Shoulder Joint Complex

SHOULDER JOINT, STERNOCLAVICULAR, ACROMIOCLAVICULAR AND SCAPULOTHORACIC ARTICULATION

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Shoulder Joint Complex

The ‘shoulder joint complex’ consists of four basic articulations,

1. Glenohumeral joint.

2. Acromioclavicular joint.

3. Sternoclavicular joint.

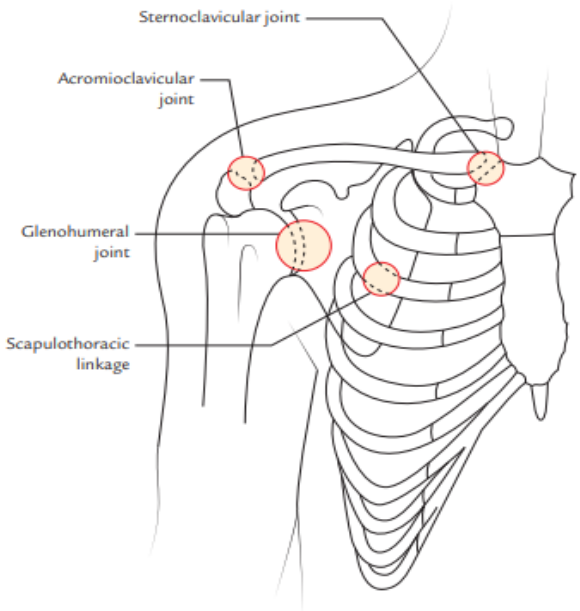
4. Scapulothoracic articulation/scapulothoracic linkage (functional linkage between the scapula and thorax).

The normal function of the shoulder girdle requires smooth coordination of movements on all these joints. The impairment of any one of these joints leads to functional defects of the whole complex.

The main function of the shoulder in man is to enable him to place his hand where he wishes to in a coordinated and controlled manner. The glenohumeral joint is the primary articulation of the shoulder girdle and generally termed shoulder joint by the clinicians.

SHOULDER JOINT (GLENOHUMERAL JOINT)

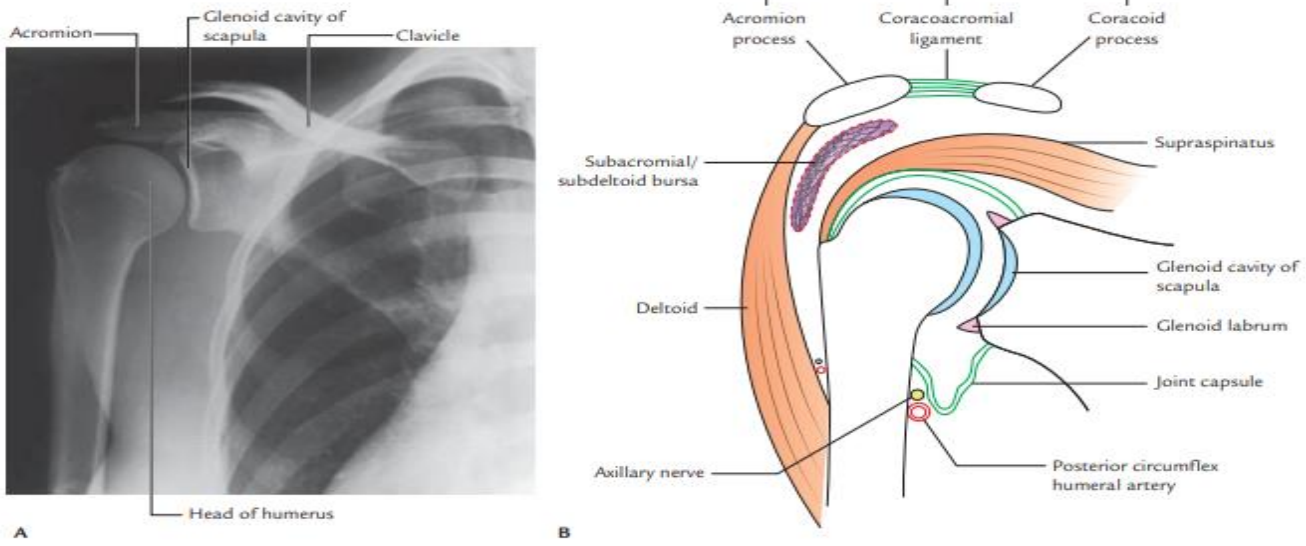
It is a joint between the head of humerus and glenoid cavity of the scapula. The shoulder joint is the most movable joint of the body and consequently one of the least stable. It is the most common joint to dislocate and



to undergo recurrent dislocations. Type The shoulder joint is a ball-and-socket type of synovial joint.

