

Biomechanics of arm elevation

Ho Quang Hung

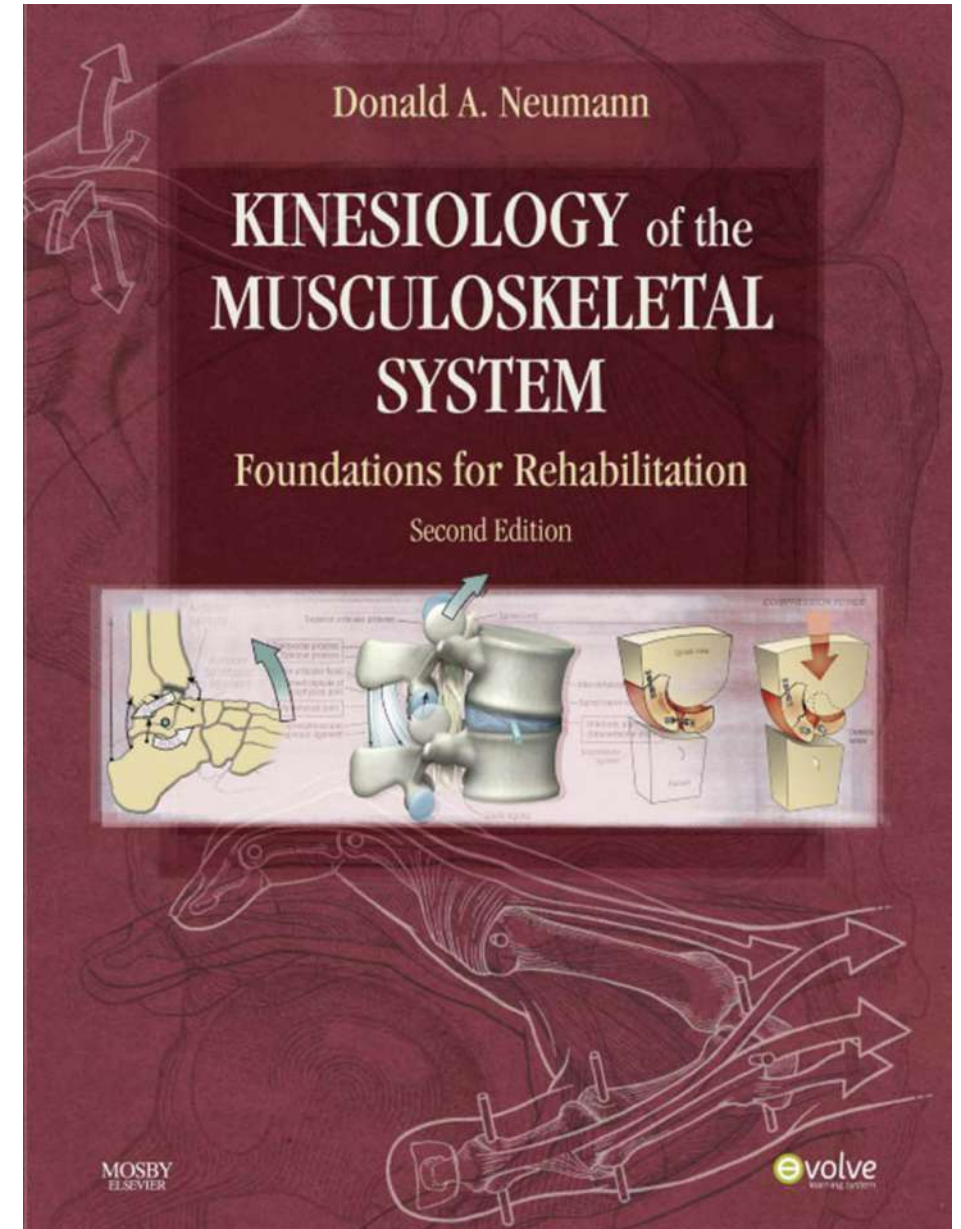
drhungho.com

04/07/2019

Workshop - HAS 2019 - Danang - Vietnam

Content

- Joint kinematics
- Muscle activities



Neumann, 2010

Glenoscapular joint

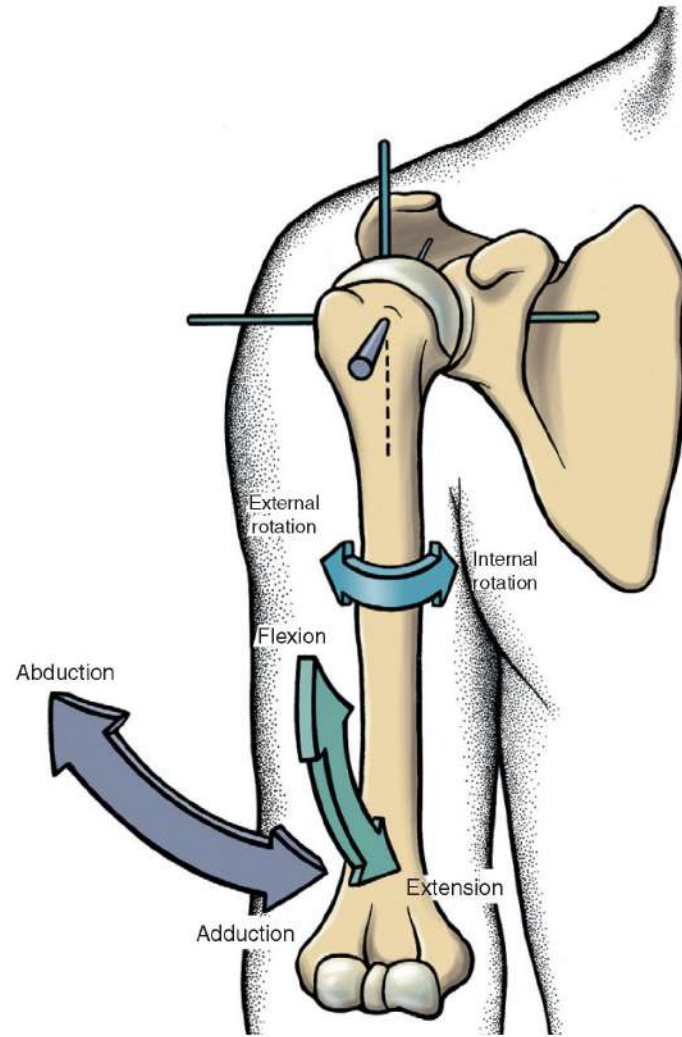


FIGURE 5-30. The osteokinematics of the glenohumeral joint includes abduction and adduction (*purple*), flexion and extension (*green*), and internal and external rotation (*blue*). Note that each axis of rotation is color-coded with its corresponding plane of movement.

