

SHOULDER PAIN

Version 2 Final

Document control

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General Information

(painful arc, frozen shoulder, rotator cuff syndrome, glenohumeral instability or bursitis)

Description

The function of the shoulder joint is to act as an attachment for the upper limb to the trunk and to act as a fulcrum for its movement and thereby accurately positioning the hand in space.. This is achieved with a combination of 5 articulations- the glenohumeral joint, acromioclavicular (AC) joint, subacromial joint (not a true synovial joint), sternoclavicular joint and the scapulothoracic joint. In the shoulder joint the large range of mobility is achieved at the expense of stability. The glenohumeral joint is held in place by a combination of bony contours (minimal contribution), rotator cuff tone, glenoid labrum, the tendon to the long head of biceps, and glenohumeral ligaments. The rotator cuff consists of the supraspinatus, infraspinatus, teres minor and subscapularis muscles and is intimately associated with the biceps tendon. As well as stability, movement of the shoulder joint depends on free movement of the rotator cuff, subacromial bursa and the biceps muscle.



“Shoulder pain” may originate from the glenohumeral joint, subacromial joint, acromioclavicular joint, subacromial bursa, biceps tendon, rotator cuff, or any other surrounding structure.

Regardless of the disorder, pain is the most common reason for consulting a practitioner. There may also be significant restriction of movement. For most shoulder disorders, diagnosis is based on clinical features, with imaging studies playing a role in some people. [1]

Aetiology

1. Sports requiring the arm to be moved repeatedly over the head e.g. swimming, weightlifting and serving in tennis can lead to tearing and inflammation of the tendons. Reaching forward causes the humeral head to abut the acromium and coracoacromial ligament with rubbing and friction on the supraspinatus tendon. Chronic irritation leads to subacromial bursitis, tendon inflammation and tearing of the rotator cuff.
2. Gleno humeral instability with laxity of the shoulder capsule and rotator cuff weakness. The rotator cuff functions to prevent upward displacement of the humeral head on the glenoid.

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Weakness allows the humeral head to move upwards resulting in impingement of the cuff under the coracoacromial arch.

3. Rotator cuff tendons are composed of collagen, proteoglycans and cells. The collagen which comprises 85% is primarily responsible for resistance of tensile forces. However rotator cuff tendons appear to contain increased amounts of glycosaminoglycans and proteoglycans compared with flexor tendons which are subjected to purely tensile loads. The biochemical profile of rotator cuff tendons is similar to that demonstrated by tendons subject to compressive as well as tensile loads, however microscopically they do not demonstrate the fibrocartilagenous appearance seen in other tendons subject to the two forms of loading. The relationship of this to impingement is still unclear.

Rotator cuff injury normally follows excessive use or trauma resulting in inflammation of the tendons or tears of the muscles of the rotator cuff. These result in painful movements, often with a defined arc of pain in abduction between 60° to 120° and possible weakness of one or more movements of the shoulder.

4. Shoulder pain and disability are associated with several aspects of employment in working conditions and activities. These were primarily confined to men. Working with hands above shoulder level, using wrists in a repetitive way, stretching down below knee level and working with a bent posture all resulted in a risk factor of twice that of those who did not carry out such activities. Working in damp or cold conditions or carrying weights on one shoulder increased the risk fivefold [3].

5. Direct injury to the shoulder, often by a heavy fall, can result in contusion to the cuff with acute swelling and inflammation. This limits the amount of space below the coracoacromial arch for the rotator cuff resulting in acute impingement. Similarly, if enough force is transmitted to the cuff tendons, acute full thickness ruptures may be seen. Dislocation of the glenohumeral joint may result in rotator cuff tears, especially in individuals over the age of 40 years. This mechanism is likely to involve acute tensile overloading of the cuff as the humeral head dislocates out of the glenoid.

Injury to the acromioclavicular joint in the form of subluxation or dislocation may occur. Degenerative arthritis may follow and if a bony spur forms this can impinge on the rotator cuff tendons.

