

Pathomechanics of shoulder instability

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Introduction

The mechanisms contributing to glenohumeral stability are complex and varied. The rotator cuff is the dominant contributor to stability through the mid arcs of motion through concavity compression. At the end ranges of motion, the capsular ligamentous system becomes responsible for shoulder stability. As the shoulder position varies from adduction to abduction and internal to external rotation, varying components of the capsular ligamentous system become responsible for static shoulder stability. The nature of the individual ligament contribution to overall static stability has become better known through biomechanical cutting studies of cadaveric shoulders.

Table 1. Factors maintaining joint stability

STATIC FACTORS	DYNAMIC FACTORS
articular components	rotator cuff
articular version	biceps brachii
glenoid labrum	scapular rotators
negative intraarticular pressure	proprioception
adhesion- cohesion	
capsule and ligament	
rotator cuff	

Patho-Anatomy of the Glenohumeral Ligaments

1. Coracohumeral Ligament

The rotator interval, the region of the capsule between the anterior border of the supraspinatus and the superior border of the subscapularis muscle, is reinforced by the coracohumeral ligament. This ligament also blends inferiorly with the superior glenohumeral ligament.

2. Superior Glenohumeral Ligament

The superior glenohumeral ligament originates from the supraglenoid tubercle, just anterior

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to the origin of the long head of the biceps, and inserts on the humerus near the proximal tip of the lesser tuberosity on the medial ridge of the intertubercular groove

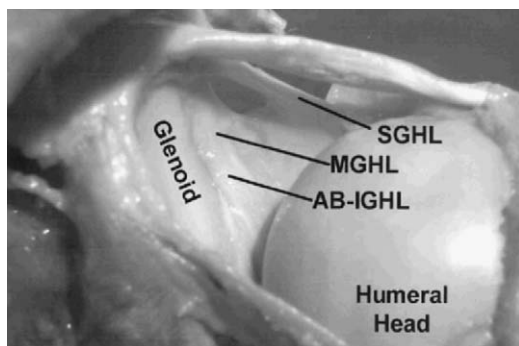


Fig. 1.

The superior glenohumeral ligament (SGHL), middle glenohumeral ligament (MGHL), anterior band of the inferior glenohumeral ligament (AB-IGHL), glenoid, and humeral head are labeled as each ligament from its origin on the glenoid to its insertion on the humerus.

3. Middle Glenohumeral Ligament

4. Inferior Glenohumeral Ligament Complex

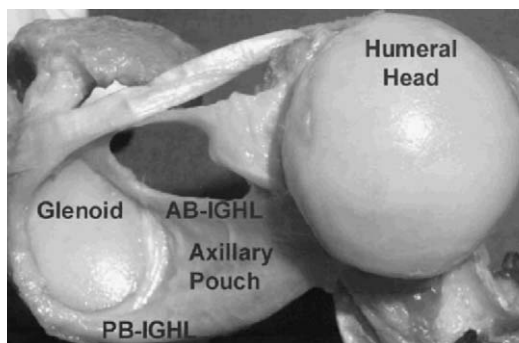


Fig. 2.

The inferior glenohumeral ligament complex is a hammocklike structure with anchor points on the anterior and posterior sides of the glenoid and includes the anterosuperior, inferior, and posteroinferior regions of the capsule.

The anterior band of the inferior glenohumeral ligament originates primarily from the anterior labrum and attaches to the glenoid through two separate mechanisms: (1) the collagen fibers directly attach to the glenoid labrum; and (2) collagen fibers attach at an acute angle along the neck of the glenoid and some fibers run parallel to the surface and blend with the periosteum.

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Function of the Glenohumeral Ligaments

1. Coracohumeral Ligament and Superior Glenohumeral Ligament Complex

Superior glenohumeral ligament : an important inferior stabilizer of the adducted shoulder, coracohumeral ligament also has been shown to contribute to inferior stability.

2. Middle Glenohumeral Ligament

Function of the middle glenohumeral ligament (1) to support the arm; (2) to restrain external rotation from 0° to 90° abduction; and (3) to provide anterosuperior stability.

3. Inferior Glenohumeral Ligament Complex

Anterior band of the inferior glenohumeral ligament spans the midportion of the anterior glenohumeral joint at 90° abduction and external rotation and restrains anterior and inferior translation of the humerus.

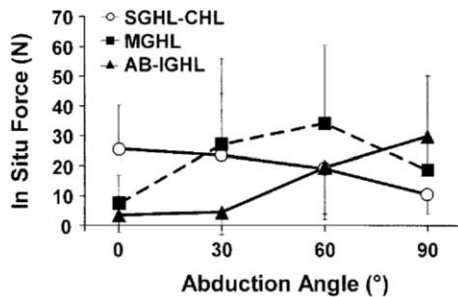


Fig. 3.

The failures at the glenoid attachment can be separated into two categories: (1) the labrum was avulsed from the glenoid bone (63%); and (2) the labrum remained attached to the glenoid and the ligament alone was avulsed, representing failure at the ligament-to-labral junction (37%).

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Table 2. Normal and Abnormal Anatomy and Biomechanics

STABILITY FACTORS	PATHOANATOMY
Glenoid version	Congenital : abnormal version: dysplasia Fracture causing abnormal version
Humeral version	Congenital : abnormal version: dysplasia Fracture/surgery causing abnormal version
Articular congruity	Congenital :dysplasia Acquired: fracture , Bankart lesion, Osteoarthritis
Labrum	Bankart lesion “Fraying “secondary to laxity
Capsuloligamentous	Traumatic tear cumulative microtrauma Loss of proprioceptive feedback
Negative intraarticular pressure	Capsular tear RI defect Lax capsule
Rotator cuff deficiency	Traumatic tear, cumulative microtrauma
Biceps	SLAP lesion Tendon rupture
Scapulothoracic motion	Dyskinesia Long thoracic nerve palsy

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