scapulothoracic joint

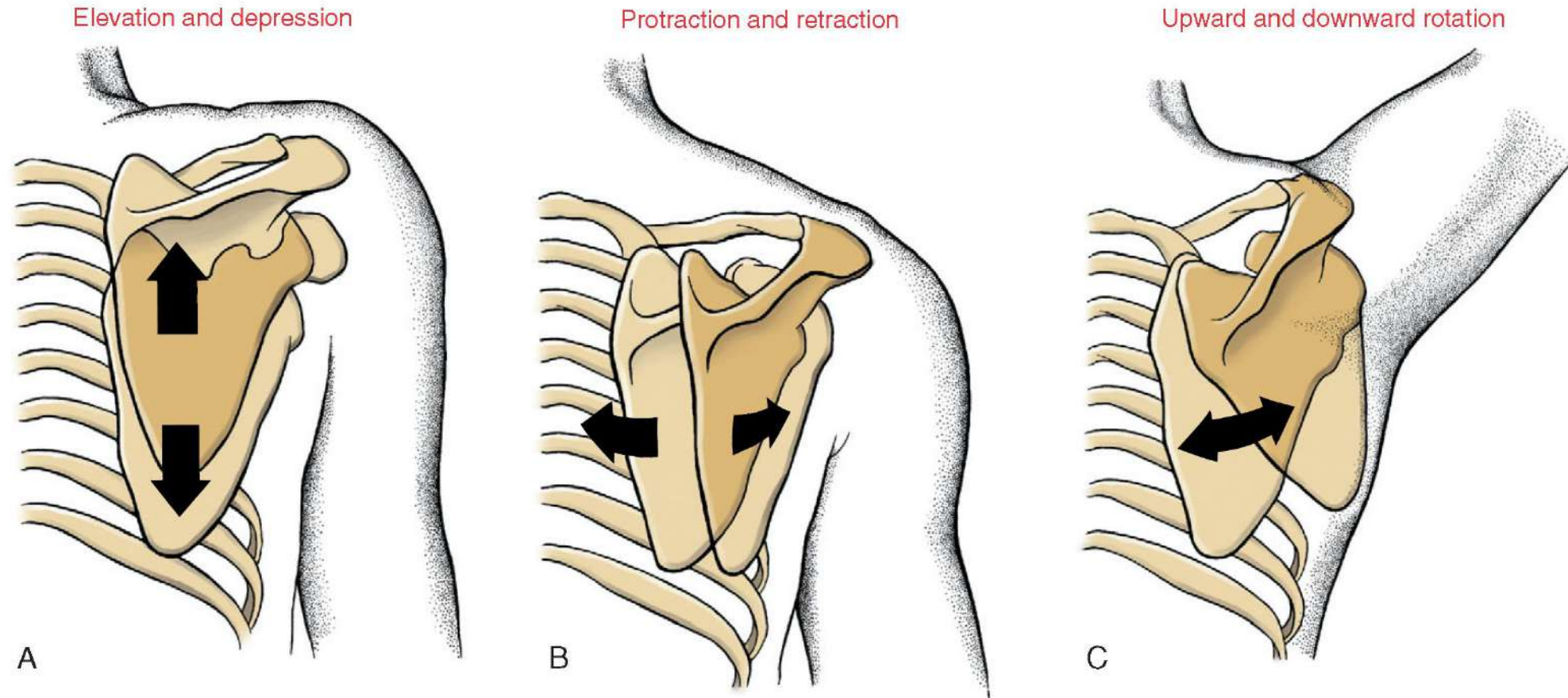


FIGURE 5-10. Motions of the right scapulothoracic joint. **A**, Elevation and depression. **B**, Protraction and retraction. **C**, Upward and downward rotation.