6. Calcium deposits may form around the site of injury or inflammation giving rise to calcific tendonitis. Although these deposits may remain asymptomatic, only being visible on x-ray, they can produce symptoms of discomfort or may be extravasated into the subacromial bursa giving rise to intense pain, loss of movement, severe tenderness, swelling and muscle spasm.

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7. Risk factors for frozen shoulder include female sex, older age, shoulder trauma, surgery, diabetes, cardiorespiratory disorders, cerebrovascular events, thyroid disease, and hemiplegia. Arthritis of the glenohumeral joint can occur in numerous forms, including primary and secondary osteoarthritis, rheumatoid arthritis, and crystal arthritides.

Shoulder pain can also be referred from other sites, in particular the cervical spine.

Diagnosis

History

As with most conditions, diagnosis is most commonly made on the basis of a good history, with confirmatory imaging. Details of the pain should be gained, including the exact site. A finger pointing to the AC joint locates the pain to that joint, whereas a hand covering the deltoid area suggests subacromial pathology. Any previous trauma should be noted, which may indicate a traumatic rotator cuff tear, and an interest in sports involving the upper limb can lead to muscle imbalance and shoulder instability.

Examination

Muscle wasting may be seen, especially of the deltoid. Supraspinatus, and infraspinatus wasting can also be seen if examined carefully. An overly prominent AC joint may be clearly visible. Active and passive range of movement should be documented, including flexion (forward elevation), abduction, external and internal rotation. A “painful arc”, classically seen from 60-120° abduction, with diminution of symptoms at >120°, is described for impingement syndrome. Pure glenohumeral movement is only seen with internal and external rotation, as flexion and abduction involve a substantial amount of scapulothoracic movement as well, and it can be difficult to differentiate between the two. Weakness in a specific movement plane compared to the contralateral arm may be a sign of rotator cuff tear.

Painful arcs.

60° to 120° Supraspinatus tendinitis, bursitis, impingement syndrome or partial tear.

100° to 140° Osteoarthritis of the acromioclavicular joint

Confirming diagnosis

To date there have been no internationally agreed criteria or classification for signs, symptoms or severity.

However there are a number of internationally recognised disability index questionnaires which have proved successful in assessing treatment outcomes and in longitudinal studies of natural disease progression and resolution. The two most favoured are currently SPADI (Shoulder Pain and Disability Index) and SDQ-UK (Shoulder Disability Questionnaire).

See appendices 1 and 2.

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Imaging

An AP (anterior – posterior) radiograph is a minimum necessity to confirm any diagnosis. Views from other angles may be helpful depending on the likely specific condition. MRI scanning, including MR arthrogram, or ultrasound are commonly used to assess the rotator cuff and biceps tendon.

Differential diagnosis

The most common conditions leading to pain felt around the shoulder include:

- Impingement syndrome
- Acromioclavicular degeneration/instability
- Glenohumeral instability
- Calcific tendonitis
- Adhesive capsulitis (frozen shoulder)
- Glenohumeral arthritis
 - Rheumatoid arthritis
 - Primary osteoarthritis
 - Cuff tear arthropathy
 - Post-traumatic arthritis
- Non-shoulder pathology
 - Pain referred from the cervical spine/surrounding musculature
 - Diaphragmatic irritation referred to shoulder tip e.g. subphrenic abscess
 - Pain from apical lung tumour
 - Axillary vein thrombosis

Relative Prevalence

One survey of 134 people with shoulder pain in a community based rheumatology clinic found that 65% of cases were due to rotator cuff lesions; 11% were caused by localised tenderness in the pericapsular musculature; 10% acromioclavicular joint pain; 3% glenohumeral joint arthritis; and 5% were referred pain from the neck [2]. Another survey found that, in adults, the annual incidence of frozen shoulder was about 2%, with those aged 40–70 years most commonly affected [3].

