The Shoulder

Contents

Normal shoulder function is essential for many sports and activities. Injury can cause great impairment to quality of life. Due to the range of motion the shoulder can achieve it requires enormous stability and correct timing of muscle activation to work efficiently.

Anatomy

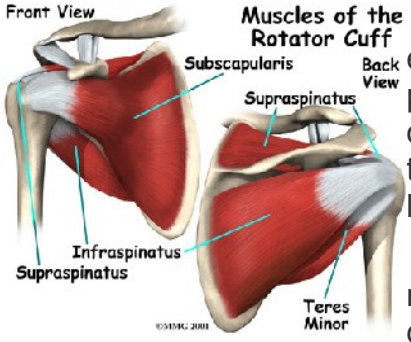
The shoulder is considered a ball-in-socket joint. Shoulder stabilizers can be grossly categorized as static or dynamic.

Static stabilizers include the bony structures, labrum, GH ligaments, and joint capsule. Unlike the hip joint, the bony articulation of the shoulder offers little stability. This is due to thelimited contact area of the glenoid with the humeral head. The labrum is a fibrous structure that attaches to the glenoid to increase the contact area and deepen the socket of the glenoid up to 50%, forming a concave surface. Three GH ligaments exist as follows: superior, middle, and inferior.

Dynamic stabilizers include the rotator and scapular stabiliser muscles.

The Rotator Cuff

The rotator cuff muscles are associated and assist with some shoulder motion; however, their main function is to provide stability to the joint by compressing the humeral head on the glenoid. The supraspinatus assists in shoulder abduction by maintaining the humeral head centered on the glenoid, with the middle deltoid acting as the primary mover. These muscles act as force couples because they work synergistically to carry out a particular movement. Electromyography (EMG) studies have demonstrated a high degree of supraspinatus activity during the initial 30° of abduction. The supraspinatus has to fire strongly to stabilize the GH joint as the deltoid abducts the arm.



The infraspinatus and teres minor muscles assist in external rotation of the shoulder and also provide an inferior pull upon the humeral head, assisting in its centering during overhead activity. The subscapularis muscle participates in this centering but also acts with the pectoralis muscles and latissimus dorsi as an internal rotator of the shoulder.

Weakness or insufficiency of the rotator cuff muscles results in increasing demands on the static stabilizers. If these demands are long term or recurrent, static stabilizers may begin to fail. This can result in stretching or attenuation of the capsule, which results in even greater shoulder laxity and greater demands on the already weak rotator cuff muscles. Humeral head migration may occur with capsule laxity and result in rotator cuff impingement and pain. Pain may inhibit rotator cuff muscle firing, leading to disuse and further weakening of the dynamic stabilizers with greater demands placed on the static stabilizers. Increased humeral head translation can also lead to shearing and injury to the glenoid labrum.

Rotator cuff impingement, tendinitis, and labral pathology are commonly encountered injury patterns in athletes and workers who perform overhead motions. Focusing solely on the static stabilizers in treatment neglects the dynamic structures that probably initiate and perpetuate the cycle

Assessing the Shoulder

When assessing the shoulder there can be a number of structures causing pain so at Pro-Am Sports Injury Clinic we tend to narrow the problems down in to the following: -

- Rotator cuff disorders, includes; impingement, subacromial bursitis, tendinosis, painful arc syndrome, and partial or full thickness tears of the rotator cuff.
- Biceps tendinosis or rupture and calcify
- Frozen Shoulder (Adhesive Capsulitis)
- Instabilities, includes; acute and recurrent subluxation, dislocation and labral injuries
- AC joint and SC Joint

Looking at the position of the scapula is a good starting point to any shoulder assessment. You also have to be aware that the cause is maybe coming from else where. For example if the core muscle of the spine are not working then it creates a stiffness of the lower and mid back, this will reduce shoulder range of motion and put more demand on the muscles of the shoulder to compensate.

Common injuries to the shoulder

Rotator cuff injuries can be acute such as muscle strains, tears, or chronic in nature such as tendinopathy, tightening and focal thickening of the muscle bellies. A common complaint is impingement. Chronic injury to these muscles is usually secondary to a another problem.

Pain felt in the biceps region can be referred from the rotator cuff. It is important to differentiate between a true biceps injury and rotator cuff dysfunction. They can co-exist together.

Shoulder instability is another common cause of shoulder pain and can become the cause of rotator cuff injuries. It can result from a sprain to the capsule and ligaments, secondary impingement (loss of scapulohumeral rhythm), as well as subluxation/dislocation. This can cause glenoid labral tears. Instability can be obvious in patients with recurrent dislocation but instability can cause minor symptoms such as mild impingement. Although capsular laxity and impaired proprioception (sensory awareness) have been suggested as the cause, altered muscle activation has also been shown to create instability. Pectoralis major, short head of biceps, corocobrachialis, anterior deltoid and subscapularis provide support to the front of the joint and have been shown to be not firing properly when instability at the front of the joint is present.

