Scapula and Clavicle

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OBJECTIVES

1. Describe the anatomy of the scapula and clavicle
2. Discuss the muscles attached to the scapula and clavicle and their function
3. Describe both the sternoclavicular and acromioclavicular joints
4. Describe the normal motions of both the sternoclavicular, acromioclavicular, and scapulothoracic joints
5. Describe the findings in each of these clavicular dysfunctions:
   a) horizontal extension
   b) horizontal flexion
   c) abduction
   d) adduction
Thoracic kyphosis, acromio-clavicular joint disorders, subacromial or internal impingement, instability or labral pathology can alter scapular kinematics.

Forthomme B, et al. 2008
Postural

- Weak deep neck flexors
- Tight upper trapezius and levator scapula
- Tight pectorals
- Weak lower trapezius and serratus anterior
Scapula Anatomy

- Coracoid process
- Acromion
- Lesser tubercle
- Greater tubercle
- Intertubercular groove
- Surgical neck
- Deltoid tuberosity
- Humerus
- Clavicle
- Superior angle
- Sternal end
- Medial border
- Inferior angle
- Lateral border
FIG. 79-1 Shoulder girdle, anterior view.
Scapular dyskinesia—altered scapular positioning and motion—is found in association with most shoulder injuries.

Alteration of scapular stabilizing muscle activation, inflexibility of the muscles and capsule-ligamentous complex around the shoulder may affect the resting position and motion of the scapula.

Scapular dyskinesis usually manifests as a loss of control in the motions of scapular external rotation and the translation of scapular retraction.

This loss of control results in alteration in timing and magnitude of acromial upward rotation, excessive antetilting of the glenoid, and loss of maximal rotator cuff muscle activation capability.

If normal scapular movements are disrupted by abnormal scapular muscle firing patterns, weakness, fatigue, or injury, the shoulder complex functions less efficiently and injury risk increases.

Scapula position and humeral rotation can affect injury risk during humeral elevation.

Compared with scapular protraction, scapular retraction has been shown to both increase subacromial space width and enhance supraspinatus force production during humeral elevation.

Escamilla RF, et al. 2009
During maximum humeral elevation the scapula normally
- upwardly rotates 45 to 55 degrees
- posterior tilts 20 to 40 degrees
- externally rotates 15 to 35 degrees

Escamilla RF, et al. 2009
"Looks like you're out for the season—you've got a torn rotator cuff."
Scapulothoracic

- Motion - (triplanar)
  - elevation/depression
  - abduction/adduction
  - upward/downward rotation
Scapulothoracic Function

- Keep the glenoid in the optimal position
- Increase available range at G-H joint
- 2:1 ratio of motion of G-H to Scapulothoracic
Phase 1 Scapulothoracic Movement

Humerus 30 degrees abduction

Scapula minimal movement
4.3 to 1 ratio (Poppen and Walker)

Clavicle 0 to 15 degrees elevation
Phase 2 Scapulothoracic Movement

Humerus  40 degrees abduction
Scapula   20 degrees rotation
Clavicle  30 to 35 degrees elevation
Phase 3 Scapulothoracic Movement

Humerus  60 degrees abduction
        90 deg lateral rotation

Scapula  30 deg rotation

Clavicle 30 to 50 deg posterior rotation
          Up to 30 degrees elevation
Of the 60 degrees of Scapulothoracic movement for abduction and flexion

- 40 degrees from the SC joint
- 20 degrees from the AC joint

Axis

- First 30 degrees, minimal scapula movement
- After 30 degrees the SC joint becomes the axis of rotation
- After 100 degrees the SC joint becomes the axis of rotation

**FIG. 79-8** Rotation of the scapula. (A) Downward. (B) Upward.
Impingement syndrome

**FIG. 79-3** Suprhumeral compression during abduction.
Clavicle Anatomy

- The clavicle bone resembles a crankshaft, extending medially to the manubrium and laterally to the acromion.

- The bone is “S” shaped:
  - medial portion concave
  - lateral portion convex

- The “S” shape serves to give the bone elasticity and ability to shock absorb.
Anatomy

The site where the "S" curve changes from concave to convex is the site that is the weakest portion of the bone and the location of most likely fracture.
The clavicle serves to maintain lateral projection of the shoulder.
The clavicle also provides a base for insertion of the trunk and arm musculature.
The clavicle is the only bony attachment between the upper limb and the axial skeleton.
The clavicle also provides a protection for the major nerves and major blood vessels passing beneath it.

- internal jugular vein, subclavian a., subclavian v., brachial plexus
Muscular attachments

- The clavicle serves as the attachment for the
  - trapezius m.
  - deltoid m.
  - pectoralis major m
  - sternohyoid m.
  - subclavius m.
  - sternocleidomastoid m.
Composition of the SC joint

- Sternal end of the clavicle
- Cartilage of rib one
- Uppermost manubrium
The sternoclavicular joint:

- Synovial joint
- (functions as ball and socket)
  - Loose articular capsule
  - Lined with synovial membrane
  - Frequently with an intraarticular meniscus
Joint motions - SC

- Sternoclavicular joint is polyaxial
- Major motions are:
  - Abduction-Adduction
  - Horizontal flexion- horizontal extension
Joint motions SC

- Motions are coupled
- Abduction is coupled with posterior rotation (external rotation)
- Adduction is coupled with anterior rotation (internal rotation)
- Horizontal flexion and horizontal extension is coupled with a translatory glide
FIG. 79-2 Sterno-clavicular joint motion.
The acromioclavicular joint

- Composed of the lateral end of the clavicle
- And the acromion of the scapula
- It is also functionally a ball and socket joint
The AC joint

The major motions of the AC joint are:

- Internal rotation
- External rotation
Scapula Treatments

- Counterstrain
- Muscle energy
Assessment of Clavicle Abduction
Assessment of Clavicle Horizontal Flexion
Exercises

- There are several exercises in the literature that exhibit high to very high activity from the rotator cuff, deltoids and scapular muscles
  - Prone horizontal abduction at 100 degrees abduction with ER, flexion and abduction with ER, 'full can' and 'empty can',
  - D1 and D2 diagonal pattern flexion and extension,
  - ER and IR at 0 degrees and 90 degrees abduction,
  - Standing extension from 90-0 degrees

The scapular muscles are important

- Serratus anterior
  - Contributes to scapular upward rotation, posterior tilt and ER.
  - The serratus anterior also helps stabilize the medial border and inferior angle of the scapular, preventing scapular IR (winging) and anterior tilt.
  - Scapular IR and scapular anterior tilt, both of which decrease subacromial space width and increase impingement risk, are greater when performing scaption with IR ('empty can') compared with scaption with ER ('full can').

Exercises

- Variety of weight-bearing upper extremity exercises
  - push-up
  - standing scapular dynamic hug
  - forward scapular punch
  - rowing type exercises

References