Apart from association with work activities of carrying over 12 kg. on one shoulder the

male : female incidence was equal. Much more variability is seen with age. Patients under 40 years usually have instability or sports related damage with secondary rotator cuff impingement. Calcific tendonitis is rare under 35 years. Frozen shoulder and rotator cuff problems are seen in the age group 40 to 60 years and here have to be distinguished from osteoarthritis, while shoulder pain in the over 60 years old group is almost certainly due to rotator cuff tear.

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Impingement syndrome

The humeral head moves below an arch made up of the acromion, acromioclavicular ligament, and AC joint, with the subacromial bursa and rotator cuff tendons (supraspinatus and infraspinatus) interposed. One of the prime functions of the rotator cuff is to offset the superior force generated by the deltoid and thereby prevent impingement of itself and the bursa between the humeral head and acromion. Failure of this mechanism leads to such impingement and further weakens the rotator cuff, worsening the condition. Over a longer period, attrition can result in partial or full thickness rotator cuff tears. The cause of failure of the rotator cuff is the subject of much controversy [4]. Primary vascular degeneration is thought to be the originating factor, and age is the most reliable associated risk. Repetitive overhead activity is also implicated, presumably from its attritional effect.

Symptoms typically consist of pain in the deltoid area, felt on abduction, especially in the 60-120° painful arc. Weakness may ensue if the rotator cuff develops a rent or proceeds to full thickness tear. In a small number of people, advanced disease can result in “cuff tear arthropathy”, in which the biomechanics of the glenohumeral joint are so disordered that degenerative change becomes the overriding pathology, including direct bony articulation between the humeral head and acromial arch. Diagnosis is usually based on clinical symptoms and tests. A subacromial injection of local anaesthetic may be helpful in localising the site of pain.

Initial treatment consists of oral anti-inflammatory drugs, with physiotherapy designed to strengthen the rotator cuff and thereby depress the humeral head away from the acromial arch [5]. Subacromial steroid injection can alleviate symptoms temporarily to allow successful physiotherapy [6], but may worsen tendon degeneration if overused [7]. If conservative management has failed, acromioplasty, either as an open procedure or arthroscopically, may be performed with over 80% success [8]. This can be done in conjunction with rotator cuff repair in instances of tear.

Acromioclavicular pain

The AC joint, at the lateral end of the clavicle, is a fibrocartilagenous joint. The disc, interposed within the joint, begins to degenerate during the second decade of life. Degeneration may be accompanied by osteophyte formation, which can contribute in turn to rotator cuff pathology e.g. tear or impingement syndrome. The pain is well-localised, and exacerbated by overhead activity, as well as crossing the arm across the chest. Diagnosis is aided by radiography of the joint, which may show joint space narrowing, sclerosis and osteophyte formation. Local anaesthetic injection into the joint may also be helpful in confirming the site of pain.

Conservative treatment consists of steroid injection into the joint, which may alleviate symptoms, and NSAIDs. If this fails, excision of the lateral 1cm of the clavicle may succeed with minimal adverse effects.

Glenohumeral instability

As mentioned above, the glenohumeral joint is inherently unstable. If the soft tissue stabilising mechanisms fail the joint may sublux, or dislocate recurrently. Reasons for failure of the stabilising mechanisms may be acute or chronic and include: generalised soft tissue laxity, initial traumatic dislocation resulting in capsular/ligamentous failure, muscular imbalance through intense training (e.g. swimmers, throwing athletes), and developmental or traumatic bony abnormality [9].

Instability may be unidirectional (usually through a traumatic event) or multidirectional. Symptoms include recurrent dislocation and painful subluxation.

Multidirectional instability is usually treated with physiotherapy, aiming to correct imbalance of muscular tone, especially in the rotator cuff. When this fails, capsular shift surgery may tighten the soft tissues and aid stability [10, 11].

Unidirectional instability more frequently requires surgery, as there is often an anatomic lesion, the Bankart lesion, which can be corrected. Anterior stabilisation may be performed as an open or arthroscopic procedure. There are a number of other procedures which have been described using different methods to provide stability [12].