Labral tears, these are common with a fall onto an outstretched arm. They are also common with repetitive injuries of the shoulder often related to poor scapula stabilization and poor humeral centration

It is important to assess the AC Joint which is just above the shoulder joint, it is usually injured by falling onto an outstretched arm and onto the shoulder (compression). Pain can also be referred from the neck and upper back.

A patient with chronic shoulder problems will have a number of factors contributing to the problem, such as cervical/thoracic joint dysfunction, soft tissue tightness and trigger points, in addition to the primary shoulder joint abnormalities such as rotator cuff

tendinopathy and/or instability.

Normal shoulder motion

The shoulder complex is comprised of several joints, including the sternoclavicular joint, Acromioclavicular joint, glenohumeral (GH) joint, and scapulathoracic (ST) joint. These articulations work together to carry out normal shoulder motion.

The majority of motion occurs at the GH and ST joints. A rhythm between these 2 areas of motion has been found. The GH–to–ST ratio is 2:1, i.e., 180° of abduction, consisting of 120° of GH motion and 60° of ST motion. The 2:1 ratio is an average over the entire arc of motion. In the beginning of arm motion the GH motion predominates, for the humerus to reach further than 60 degrees the scapula must start to move. Scapula motion will stop around 120 degrees leaving the GH joint free to finish the full movement. Impingement syndrome is usually felt between 60-120 degrees of abduction (painful arc).

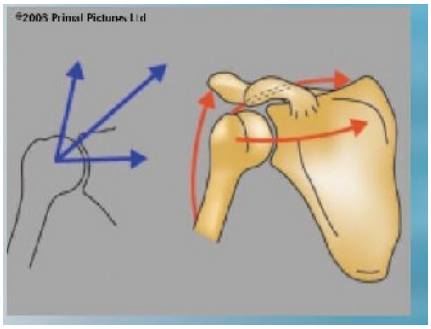


Illustration 1: Direction of forces involved around the shoulder joint to keep the humerus central

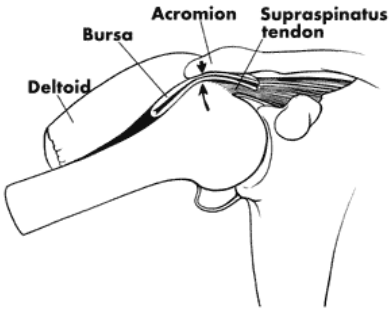


Illustration 2: Where impingement happens in the shoulder

The importance of the scapula in normal shoulder motion cannot be overstated. The scapula, with the glenoid as its contact point, forms the platform for humeral head articulation and motion. A stable platform is essential for normal shoulder biomechanics in everyday activities and is crucial for high-demand activities (e.g., overhead sports or work). The scapula must glide along the chest wall as it protracts and retracts during normal shoulder movements. Scapular position can inform the therapist of dysfunction, I.E. winging of the scapula results in glenoid tilting forward, which results in a functional elevation of the humeral head and impingement of the rotator cuff. In addition, without scapular motion, the origin and insertion of the deltoid approximate each other, resulting in a decreased optimal length-tension relationship and a decrease in force as the shoulder abducts. Normal scapular motion allows the deltoid to maintain its length-tension relationship and generate adequate force.

When weakness of the stabilisers has been present for a while the strain will be put onto other muscles for example the levator scapula, upper traps, latissimus dorsi and the pectoral minor. Muscle imbalance happens as these global muscles compensate for the local muscles of the scapula and rotator cuff weakness. The most common finding is a

weak serratus anterior and lower trapezius.

Rehabilitation of the shoulder

Rehabilitation of shoulder injuries should look at the whole area no matter how minor. Without scapula stabilization the rotator cuff muscles can't work efficiently. Without the rotator cuff you have no stability of the humerus. Proprioception work is also vital. It can be a hard, long return to sport with shoulder injuries as the rehabilitation process is quite complex.

Before any strengthening can begin the therapist needs to make sure the patient knows how to reset the scapula and humerus. This may take some practice but the scapula and humerus must be placed in the correct neutral position otherwise the problem is not going to improve. Taping can be used to help.

I have not given a programme to follow for shoulder rehabilitation because posture and correct alignment are very important, this can only be achieved with the help of an injury specialist. As a guide a shoulder rehabilitation programme should include the following: -

Correction and re-education of scapula and humerus position on upward of the scapula and eccentric control on lowering the arm

Scapula stability; may include seated row, press-up, reverse flies different angles.

Rotator cuff strengthening if needed

Proprioception: gym ball, catching, mirror matching

Sports Specific training