Musculo-skeletal System

Medical Terminology
Week 2
Created by: Rita Weingourt
LAH3C

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Skeleton

- Rigid
- Articulating (moveable)
  - Framework for muscles and other tissues
  - Protects vital organs
  - Produce and store essential minerals
  - Make red blood cells (bone marrow)
  - Stores calcium

How does it move?

- Ligaments, Tendons, Joints
- Ligaments tie bones together
- Tendons stretch
- Joints are places where bones come together
  - Allow for movement

Bones

- About 206 in the human body
  - Osseous tissue
  - Ossify means harden
  - Cartilage hardens and turns into bone
- Different shapes and sizes
  - Flat
  - Short
  - Long

Divisions of the Skeleton

- **Axial Skeleton:** central part
- **Appendicular:** extremities

Long Bones

- **Diaphysis:** long, narrow shaft
- **Medullary cavity:** center, containing bone marrow
- **Epiphyses:** ends
- **Periosteum:** thin layer of tissue covering outer surface of bone
- **Cartilage:** layer of tissue covering epiphyses

Tissue and Marrow

- Bone cells are alive
- Bones: organs with blood & lymphatic vessels & nerves
- Bone tissue is densest form of connective tissue
- Two types of bone:
  - **Compact** (hard & dense)
  - **Spongy**
- Two types of marrow
  - **Red** (makes blood cells; in ends of long bones, center of others)
  - **Yellow** (mostly fat; in central cavities of long bones)

Types of Joints

- Fibrous
- Cartilaginous
- Synovial

Joints

- Some joints highly moveable (knee, elbow)
- A joint with free movement: synovial joint
- Bursae are found wherever tendons and ligaments impinge on other tissues
- Bursae are spaces within connective tissue filled with synovial fluid.

Words of Movement

- Abduction: motion away from the body
- Rotation: motion around a central axis
- Plantar flexion: bending the foot toward the ground
- Extension: Straightening or stretching
- Dorsiflexion: backward bending of foot or hand
- Flexion: bending motion
- Adduction: movement toward the body

Effects of Aging on Skeletal System

- Slower pace of bone remodeling: weaker, more fragile bones
- **Osteoporosis:** extreme loss of bone mass
- Decreased ability to form proteins: fractures heal slowly
- Reduction in collagen in tendons, ligaments, & skin: stiffness
- Thinning of disks between bodies of vertebrae: height loss

Common Diseases and Conditions

- Fracture
- Sprain
- Osteoporosis
- Osteoarthritis

Sprain

- Tear in the ligament or fibrous tissue that connects bones
- Treatment: R.I.C.E.
- Rest
- Ice
- Compression
- Elevation

Fracture

- Closed Fracture: break in the bone
- no break in the skin
- Open Fracture or Compound Fracture:
- break in the bone
- break in the skin

Fractures

- Hairline: break without separation
- Comminuted: beak in which the bone is crushed or splintered
- Compression: Squeezing or opposing force
- Spiral: caused by twisting
- Transverse: break is straight across the bone

Fracture/Treatment

- Reduction: (realignment of the bone)
  - Cast: immobilization during healing process
  - Traction: pulleys or weights to maintain alignments
  - Pain medication
    - Opiates
    - NSAIDS, maybe

Bone Disorders

- Osteomyelitis:: Inflammation caused by bacteria
- Osteoporosis: decrease in bone density
- Neoplasms: tumors (Osteosarcoma)
- Osteoarthritis (wear and tear disease)
- Rheumatoid arthritis (immune abnormablity)
- Kyphosis (humpback)
- Lordosis (swayback)
- Scoliosis (sideways curvature of the spine)

Diagnosis/Treatment

- MRI (magnetic resonance imaging)
- Myelogram (X-ray of the spinal column)
- NSAIDS Nonsteroidal anti-inflammatory drugs
- Arthrectomy (joint removal)
- Arthroplasty (surgical repair)
- Ostectomy (surgical removal of bone)

Word Building

- Costoalgia
- Myelogram
- Osteosarcoma
- Osteoporosis
- arthrectomy

Muscular System

- Main characteristic: ability to contract
- Muscles shorten to produce movement of:
  - Skeleton
  - Vessels
  - Internal organs

Smooth Muscle

- Makes up walls of hollow organs (stomach, blood vessels)
- No striations (bands)
- Moves involuntarily
- Contracts & relaxes slowly
- Can stay contracted a long time