There are a small number of patients who voluntarily dislocate their shoulder, sometimes as a “party trick”, who are known to have a reduced surgical success rate [13].

Calcific tendonitis

Calcium deposits may form within the rotator cuff tendons, usually supraspinatus. The exact cause remains unclear, but degeneration and trauma are thought to be involved [14]. These deposits may be asymptomatic (and may be seen as an incidental finding on x-ray), or may become excruciatingly painful. Although the condition is self-limiting, subacute symptoms may last for months. Pain is felt at the deltoid insertion, and may mimic impingement syndrome. Diagnosis is confirmed on x-ray.

In the acute stage, treatment may involve subacromial injection of local anaesthetic or needling of the deposit to break up the calcification and allow resorption. Despite providing transient relief, corticosteroid injection reduces vascular proliferation and macrophage activity, and may therefore prolong the underlying condition. In chronic cases, physiotherapy may be needed to retain range of movement, and analgesic therapies including NSAIDs, heat and ultrasound may be of benefit. If pain continues, surgery may be used to remove the calcification with good results [15].

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Adhesive capsulitis (frozen shoulder)

Frozen shoulder is frequently over-diagnosed. In true cases, for reasons that are unclear, the glenohumeral capsule becomes inflamed and fibrotic. The glenohumeral range of movement is severely restricted with associated pain [16]. The incidence is much higher in diabetics, and the clinical course is longer and less responsive to therapy, either conservative or surgical.

The pain is of gradual onset, and will frequently interrupt sleep. The initial phase, from 2-9 months, is the most painful. During the next stage, the pain may subside but range of movement is lost. Usually, there is then a thawing phase, with resolution of symptoms (which may only be partial). In most cases, a course of 1-3 years can be expected. Diagnosis requires restriction of external rotation to <50% that of the uninvolved arm with associated pain and an absence of other pathology.

Conservative options include physiotherapy, and intra-articular steroid injection. Failure of conservative therapy after 6 months is an indication for operative intervention, which may include gentle manipulation under anaesthetic, arthroscopy with capsular distension by saline infusion, or capsular release [17, 18]. Diabetic patients are known to be more refractory to surgical treatment. Evidence is lacking to definitively recommend one treatment over another.

Glenohumeral arthritis

Arthritis of the glenohumeral joint can be of a number of different aetiologies, but the final common pathway is of degeneration of the articular surface with pain and reduced range of movement [19]. Unlike the larger lower limb joints, primary osteoarthritis is one of the is

least common causes. 50-90% of cases of arthritis of the shoulder are due to rheumatoid disease. Many cases of osteoarthritis are due to altered biomechanics after rotator cuff tears, which allow the humeral head to sit in an elevated position [20]. Post-traumatic arthritis following fracture may be the cause in younger patients, and avascular necrosis of the humeral head may occur, especially in patients taking systemic steroids.

Conservative management involves physiotherapy, NSAIDs, and intra-articular steroid injections. Prosthetic arthroplasty, in the form of hemi- or total shoulder replacement or resurfacing may be required if symptoms progress.

Rheumatoid arthritis

Rheumatoid arthritis can quite commonly involve the glenohumeral joint, the subacromial space and the rotator cuff itself can become damaged.

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Cervical spondylosis

This may present with shoulder pain but there is usually pain in areas outwith those of a C4 and C5 dermatomal distribution. There is usually a painless arc of shoulder movement while neck rotation or compression may trigger the pain.

Systemic lupus erythematosus

S.L.E. can involve the shoulder. Anti-nuclear antibodies will be found in 96% to 99% of cases. There may also be the appearance of the malar flush (butterfly rash) though this is only present in 30% of cases.

Gout

Gout is not uncommon in the shoulder joint, although pseudo-gout (with calcium pyrophosphate crystals) is rarer.

