M1 Gross and Developmental Anatomy

Scapular and Deltoid Regions

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Outline

I. Skeleton of the Shoulder and Attachment of the Upper Extremity to Trunk
II. Positions and Movements of the Scapula
   Extrinsic Muscles of the Shoulder
III. Glenohumeral (Shoulder) Joint
IV. Movements at the Shoulder Joint
   Intrinsic Muscles of the Shoulder
   Prime Movers of the Arm
V. Neurovascular Relationships

Shoulder Girdle

- Clavicle is a strut holding shoulders away from trunk
- Clavicle is most frequently fractured bone of the body
- Sternoclavicular is the only joint attaching extremity to trunk
- Clavicle is palpable along its entire length
- Laterally the clavicle articulates with the scapula at acromioclavicular joint

Bony Landmarks -- Scapula

- Borders thickened from muscle attachments

Anterior View

Scapular Processes and their Ligaments

- Acromion Process:
  - Free (lateral) end of spine
  - Articulates with the clavicle (acromio-clavicular joint)
- Coracoid Process: Shaped like a Crow’s beak
  - Pectoralis Minor Inserts
  - Coracobrachialis and Short Head of Biceps Arise
- Ligaments:
  - Acromioclavicular
  - Coracoclavicular
  - Coracoacromial
II. Positions and Movements of the Scapula

Muscles Pulling on Shoulder Girdle from Anterior Chest Wall

- **Serratus Anterior**
  - (Upwardly rotates, protracts, holds scapula against thorax; long thoracic n.)
- **Pectoralis minor**
  - (Depresses, downwardly rotates scapula; medial pectoral nerve)

Muscles Suspending the Shoulder Girdle from Vertebral Column

- **Trapezius** (Elevates, retracts, upwardly rotates scapula; Spinal Accessory Nerve)
- **Levator Scapulae**
- **Rhomboid Major**
- **Rhomboid Minor** (all elevate medial border and downwardly rotate scapula; Dorsal Scapular nerve)

Shoulder Separation

Ligaments of the Shoulder Joint

- **Acromioclavicular ligament**: Injured in shoulder separation
- **Coracoclavicular ligament**
  - Conoid portion
  - Trapezoid portion
- **Coracoacromial ligament**: With coracoid process and acromion process, helps to prevent upward dislocation of humerus
III. Glenohumeral Joint

- A 2/3 sphere articulates with a shallow glenoid fossa.
- Designed to maximize movement.
- Large muscles (e.g., Deltoid) act across it.
- Little ligamentous support.

Summary of Scapular Movements

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Upper End of Humerus

- Head articulates with glenoid fossa of scapula.
- Necks: Anatomical — below head; Surgical — site of fractures.
- Lesser tubercle: faces anterior; insertion of subscapularis.
- Greater tubercle: faces lateral; 3 facets, for insertion.
- (superior to inferior) of Supraspinatus, Infraspinatus, Teres Minor.
Intertubercular (Bicipital) Groove

• Depression between crests of greater tubercle (lateral lip) and lesser tubercle (medial lip)
• Contains tendon of long head of biceps, hence the name “Bicipital Groove”
• Latissimus dorsi inserts into bicipital groove

Capsule of the Shoulder Joint

• Capsule thickened anteriorly as glenohumeral ligaments
• Rotator Cuff muscles blend with capsule as they cross
• Capsule not reinforced inferiorly
• Dislocation initially inferior – SUB-GLENOID position

Glenohumeral Ligaments

Subacromial Bursa

• A bursa is a closed synovial membrane to decrease friction
• Bursae may become inflamed and sore (“bursitis”)
• Subacromial and subdeltoid bursae lie between these structures and supraspinatus tendon and humerus
• They often fuse

Synovial Cavity of Shoulder Joint

• Normally communicates with subscapular bursa
• Only pathologically communicates with subacromial bursa
• Is prolonged downward around biceps tendon
IV. Movements at the Shoulder

