age or wear & tear
- ▷ art. cart. breaks down; bone rubbing joint
- ▷ bone friction: inflammation; anti-inflammatory
- * Rheumatoid arthritis
- ▷ autoimmune disorder that affects joints
- ▷ early point in life, anti-inflammatory
- ▷ systemic disease/gout can also cause this

Muscles part 1

- all muscle ^{cells} contracts
- all muscle tissues are excitable - responsive & contractile
- > conductive: stimulus from one part of the cell
- > contractile (shorten)
- > extensible: extend past their relaxed length (strength)
- > elasticity: par muscle passively return to their relaxed position
- > smooth muscle: propel substances, ^{mostly} involuntary
 - loc: internal passageways (GI, respiratory, eye, pape rector
 - and muscle), regenerates to ~~regenerate~~ repair itself
 - > tapered @ end, no striations, uninucleate
 - > respond to hormones, nervous stimulus
 - > aerobic - fatigue resistant
- > cardiac muscle: heart ^{beat}, propel blood through cardiovascular system - striated
 - > branched connected by intercalated discs to allow for autorhythmic beats
 - > mostly areobic, replies to chem stimulus
 - > cells cant repair it self:
- > skeletal muscle contraction
 - > voluntary muscle contractions to create movement in skele system
 - > attached to bone, multinucleate, long cells - striated
 - > only responds to motor neuron of NS
 - > aerobic & anaerobic - muscles can keep working w/ little oxygen, varied fatigue
 - > limited regeneration, heals slowly

skeletal
SMF = muscle fiber (muscle cells)

organization of skele. muscle organ

- △ bundles of bundles = hierarchy of organizational levels: bundle of fascicles, bundle of muscle fibers
- △ myofascium: wrapping around each level
 - fascia: outside of epimysium
 - * length of each fascicle is as long as the muscle
 - myofibril: cylinder of many sarcomeres: is as long as its SMF
 - myofascium is wrapping around every little piece
- △ fascia: not always present, depends on location
 - tissue: dense regular, dense irregular CT
- △ epimysium = epi = above = outside of muscle organ
 - dense irregular + regular CT
 - at ends of muscle = dense reg CT, continuous w/ muscle attachment
- △ in the middle (body) of muscle = dense irreg CT
- △ perimysium = around outside, surrounding fascicles
 - dense irreg. CT (binds tissue, strong in all directions, room for B & nerves)
- △ endomysium: loose CT, room for B & nerves to support SMF & plasma membrane of SMF
- △ of endomysium, surrounds skeletal muscle fibers
- * muscle attachments:
 - origins = bone attachment @ stationary end of muscle
 - insertion = bone attachment @ moving end of the muscle
 - during contraction insertion ALWAYS moves closer to origin as muscle contracts

Week 6 Lecture content: Joints

- ▶ Joints aka articulations: a part of the skeletal system
- ▶ Fx: connects bones together - determine mobility
- * Classification of Joints
 - ▶ Synarthrosis = no movement
 - ▶ Amphiarthrosis = little movement
 - ▶ Diarthrosis = lots of movement
 - ▶ (syn = junction; arthro = joint; osteo/osteo = bone; chondro = cartilage)
- * Structural Classification of Joints
 - ▶ Fibrous joints = collagen fibers between bones (dense irregular CT)
 - ▶ Cartilaginous joints = cartilage between bones
 - ▶ Synovial joints = synovial fluid between bones for lubrication
- Sutures
 - * Fibrous joints
 - * Ch = collagen fibers stitch together the bones of the skull
 - ▶ Synarthroses - as we age, collagen fibers get shorter; shorter, eventually in middle age, so short, bones grow together
 - ▶ Lose joint - synostosis = bony junction
- * Syndesmoses - syn = junction; desmo = ligament
 - ▶ Ch = collagen fibers band together the bones of leg, forearm
 - * Loc = between ulna & radius & tibia & fib
 - * Fx = amphiarthroses (collagen fibers are longer, allows for movement)
- * Gomphoses
 - ▶ (gomphosis = peg/tooth)
 - * Ctl = collagen fibers from ~~peri~~ periodontal ligaments
 - * Loc = between teeth & jaw
 - * Fx = synarthroses
- * Cartilaginous joints, ~~syn~~
 - ▶ cartilage between the bones
- * Synchondroses
 - * Ch = junction of cartilage, Tiss = hyaline cartilage

synovial membrane (synovial joints)

- ▷ inner layer
 - * CH: TISS loose CT
 - * Fx = produce & secrete synovial fluid
- ▷ Reinforcing ligaments
 - ▷ TISS: dense regular CT connect bone to bone
 - * Fx = binds tissues (holding bones together); limit range of motion/define range of motion of a joint; add strength in one direction for needed places
 - ▷ Loc: ~~extra~~scapular ligaments (outside joint capsule ex: collateral ligaments)
 - * intrascapular ligaments (inside joint capsule; ex: cruciate ligaments)
- ▷ Bursae/Tendon sheaths
 - ▷ found where they are needed
 - * Fx: lubricating to prevent friction between non-moving & moving parts outside joint capsule
 - * Bursa: CH = membrane bound sac of synovial fluid
 - ▷ outside joint cavity
 - * Tendon sheath: CH = membrane bound sac of synovial fluid outside joint cavity, wrapped around a tendon to function in multiple planes
- ▷ Fat pad
 - ▷ optional, fill in space in a joint - adipose CT (tiss)
- ▷ Articular disc
 - ▷ optional - pad of fibrocartilage (tiss), absorb shock
 - ▷ knee & jaw located

Synchondroses

* Fx = synchondroses

* LOC/Fx = epiphyseal plates of long bones (present for growth, go away... become synchondroses; costal cartilage of rib #1)

* Symphyses

* CH = TSS = Fibro cartilage (absorb shock)

* Fx = ~~synchondroses~~ amphiphyses (little movement to fx properly)

* LOC/Fx = pubic symphysis (between pubis regions of claval bones in articulated pelvis); intervertebral discs of spine

* Synovial joints

* CH = have a joint cavity (space) between bones filled w/ synovial fluid (lubricating)

* Fx = diarthroses (lots of movement)

* Types: ball & socket joints, hinge joints, plane joints, pivot joints

* Structures of a typical synovial joint

1) Articular cartilage: hyaline cartilage, creates a smooth surface on articulating regions of bones @ articulating surfaces of bones

2) Synovial cavity: space between bones that is filled w/ synovial fluid, space for fluid

3) Synovial fluid: consistency like egg whites, filled w/ nutrients; some wastes, lubricates joint to prevent friction, nourishes articular cartilage

4) Joint capsule: surrounds joint cavity

2 layers:

* Fibrous = outer layer; aka fibrous capsule

* CH TISS = dense irregular CT (runs continuously from periosteum of bone #1 to periosteum of bone #2, across the joint cavity) - binds bones together; creates a strong protective layer around edges of joint cavity