ARTICULAR SURFACES

The shoulder joint is formed by articulation of large round head of humerus with the relatively shallow glenoid cavity of the scapula. The glenoid cavity is deepened slightly but effectively by the fibrocartilaginous ring called glenoid labrum.



LIGAMENTS

The ligaments of the shoulder joint are as follows:

1. **Capsular ligament (joint capsule)**: The thin fibrous layer of the joint capsule surrounds the glenohumeral joint. It is attached medially to the margins of the glenoid cavity beyond the glenoid labrum and laterally to the anatomical neck of the humerus, except inferiorly where it extends downwards 1.5 cm or more on the surgical neck of the humerus. Medially the attachment extends beyond the supraglenoid tubercle thus enclosing the long head of biceps brachii within the joint cavity.

The synovial membrane lines the inner surface of the joint capsule and reflects from it to the glenoid labrum and humerus as far as the articular margin of the head. The synovial cavity of the joint presents the following features:

(a) It forms tubular sheath around the tendon of biceps brachii where it lies in the bicipital groove of the humerus.

(b) It communicates with subscapular and infraspinatus bursae, around the joint. Thus, there are three apertures in the joint capsule:

(a) An opening between the tubercles of the humerus for the passage of tendon of long head of biceps brachii.

(b) An opening situated anteriorly inferior to the coracoid process to allow communication between the synovial cavity and subscapular bursa.

(c) An opening situated posteriorly to allow communication between synovial cavity and infraspinatus bursa.

2. **Glenohumeral ligaments:** There are three thickenings in the anterior part of the fibrous capsule; to strengthen it. These are called superior, middle, and inferior glenohumeral ligaments. They are visible only from the interior of the joint. A defect exists between superior and middle glenohumeral ligaments, which acquire importance in the anterior dislocation of the shoulder joint.

3. **Coracohumeral ligament:** It is a strong band of fibrous tissue that passes from the base of the coracoid process to the anterior aspect of the greater tubercle of the humerus.

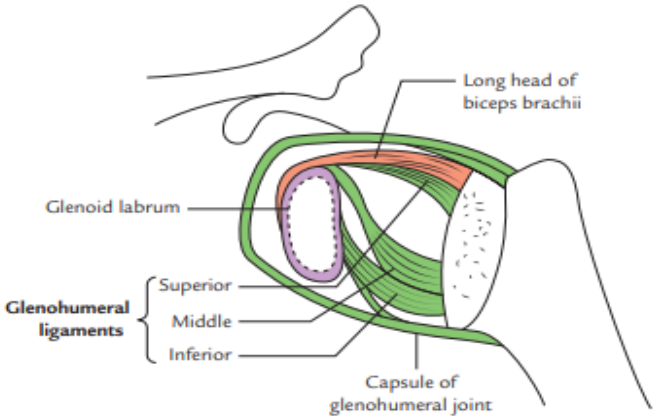
4. **Transverse humeral ligament:** It is a broad fibrous band, which bridges the bicipital groove between the greater and lesser tubercles. This ligament converts the groove into a canal that provides passage to the tendon of the long head of biceps surrounded by a synovial sheath.

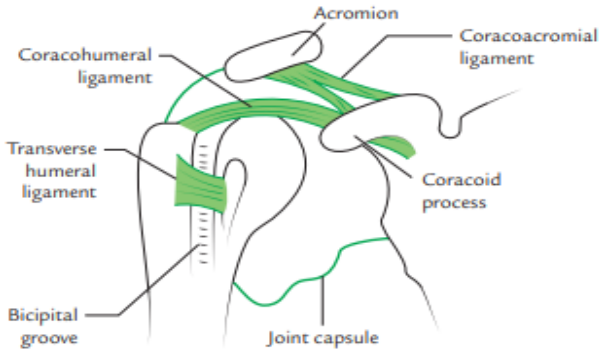
ACCESSORY LIGAMENTS

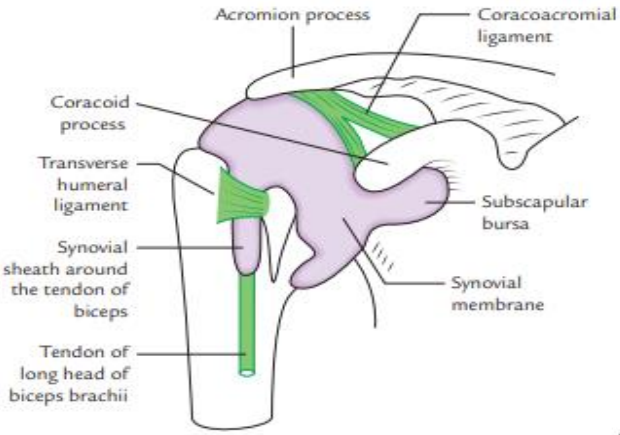
The accessory ligaments of the shoulder joint are as follows:

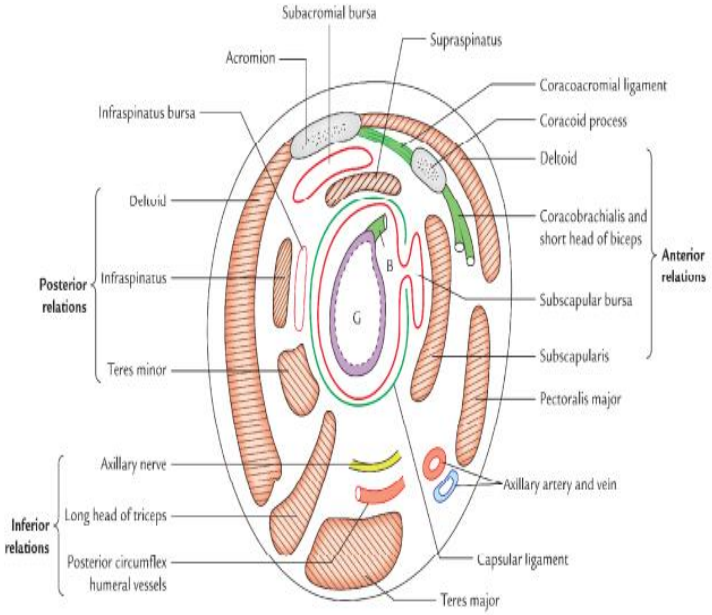
1. **Coracoacromial ligament:** It extends between coracoid and acromion processes. It protects the superior aspect of the joint.

2. **Coracoacromial arch:** The coracoacromial arch is formed by a coracoid process, acromion process, and coracoacromial ligament between them. This osseo-ligamentous structure forms a protective arch for the head of humerus above and prevents its superior displacement above the glenoid cavity. The supraspinatus muscle passes under this arch and lies deep to the deltoid where its tendon blends with the joint capsule. The large subacromial bursa lies between the arch superiorly and tendon of supraspinatus and greater tubercle of humerus inferiorly. This facilitates the movement of supraspinatus tendon.







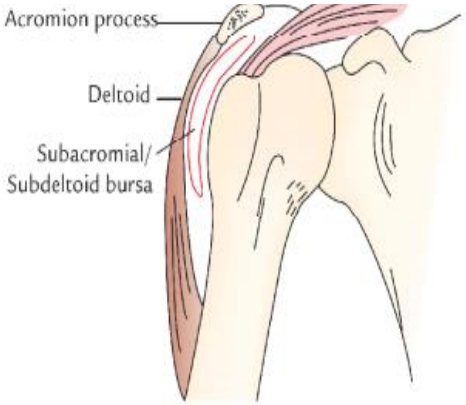


BURSAE RELATED TO THE SHOULDER JOINT

Several bursae are related to the shoulder joint, but the important ones are as follows:

1. **Subscapular bursa:** It lies between the tendon of subscapularis and the neck of the scapula; and protects the tendon from friction against the neck. This bursa usually communicates with the joint cavity.

2. **Subacromial bursa:** It lies between the coracoacromial ligament and acromion process above, and supraspinatus tendon and joint capsule below. It continues downwards beneath the deltoid; hence it



is sometimes also referred to as subdeltoid bursa. It is the largest synovial bursa in the body and facilitates the movements of supraspinatus tendon under the coracoacromial arch.