Abduction

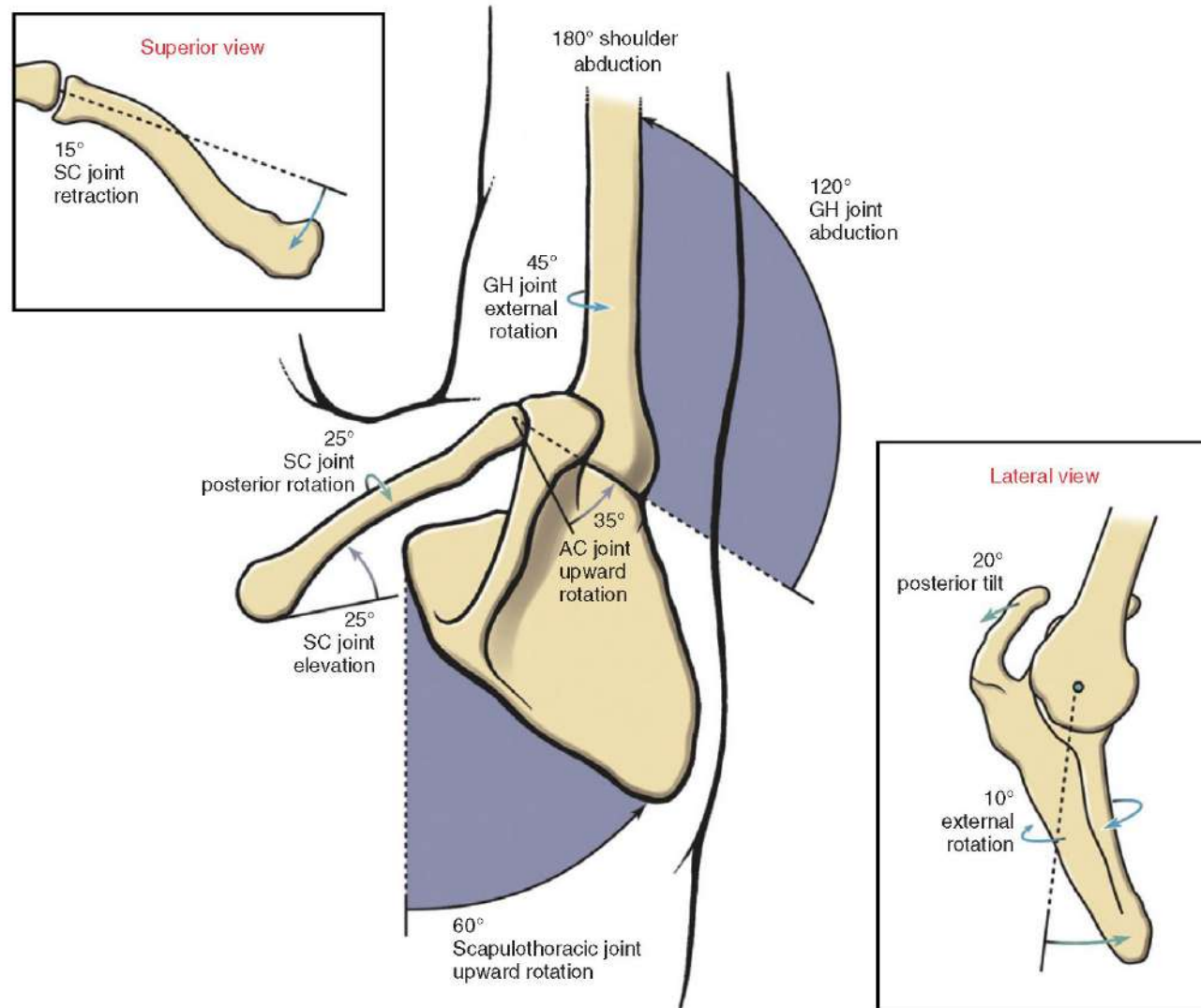


FIGURE 5-35. Posterior view of the right shoulder complex after the arm has abducted 180 degrees. The 60 degrees of scapulothoracic joint upward rotation and the 120 degrees of glenohumeral (*GH*) joint abduction are shaded in purple. Additional inserts contained in the boxes depict superior and lateral views of selected kinematics of the clavicle and scapula, respectively. All numeric values are chosen from a wide range of estimates cited across multiple literature sources (see text). Actual kinematic values vary considerably among persons and studies.