Skeletal Muscle

- Makes up largest amount of body's muscle tissue
- 40% of body's total weight
- >600 individual muscles in body
- Cells (fibers) are long, cylindrical, striated, & multinucleated
- Stimulated by nervous system to contract
- Moves voluntarily (although some move involuntarily)

Cardiac Muscle

- Makes up walls of heart
- Cells are striated
- Cell membranes allow electrical impulses to travel
- Muscle itself generates electrical impulse, making muscle contract

Muscle Function

- How Skeletal Muscle Cells Work
  - Muscle composed of bundle of thin & thick filaments
    - Thin filament: actin
    - Thick filament: myosin
  - Alternating bands of filaments give striated appearance
  - **Sarcomere:** unit consisting of myosin & actin filaments; causes contraction
  - **Myosin heads:** paddle-like extensions on myosin filaments
  - Overlapping filaments slide together, causing muscle fiber to contract

Muscle Function (cont.)

- Muscle Contraction
  - Occurs in response to stimulation from nerve impulses
  - Axons from neurons branch to individual muscle cells
  - **Motor unit:** single neuron & all of the muscle fibers it stimulates
  - **Neuromuscular junction:** point at which neuron branch meets muscle cell
  - **Acetylcholine:** chemical released by neuron to stimulate muscle to contract
  - **Action potential:** spreading wave of electrical current

Team Effort

- Muscles Work Together
  - Skeletal muscles attach to skeleton at two or more points
  - **Tendon:** cordlike extension of muscle that attaches to bone
  - **Origin:** point where muscle attaches to a stable part of skeleton
  - **Insertion:** point where muscle attaches to moving part of skeleton
  - **Belly:** fleshy part of muscle between origin & insertion
  - **Prime mover:** main muscle producing movement
  - **Antagonist:** muscle that opposes movement of prime mover

Where do they get their energy?

- Energy Sources
  - **ATP:** energy source needed for muscle contraction
  - Muscle makes ATP from oxygen & nutrient (such as glucose)
  - When oxygen not available, glucose is used alone (anaerobic)
  - **Lactic acid:** by-product of anaerobic metabolism
  - **Oxygen debt:** muscles operating without enough oxygen

Effects of Exercise: Just do it

- Stretching
  - Muscles can contract more forcefully
  - Increased balance & joint flexibility
- Aerobic Exercise
  - Improves endurance
- Resistance Training
  - Increases size of muscle cells & thus muscles
- General Changes
  - Increased # of capillaries & mitochondria
  - Bigger energy reserves

Effects of Aging

- Gradual loss of muscle cells after age 40
- Decrease in muscle mass
- Increase in body fat
- Increase in “bad” cholesterol levels
- Loss of power
- Decrease in height

Common Diseases and Conditions

- Strain
  - Injury to a muscle & its surrounding tendons
  - **Symptoms**
    - Pain
    - Limited motion
    - Muscle spasms or weakness
    - Inflammation
  - **Treatment:** RICE (rest, ice, compression, elevation)

Chronic Disorders

- Muscular Dystrophy: weakness w/o affecting nervous system
- Fibromyalgia: widespread aching and stiffness
- Amyotrophic Lateral Sclerosis (Lou Gehrig's Disease) muscle atrophy and death

Cumulative Trauma/Sports Injuries

- Rotator Cuff Injury: Shoulder
- Plantar fasciitis: connective tissue in arch of foot
- Shin Splints:: overuse of muscles in lower leg
- Epicondylitis: tennis elbow

(cont.)

- Carpal Tunnel Syndrome
  - Pressure on median nerve as it passes through tunnel formed by wrist bones
  - **Symptoms:** numbness, weakness, & pain in areas of hand supplied by nerve
  - Occurs in people who use their hands & fingers strenuously
  - **Treatment**
    - Over-the-counter pain relievers
    - Exercise
    - Surgery

Who treats these?

- Orthopedists
- Orthopedic Surgeons
- Neurologists
- Physical Therapists
- Occupational Therapists

Paralysis

- Hemiparesis
- Myoparesis
- Paraplegia
- Quadriplegia
- Hemiplegia

Common terms

- Fascia: sheath of connective tissue that covers a muscle
- Tone: tension present in resting muscle
- Asthenia: weakness
- Atrophy: wasting of muscles
- Atonia: flaccidity; lack of muscle tone.

Diagnosis/Treatment

- Myectomy: Excision of part of a muscle
- kinesiology: study of muscle motion
- Tenontoplasty: surgical repair of tendon
- Skeletal Muscle Relaxants: medication that reduces muscle spasms
  - Valium
  - Flexeril