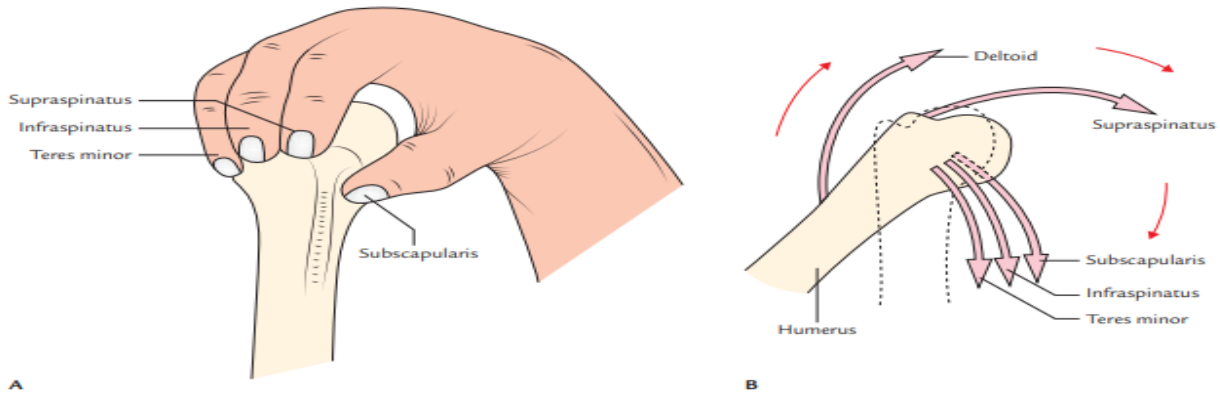
3. **Infraspinatus bursa:** It lies between the tendon of infraspinatus and posterolateral aspect of the joint capsule. It may sometime communicate with the joint cavity.

Vascular supply to the glenohumeral joint is predominantly through branches of the anterior and posterior circumflex humeral and suprascapular arteries.

The glenohumeral joint is innervated by branches from the posterior cord of the brachial plexus, and from the suprascapular, axillary, and lateral pectoral nerves.

Joint stability

is provided by surrounding muscle tendons and a skeletal arch formed superiorly by the coracoid process and acromion and the coraco-acromial ligament. Tendons of the rotator cuff muscles (the supraspinatus, infraspinatus, teres minor, and subscapularis muscles) blend with the joint capsule and form a musculotendinous collar that surrounds the posterior, superior, and anterior aspects of the glenohumeral joint. This cuff of muscles stabilizes and holds the head of the humerus in the glenoid cavity of the scapula without compromising the arm's flexibility and range of motion. The tendon of the long head of the biceps brachii muscle passes superiorly through the joint and restricts upward movement of the humeral head on the glenoid cavity.



MOVEMENTS OF THE SHOULDER JOINT

The shoulder joint has more freedom of mobility than any other joint in the body, due to the following factors:

1. Laxity of joint capsule.

2. Articulation between relatively large humeral head and smaller and shallow glenoid cavity.

The glenohumeral joint permits four groups of movements:

1. Flexion and extension.

2. Abduction and adduction.

3. Medial and lateral rotation.

4. Circumduction.

The movements of shoulder joint occur in all the three planes.

- The flexion and extension/hyperextension occur in sagittal plane.
- The abduction and adduction occur in frontal plane.
- The medial and lateral rotation occur in transverse plane.
- The circumduction is only a combination of all above movements.

Movements	Main muscles (prime movers)	Accessory muscles (synergists)
Flexion	• Pectoralis major (clavicular part) • Deltoid (anterior fibres)	• Biceps brachii (short head) • Coracobrachialis • Sternocostal head of pectoralis major
Extension	• Deltoid (posterior fibres) • Latissimus dorsi	• Teres major • Long head of triceps
Adduction	• Pectoralis major (sternocostal part) • Latissimus dorsi	• Teres major • Coracobrachialis • Short head of biceps • Long head of triceps
Abduction	• Deltoid (lateral fibres) • Supraspinatus	• Serratus anterior • Upper and lower fibres of trapezius
Medial rotation	• Subscapularis	• Pectoralis major • Latissimus dorsi • Deltoid (anterior fibres) • Teres major
Lateral rotation	• Deltoid (posterior fibres)	• Infraspinatus • Teres minor

ACROMIOCLAVICULAR JOINT

It is a plane type of synovial joint between the lateral end of the clavicle and acromion process of the scapula. The acromioclavicular joint is located about 2.5 cm medial to the point of the shoulder.

Articular Surfaces

These are small facets present on the lateral end of clavicle and the medial margin of the acromion process of the scapula. The articular surfaces are covered with fibrocartilage. The joint cavity is subdivided by an incomplete wedge-shaped articular disc.

Joint Capsule

It is a thin, lax fibrous sac attached to the margins of articular surfaces.

Ligaments

These are acromioclavicular and coracoclavicular ligaments.

1. Acromioclavicular ligament: It is a fibrous band that extends from acromion to the clavicle. It strengthens the acromioclavicular joint superiorly.

