PHTY 207 NOTES

Demonstrate a thorough understanding of the anatomy and biomechanics of the shoulder girdle complex

- The shoulder girdle is a complex of 4 joints, it has a very unstable base ie scapula, shallow socket for the humeral head, predominantly open kinetic chain
- The GH joint has the greatest ROM in the body
- There are small support ligaments, small x sectional area muscles control the GHJ, rotator cuff muscles travel between the acromion and humeral head providing potential to impinge

Discuss the inter-relationships between bones and joints of the shoulder complex that are required for optimal function and movement

- The joints of the shoulder girdle are
- **Acromioclavicular (AC):**
- There are 3 axis of movement
    - Longitudinal ie protraction / retraction at 30 degrees
    - Transverse (frontal plane) ie elevation / depression at 60 degrees
    - Transverse (sagittal plane) at 30 degrees
- Consequences of dysfunction
    - Disease / ossification
    - Limited shoulder movement
    - Symptoms may be indistinguishable to sub acromial pathologies

- **Sternoclavicular (SC):**
- Synovial joint, intra-articular disc divides the joint into 2 portions
- Movements of the SC joint – 3 axes of movement
    - Elevation / depression around the oblique axis (45 degrees up, 10 degrees down)
    - Anterior / posterior rotation (30 – 35 degrees)
    - Axial rotation 45 degrees
- Consequences of dysfunction
    - Degeneration – minimal impairment
    - Dislocation – unusual as ligaments are very strong
    - Laxity of SC ligaments – resting clavicle on first rib
- Protraction / retraction primarily occurs between the sternum and disc – the concave surface of the medial clavicle moves on the convex sternum, producing an anterior glide of the clavicle and an anterior rotation of the lateral clavicle
- With retraction the medial clavicle articulates with a flat surface and tilts or swings, causing and anterolateral gapping and a posterior rotation at the lateral end

- These movements are usually associated with abduction (protraction) and adduction (retraction) of the scapula, since the scapula is attached to the distal end of the clavicle
- Elevation / depression the clavicle rotates upward on the sternum and produces an inferior glide to maintain joint contact
- The reverse action happens when the shoulder returns to neutral
- The motions are usually associated with elevation and depression of the scapula

- **Scapulothoracic (ST):**
- Concave over the ribs – dictates scapula resting position
- Provides GHJ stability and mobility
- Site of muscle attachment between shoulder complex and thoracic / cervical spine
- Transfers loads from UL to torso and vice versa
- Alignment relative to thoracic region will alter the length tension relationships of shoulder complex

- **Glenohumeral (GH):**
- This has the greatest ROM of any joint in the body
- Large spherical head and a small glenoid (3:1) – hence considered one of the most unstable joints in the body
- Stabilizing factors of the GH joint
    - **Bony geometry:**
    - The glenoid is normally retroverted 7° to the scapula, pear- shaped surface with average upward tilt of 5°
    - The scapula is anteverted 30° to the spine Humeral head retroverted 30° from trans-epicondylar axis of the distal humerus
    - Articular surface inclined upward 130° from the shaft
    - **Glenoid labrum:**
    - Fibro-cartilaginous tissue that deepens glenoid by 9mm superior to inferior and 2.5 mm antero-posterior
    - Increases articular area by 50% /adapts to accommodate movement of the HOH
    - Allows for attachment of glenohumeral ligaments and LHB
    - Glenoid depth and orientation
    - **Vacuum effect:**
    - The suction effect is when the glenoid labrum acts on the humeral head like a plunger – suction cup effect on the GHJ
    - This suction resists distraction
    - **Capsular structures:**
    - Attaches around glenoid rim and forms a sleeve around HOH and anatomical neck

- Lax structure – distracted inferiorly 1 cm
- Inferior portion lies in folds – important in laxity and adhesive capsulitis
- Reinforced by the ligaments and rotator cuff tendons
- **Posterior capsule:**
- Immediately reinforced
- Neuromuscular system (active)
- **Glenohumeral ligaments:**
- **Coracohumeral ligament:**
- Anterolateral base of the coracoid, runs as 2 bands over the top of the shoulder
- Difficult to separate from the SGH ligament
- Blends with the capsule and inserts into the greater and lesser tuberosity's
    - Helps support the dependent arm
    - Resists the inferior subluxation of the GH
    - Becomes taut in external rotation
- **Superior GH ligament:**
    - From the tubercle of glenoid, anterior to origin of long head of biceps
    - Extends to HOH lesser tuberosity
    - provides resistabce to inferior subluxation
- **Middle GH ligament:**
    - Travels from the supraglenoid tubercle and anterior / superior aspect of the labrum and extends laterally and inferiorly
    - Blends with subscapularis about 2cm medial to insertion
    - Substantial structure – 2cm wide, 4mm thick, absent and poorly defined in 30% of the shoulder
    - Significant contribution to restraint of anterior humeral displacement
    - Taut in 45 degrees abduction with ER
- **Inferior GH ligament**
    - 3rd component that forms the inferior sling
    - Anterior – inferior, inferior and posterior – inferior
    - Attached to the entire anterior labrum – humeral articular surface and anatomical neck
    - Involved in maintaining anterior and inferior stability
- **General restraints:**
- 0 degrees abduction – CHL and SGHL
- 45 – 60 degrees abduction – MGHL
- 90 degrees abduction – IGHL
- Function to guide and position the head of humerus
- Augment the functions of the muscle ie smooth movement
- **Dynamic stabilisers:**

- Proprioception – nerve fibres and mechanoreceptors localized in the capsule tissue form part of a physiological feedback mechanism
- Scapular muscles
- Rotator cuff muscles

Describe the ideal resting positions of the scapula and humeral head

- Optimal functioning of the shoulder requires
  - Optimal positioning of all joints
  - Ideal excursion / mobility of all joints – ie thoracic extension 10 -15 degrees, rib cage mobility, trunk and LL stability
  - Motor control of all joints
  - Correct upright posture
  - Optimal length tension relationships of muscles and articular structures
- Ideal scapula resting position
  - Sits between T2 and T7
  - Approximately 7 cm from the thoracic midline
  - Slight upward rotation about 3 degrees, and IR of 30 degrees
  - Lies flat against the thoracic cage
- **Humeral head position:**
- It can be centered in the glenoid in the following ways
  - Anterior / posterior
  - Superior / inferior
  - Internal / external rotation

Describe the movements that occur at the joints of the shoulder girdle complex during arm elevation

- Motion requires smooth inter-relationships between
- **Humerus and scapula:** humerus rotates about the scapula within the glenohumeral joints
- **Scapula and clavicle:** scapula rotates about the clavicle at the AC joint
- **Clavicle and sternum:** clavicle rotates around the sternum at the sternoclavicular joint

Outline the movements of the scapula

- **Upward rotation:**
- Scapula rotates upwardly as clavicle elevates around an axis of motion that passes through the SC joint and base of scapula spine
- Clavicular elevation continues until costoclavicular ligament becomes tight
- Axis of scapula rotation motion moves to the AC joint
- The scapula continues to rotate upwards at the AC joint until the coracoclavicular ligament becomes tight