Fractures
result from
old age
weakness
bone thinning

3 fracture classifications
1. position of bone ends after
   - nondisplaced - normal position
   - displaced - out of normal
2. completeness of break
   - complete - all the way thru
   - incomplete - not all the way
3. skin penetration
   - open - compound - penetrated
   - closed - simple - non penetrated

Repair
reduction - realignment of broken bone ends

Repair stages
1. hematoma formation
   - blood vessels hemorrhage mass of clotted blood
   - hematoma
2. Fibrocartilaginous callus formation
   - phagocytic cells clear debris
   - fibroblasts secrete collagen connect broken ends
   - reconstruction of bone
3. Bony callus formation
   - w/ one week - new trabeculae form in callus
   - callus converted to bony (hard) callus of spongy bone
bony callus continues for about 2 months until firm union forms.

4. Bone remodeling
- begins during bony callus, continues for several months
- excess material removed
- compact bone is laid down
- original structure

**BONE DISORDERS**

*Osteomalacia*
- bones are poorly mineralized
- calcium salts are not adequately deposited
- soft, weak bones, adults
- vit D deficiency or not enough calcium

*Osteoporosis*
- bone resorption exceeds deposits
- matrix remains normal, bone mass declines
- postmenopausal women

*Rickets*
- osteomalacia of children
- bowed legs
- bones are enlarged & abnormally long

cont.
- estrogen plays a role in bone density. so as it lowers, bones less dense

**Risk factors**
- petite body form
- insufficient exercise to stress bones
Paget's disease
- excessive & haphazard bone deposit & resorption which means it's made fast and poorly
called Pagetic bone
- high ratio of spongy to compact bone
- occurs in spine, pelvis, femur & skull
- possibly viral

JOINTS
- joints - aka - articulations where bones meet
- functions - give skeleton mobility, hold skeleton together
- two classifications
  - structural
    - based on what material binds the joints
    - fibrous
    - cartilaginous
    - synovial
  - functional
    - based on movement allowed
    - synarthroses - immovable
    - amphiarthroses - slightly movable
    - diarthroses - freely
STRUCTURAL CLASSES

- **Fibrous**
  - dense fibrous connective tissue
  - no cavity
  - immovable
  - protection of organs

- **Cartilaginous**
  - bones are united by cartilage
  - no joint cavity
  - not very movable

- **Synovial**
  - bones are separated by fluid-filled cavity
  - all freely movable—diarthrotic
  - all limbs

  **Features**
  1. Articular cartilage—hyaline cartilage
     - covering that prevents crushing
  2. Joint (synovial) activity
     - small-fluid-filled space
     - unique
  3. Articular (joint) capsule
     - two layers thick
     - external—fibrous layer
     - inner—synovial membrane
       - produces synovial fluid
  4. Synovial fluid
     - lubricates & nourishes articular cartilage
     - contains phagocytic cells
       - to remove debris & microbes
  5. Diff reinforcing ligaments
     - B → B
capsular-thickened fibrous layer
extracapsular-outside
intra-capsular-deep to capsule

b. Nerves & blood vessels
   nerves detect pain
   capillary beds supply filtrate for synovial

other features
   fatty pads cushioning btwn fibrous layer
   articular discs (menisci)
   improve "fit" of bone ends, stabilize joint, reduce wear & tear
   very active joints, "ball bearing"
   bursae
   reduce friction
   tendon sheaths
   elongated bursae subjected to friction

stability of joints
   shape of articular surface
   ligament
   muscle tone
   reinforces muscles & joints w/ exercise & tone
**JOINT INJURIES**

- Cartilage tears due to compression & shear stress; repaired w/ arthroscopic surgery
- Sprains: ligaments are stretched or torn; repair slowly b/c poor vascularization; surgery might be required & immobilization
- Dislocation (luxations): forced out of alignment
- Subluxation: partial dislocation of joint

**Inflammatory & degenerative conditions**

- Bursitis: inflammation of bursa caused by blow or friction
- Tendinitis: inflammation of tendon sheaths, usually injury
- Arthritis:
  - Pain, stiffness, swelling of joint; acute - caused by bacteria
  - 3 types:
    - Osteoarthritis: most common, irreversible, degenerative, more degenerative
    - Rheumatoid arthritis: auto immune
      - 40-50 yrs old
    - Gouty arthritis: uric acid crystals; common in men, pig toe
Muscular System

Muscle Types
- Skeletal: voluntary, powerful, contract rapidly, tire easily
- Cardiac: only in heart, nervous system stimulation, bulk of wall, involuntary, stratified
- Smooth: walls of hollow organs, involuntary, not stratified, no nervous system needed

Muscle Characteristics
- Excitability (responsiveness)
- Contractility (response to stimuli)
- Shortness
- Extensibility (stretched)
- Elasticity (recoil)

Muscle Functions
- Produce movement
- Maintain posture & body position
- Stabilize joints
- Generate heat
JOINT INJURIES

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INFLAMMATORY & DEGENERATIVE CONDITIONS

- Bursitis inflammation of bursa caused by blow or friction
- Tendonitis inflammation of tendon sheaths, overuse injury
- Arthritis pain, stiffness, swelling of joint acute - caused by bacteria 3 types
- Osteoarthritis most common irreversible degenerative, more degenerative
- Rheumatoid arthritis auto immune 40-50 yrs old
- Gouty arthritis uric acid crystals common in men/pig toe
skeletal muscle anatomy

3 features
- nerve, blood supply, connective tissue sheaths and attachments

nerve & blood supply
- each muscle gets a nerve, artery & vein
- consciously controlled skeletal muscle has nerve supply to every fiber
- contracting muscle fibers require huge amounts of O₂
- also need waste removed quickly

connective tissue sheaths
- epimysium
  - surrounding entire muscle
- perimysium
  - surrounds fascicles (groups of muscle fibers)
- endomysium
  - areolar connective tissue surrounds each muscle fiber

attachments
- joints to bones
- insertion - movable
  - origin - immovable
- direct or indirect
  - direct - fleshy, fused to periosteum
  - indirect - wrapping extends as tendon or aponeurosis
microanatomy
fiber
a muscle cell contains other organelles
sarcolemma
plasma membrane
sarcoplasm
cytosplasm of muscle fiber
glycosomes
glycogen storage & myoglobin
↑ gives red pigment
modified organelles
myofibrils
One muscle fiber can have 100s of myofibrils
~ 80% of muscle cell volume
myofibril features
striations
→ A bands - dark regions
  *H zone - lighter, in middle of A-band
    only myosin
  *m line - line of protein that bisects H zone vertically
→ I bands - lighter regions
  *Z line (disc) shaped line sheet on middle of I band
sarcomeres
*smallest contractile unit
functional unit of a muscle fiber