Muscular Support: Rotator Cuff

Joint surrounded by 4 muscles:
- Anterior: Subscapularis
- Superior: Supraspinatus
- Posterior: Infraspinatus & Teres Minor

Intrinsic Shoulder Muscles: Rotator Cuff

- SITS Muscles:
  - Supraspinatus – initiates abduction
  - Infraspinatus – laterally rotates humerus
  - Teres minor – laterally rotates humerus
  - Subscapularis – medially rotates humerus
  - Arise on scapula; insert on greater & lesser tubercles of humerus
  - Stabilize joint by pulling head of humerus into glenoid fossa

Supraspinatus

- O: Supraspinous fossa
- I: Greater tuberele of humerus (upper facet)
- A: Initiate abduction
- N: Suprascapular
- AS: Suprascapular Artery
Infraspinatus
- O: Infraspinous fossa
- I: Greater tubercle of humerus (middle facet)
- A: Lateral rotation
- N: Suprascapular
- AS: suprascapular and circumflex scapular aa.

Teres Minor
- O: Middle half, lateral border of scapula
- I: Greater tubercle of humerus (lower facet)
- A: Lateral rotation of humerus
- N: Axillary
- AS: subscapular and circumflex scapular aa.

Subscapularis
- O: Subscapular fossa of scapula
- I: Lesser tubercle of humerus
- A: Medial rotation of humerus
- N: Upper & Lower Subscapular nerves
- AS: Subscapular a.

Prime Movers of ABduction and ADduction of the Arm at the Shoulder

Deltoid Muscle
Innervation: Axillary Nerve (SURGICAL NECK FRACTURE)
Arterial Supply: Deltoid Branch of Thoracoacromial Artery
Heads: Anterior and Posterior (not physically, but FUNCTIONALLY separate)
Actions: Primarily Abduction
Shoulder flexion - Anterior Head
Shoulder extension - Posterior Head
Abduction of the Upper Extremity

- Initiated by Supraspinatus Muscle
- Deltoid continues powerful Abduction
- Abduction beyond 90 degrees involves two muscles that move the scapula via upward rotation
  - Trapezius muscle (spinal accessory n.)
  - Serratus anterior muscle (long thoracic n.)
- Differential diagnosis: Lesion of Spinal Accessary versus Long Thoracic Nerve

Pectoralis Major Muscle

**Innervation:** Medial & Lateral Pectoral Nerves

**Arterial Supply:** Pectoral Branch of Thoracoacromial Truck

**Heads:** Clavicular and Sternal

**Actions:** Adduction of Humerus
Medial Rotation of Humerus
Shoulder Flexion - Clavicular Head

Teres Major Muscle

**Actions:** Adduction of Humerus
Medial Rotation of Humerus

**Innervation:** Lower Subscapular Nerve

**Arterial Supply:** Subscapular and Circumflex Arteries

Latissimus Dorsi

**Inserts** on Humerus between “Two Majors” (Floor of Intertubercular Groove)

**Action:** Extends, Adducts, and Medially Rotates Humerus

**Innervation:** Thoracodorsal N.

**Arterial Supply:** Thoracodorsal A.

“The lad has two majors”
V. Neurovascular Relationships

Erb-Duchenne paralysis
- **C5-C6 lesion** of brachial plexus or spinal cord
- **Loss** of muscles innervated by these segments, including Supraspinatus, Deltoid, Biceps brachii and Supinator
- This results in **loss** of shoulder abduction, some shoulder flexion and external rotation, as well as loss of supination of the forearm.
- The patient’s upper extremity assumes a position similar to a **waiter hinting for a tip**.

Quadrangular Space

Notice: Axillary nerve relationship to the Surgical Neck of the Humerus
Injection into Shoulder Joint through Suprapsinous Fossa

- Muscles Penetrated
- Artery and Nerve in jeopardy