Glenoscapular joint

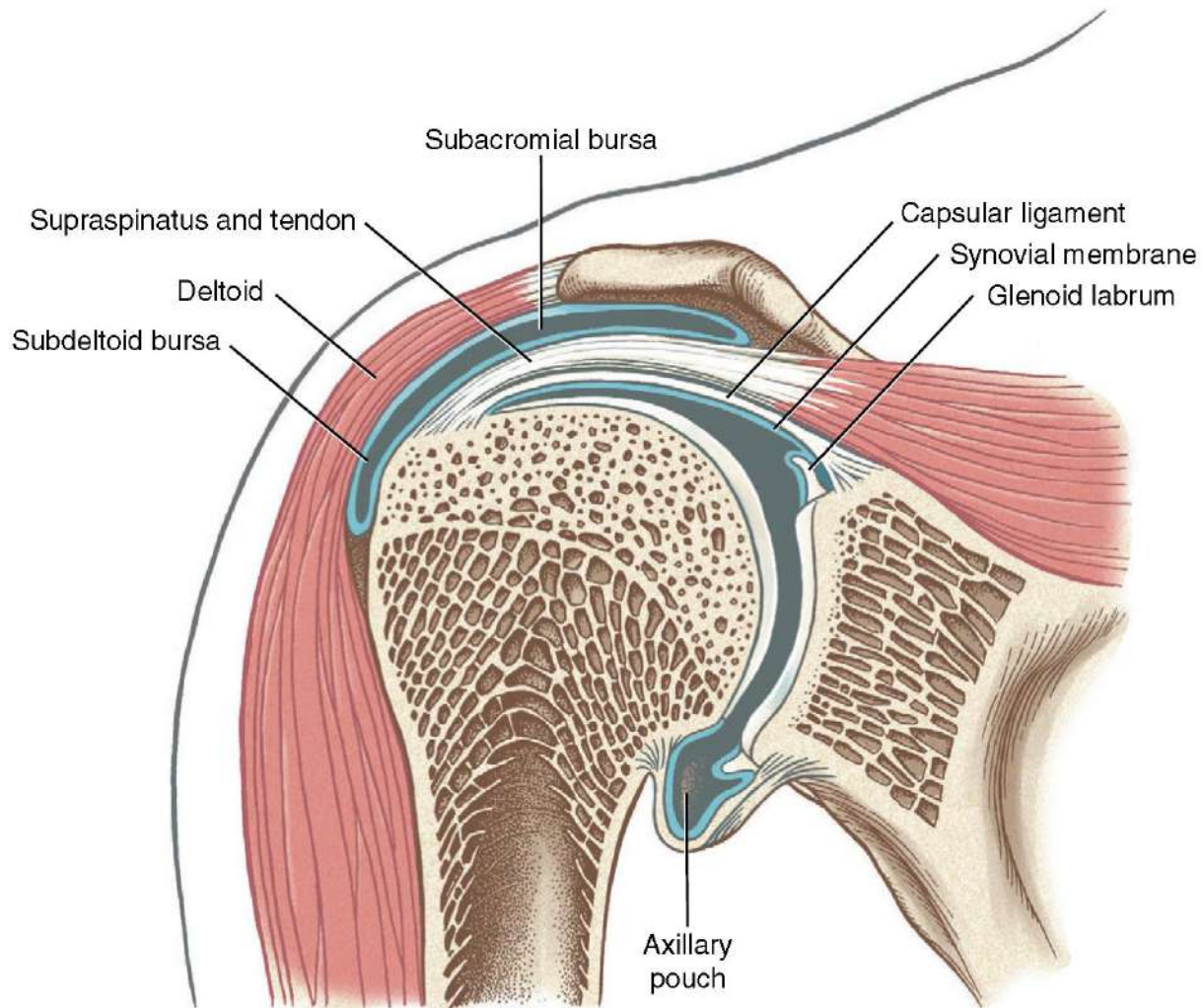


FIGURE 5-29. An anterior view of a frontal plane cross-section of the right glenohumeral joint. Note the subacromial and subdeltoid bursa within the subacromial space. Bursa and synovial lining are depicted in blue. The deltoid and supraspinatus muscles are also shown.