2. Coracoclavicular ligament: It lies a little away from the joint itself but plays an important role in maintaining the integrity of the joint. The coracoclavicular ligament consists of two parts:

(a) conoid and (b) trapezoid, which are united posteriorly and often separated by a bursa.

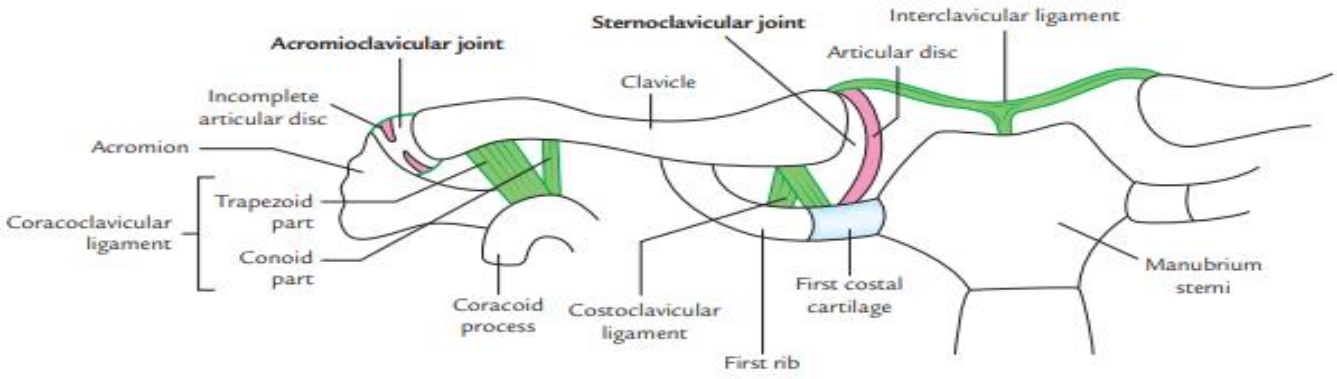
The conoid ligament is an inverted cone-shaped fibrous band. The apex is attached to the root of the coracoid process just lateral to the scapular notch and base is attached to the conoid tubercle on the inferior surface of the clavicle.

The trapezoid ligament is a horizontal fibrous band that stretches from upper surface of the coracoid process to the trapezoid line on the inferior surface of lateral end of the clavicle.

N.B. The coracoclavicular ligament is largely responsible for suspending the weight of the scapula and upper limb from clavicle. The coracoclavicular ligament is the strongest ligament of the upper limb.

Movements

The acromioclavicular joint permits the rotation of acromion of scapula at the acromial end of the clavicle. These movements are associated with movements of scapula at the scapulothoracic joint/linkage.



STERNOCLAVICULAR JOINT

Type The sternoclavicular joint is a saddle type of the synovial joint.

Articular Surfaces

The rounded sternal end of clavicle articulates with the shallow socket at the superolateral angle of the manubrium sterni and adjacent part of the 1st costal cartilage. The medial end of clavicle rises higher than the manubrium, hence it poorly fits into its shallow socket. But a strong thick articular disc of fibrocartilage attached superiorly to the clavicle and 1st costal cartilage inferiorly prevents the displacement of the medial end of the clavicle. The articular surface of clavicle is convex from above downwards and slightly concave from front to back. The articular surface of sternum is reciprocally curved. The articular surfaces are covered with fibrocartilage.

Articular Capsule

The joint capsule is attached to the margins of the articular surfaces including the periphery of the articular disc. The synovial membrane lines the internal surface of the fibrous joint capsule, extending to the edges of the articular disc.

Ligaments

1. Anterior and posterior sternoclavicular ligaments: They reinforce the joint capsule anteriorly and posteriorly. The posterior ligament is weaker than the anterior ligament.

2. Interclavicular ligament: It is T-shaped and connects the sternal ends of two clavicles and strengthens the joint capsule superiorly. In between, it is attached to the superior border of the suprasternal notch.

3. Costoclavicular ligament: It anchors the inferior surface of the sternal end of clavicle to the first rib and adjoining part of its cartilage.

Movements

The sternoclavicular joint allows the movements of pectoral girdle. This joint is critical to the movement of the clavicle.

SCAPULOTHORACIC ARTICULATION/LINKAGE

The scapulothoracic articulation is not a true articulation but a functional linkage between the ventral aspect of the scapula and lateral aspect of the thoracic wall. The linkage is provided by serratus anterior muscle. The movements of scapula around the chest wall are facilitated by the presence of loose areolar tissue between the serratus anterior and subscapularis muscles.