LECTURE OUTLINE CHAPTER 9
Joints

Lecture Outline

I. Definition of articulation - any place that two or more bones meet, not necessarily movable.

II. Functional types of articulations - note the root work -arthrosis = joint
   A. Synarthrosis – no movement possible
   B. Amphiarthrosis – slight movement possible
   C. Diarthrosis – freely moveable

III. Structural types of articulations
   
   A. Fibrous – united by fibers of some sort
      1. suture – tightly knit together
         a. serrate or interdigitated – such as sagittal or coronal
         b. squamous – flat overlapping plates
         c. plane – two pieces butted together
      2. synostosis – bone fused together – frontal bones, mandible, epiphyseal lines
      3. syndesmosis – webbing tying bones together – interosseous border between radius and ulna for example
      4. gomphosis – fibers holding teeth in place
   
   B. Cartilage joints
      1. synchondrosis – epiphyseal plates
      2. symphysis – fibrocartilage joints such as intervertebral discs & pubic symphysis
   
   C. Synovial joints - have a joint capsule enclosing:
      1. cavity lined with synovial membrane
         a. Contains synovial fluid
      2. hyaline cartilage on bone ends

IV. Principle – there is always a trade-off between flexibility and stability as determined by
   
   A. Fit of articulating surfaces
   B. Tightness of ligaments
   C. Strength of muscles and tendons crossing the joint
   D. Other factors

V. Articular Form and Function
   
   A. Gliding - sliding at articulation. Example - sternum and clavicle
   
   B. Angular movement
1. abduction - movement out of anatomical position in the frontal plane "carried away"
2. adduction - movement in the frontal plane restoring anatomical position, "adding to" the body
3. flexion - movement out of anatomical position in the sagittal plane, bending your knee
4. extension - movement restoring anatomical position in the sagittal plane
5. hyperextension - flexion - moving past anatomical position
6. rotation - turning around its own long axis, turning your head to the side.
7. circumduction - pivoting around the origin of a limb, describing circles in the air, a combination of adduction, abduction, flexion and extension.

C. Special movements
1. eversion - tipping the sole of the foot outward, laterally
2. dorsiflexion - tipping the foot upward
3. plantar flexion - tipping the toes downward, extending the ankle
4. lateral flexion - bending the spine to the side
5. protraction - movement anteriorly in the horizontal plane - jutting out your jaw
6. retraction - the reverse of protraction
7. opposition - movement of the thumb only toward the fingers. To grasp
8. elevation - movement superiorly, shrugging shoulders
9. depression - restoring position after elevation
10. pronation – rotation "inward" (palm down)
11. supination – rotation "outward" (palm up)

VI. Structural classification of synovial joints
A. Monaxial in one plane only – hinge is an example.
B. Ellipsoidal (condyloid) – biaxial – carpals with radius
C. Triaxial – ball and socket
D. Saddle joint – only at base of thumb, permits multiple degrees of motion
E. Gliding (planar) - permit gliding motion only
F. Pivot - atlas on the axis

V. Specific joints – all are diarthroses
A. Temporomandibular joint - hinge joint with some lateral movement possible
B. Intervertebral joints - symphyses, amphiarthrotic, slight movement between each vertebral pair. Stabilized by several ligaments
   1. anterior longitudinal ligament
   2. posterior longitudinal ligament
   3. ligamentum flavum - lamina to lamina
   4. interspinous ligament - between spinous processes
   5. supraspinous ligament - connects spinous processes tip to tip
C. Sternoclavicular joint - tense, limited movement
D. **Shoulder** – maximum flexibility with little stability, poor fit between head of humerus and glenoid fossa, held mostly by muscles and ligaments (the rotator cuff)
E. Elbow joint – excellent fit of articulating bones, highly stable
F. Wrist joint - radius and three proximal carpals, slight gliding between each
G. **Hip joint** – excellent fit of head of femur into acetabulum, assisted by the “screw – home” mechanism of the capitate ligament, heavy muscles across joint
H. **Knee joint** – very poor fit of bones, several adaptations to stabilize joint
   1. strong capsule ligaments – **medial and lateral collateral**
   2. **menisci** - cartilage pads to enhance fit between condyles and head of tibia
   3. **intercondylar eminence** - provides some lateral stabilization
   4. **anterior and posterior cruciate ligaments** provide a “screw-home effect which tightens with extension of the joint, limit anterior/posterior motion.
   5. **popliteal ligaments** - reinforce back of the knee
I. **Ankle joint** - basically hinge, **between tibia and talus**, lateral and deltoid ligaments stabilize it