Frontal abduction vs. Scaption

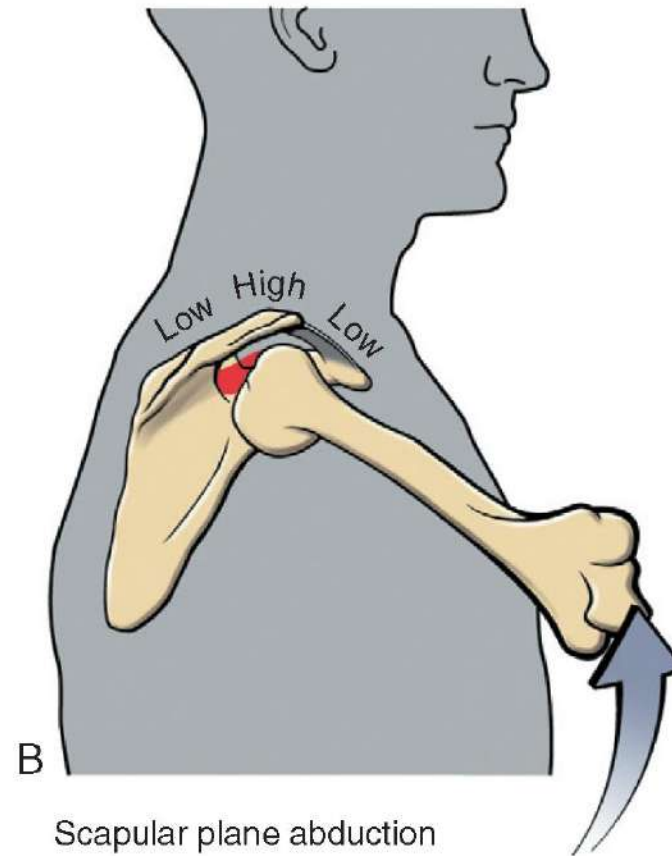
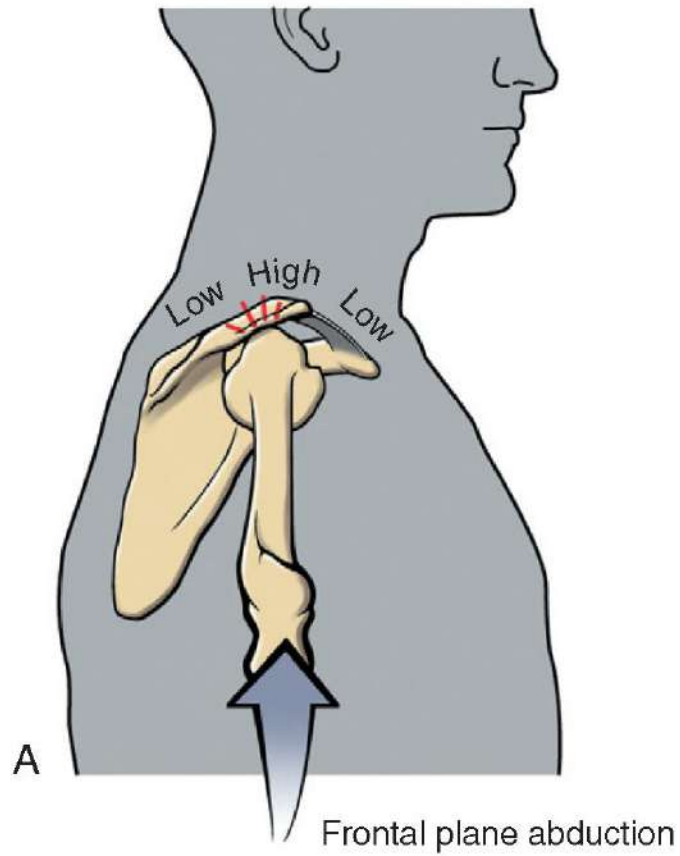
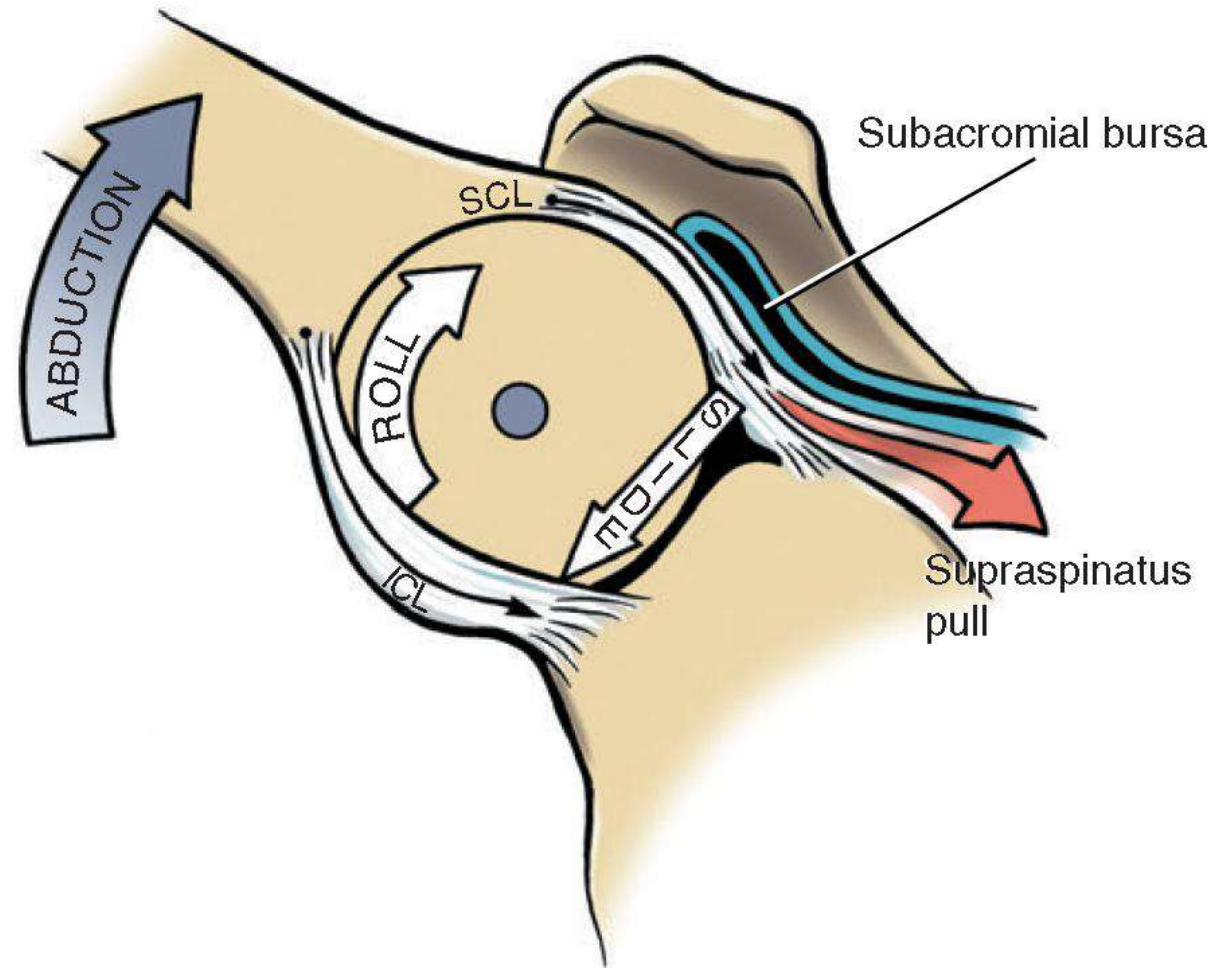
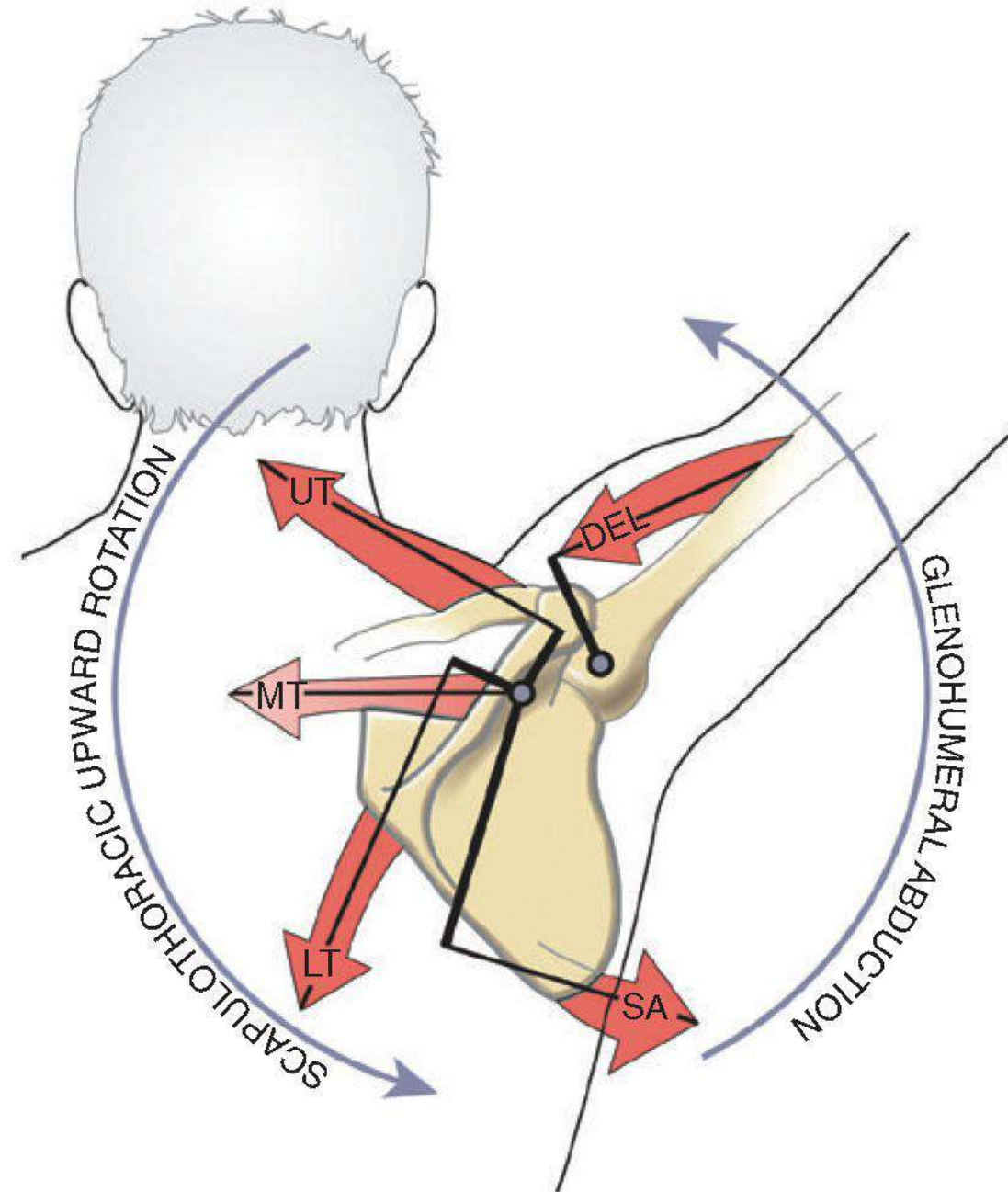


FIGURE 5-38. Side view of the right glenohumeral joint comparing abduction of the humerus in **A**, the true frontal plane and **B**, the scapular plane. In both **A** and **B**, the glenoid fossa is oriented in the scapular plane. The relative low and high points of the coracoacromial arch are also depicted. The line of force of the supraspinatus is shown in **B**, coursing under the coracoacromial arch.

Arthrokinematics

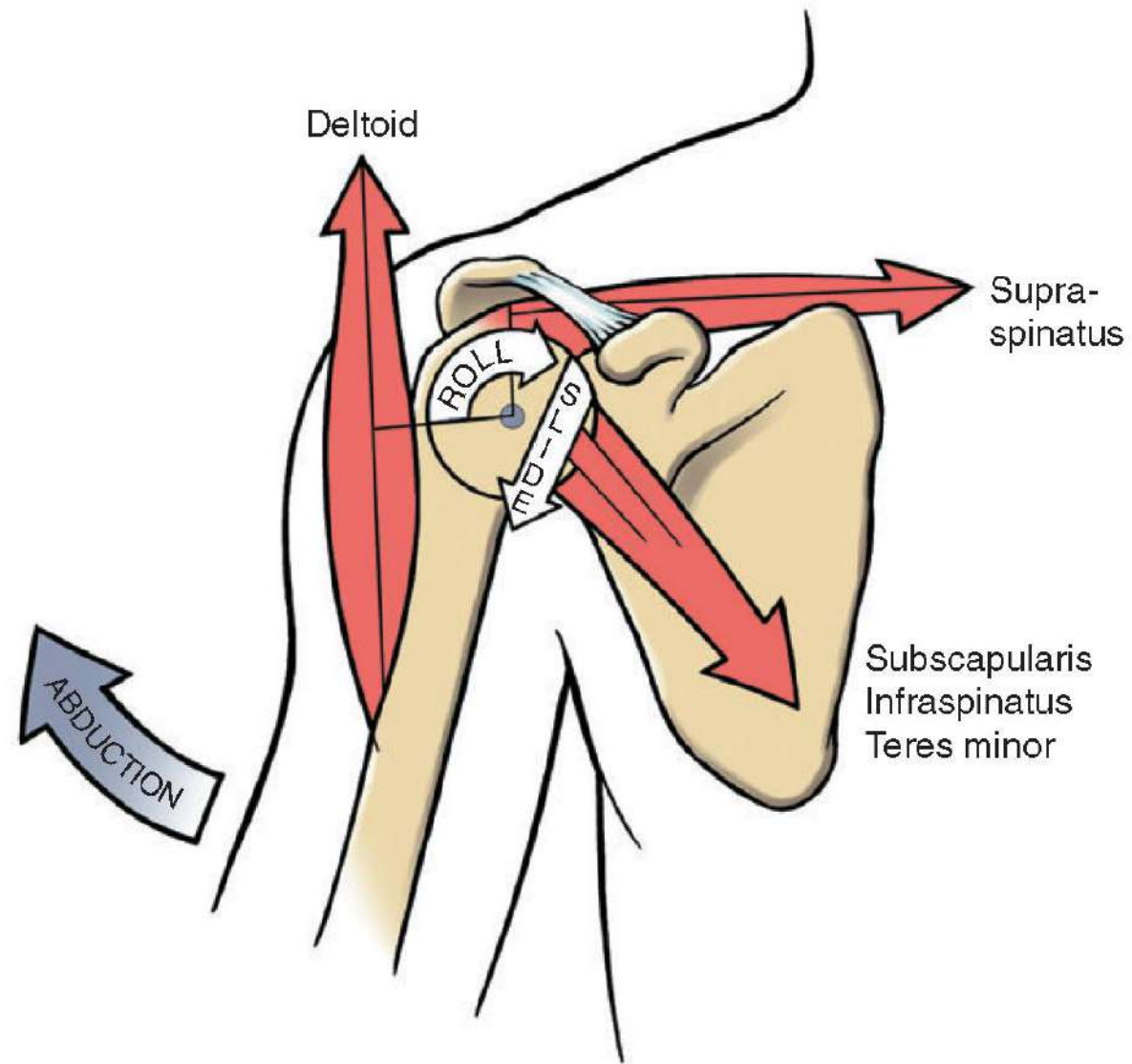


Kinetic arc



Two axes: scapular axis and glenohumeral axis

Deltoid vs. Rotator Cuff muscles



Summary

Rehabilitation for the shoulder needs a comprehensive evaluation:

- Bone
- Joint capsule
- Tendon
- Muscle
- Movement

Thank you