Synovial osteochondromatosis

This condition can generate multiple loose bodies which may be seen in the joint and give rise to impingement syndrome.

Haemarthrosis

Patients on anti-coagulant therapy can present with tense shoulder joint swellings and global restriction of movement. They require drainage and review of anticoagulant medication. Shoulder effusions are rare and require further investigation.

Treatment Summary

Rest and ice packs

Rest of the injured tendon is the initial treatment of choice, especially with acute injuries or those related to repetitive movements in sports.

Non-steroidal anti-inflammatory analgesics

These are of particular use in the 2 - 3 weeks following onset of rotator cuff tendinitis to reduce both pain and inflammation. They are also useful in frozen shoulder, subacromial bursitis and impingement. Particularly in frozen shoulder or other lesions which are slow to resolve providing adequate analgesia allows maximum benefit to be obtained from physiotherapy and rehabilitation.

Physiotherapy

Uses mainly mobilisation and strengthening techniques along with massage and friction.

Steroid injections

The main rationale for the use of steroid injections is to control pain. There is no clear evidence that they affect duration or outcome. They can be of use in painful frozen shoulder, resistant tendinitis or subacromial bursitis. They should be avoided where there is a high suspicion of a rotator cuff tear.

Surgery

Manipulation under anaesthetic can be required for frozen shoulder. Rotator cuff tendinitis due to primary subacromial impingement which has failed to resolve with six months of conservative treatment benefits from subacromial decompression. Osteophytes if present can be removed from beneath the acromio-clavicular joint. Full thickness tears of the rotator cuff may be surgically repaired. Where rotator cuff tendinitis is the result of instability in the glenohumeral joint with upward or forward translation of the humeral head surgical reduction of joint laxity is of value.

Prognosis

Although there has been an assumption that shoulder problems are short lived, research has shown that 25% of patients presenting with an acute shoulder problem have had a previous episode. Similarly reassessment of reported disability after 6 months suggests that 50% continue to have the difficulties previously described and after 18 months approximately 20% continue to experience problems.

The classic history of frozen shoulder is described as 6 months getting worse, three months static and nine months getting better.

Main Disabling Effects

The main disabling effects are well summarised in a study funded by the Arthritis and Rheumatism Council in 1996. This assessed patients presenting in general practice with shoulder pain [21]. The main problems reported were pain, particularly with disturbed sleep, and when moving the hand and arm and dressing.

84% reported sleeping less well and frequently changing position in bed. This correlates to the deep constant pain felt at night with frozen shoulder and rotator cuff tear and the inability to lie on the affected side with rotator cuff tendinitis or acromioclavicular joint arthritis.

74% reported being slower getting dressed with particular problems with items which have to be pulled over the head and fastenings which have to be reached behind the neck or behind the back. This again is in keeping with the reduced range of movements and the painful arcs of movement related to the specific disorders. A smaller number reported difficulty carrying shopping (34%). This would be expected to be the case in rotator cuff tears where weakness is often seen but not in tendinitis or impingement where difficulties only begin after 70° of abduction.

Appendix 1 - Shoulder Pain and Disability Index

Please place a mark on the line that best represents your experience during the last week attributable to your shoulder problem.

Pain scale

How severe is your pain?

Circle the number that best describes your pain where: **0** = no pain and **10** = the worst pain imaginable.

At its worst?	0 1 2 3 4 5 6 7 8 9 10
When lying on the involved side?	0 1 2 3 4 5 6 7 8 9 10
Reaching for something on a high shelf?	0 1 2 3 4 5 6 7 8 9 10
Touching the back of your neck?	0 1 2 3 4 5 6 7 8 9 10
Pushing with the involved arm?	0 1 2 3 4 5 6 7 8 9 10

Total pain score /50 x 100 = %

(Note: If a person does not answer all questions divide by the total possible score, eg. if 1 question missed divide by 40)

Disability scale

How much difficulty do you have?

Circle the number that best describes your experience where: **0** = no difficulty and **10** = so difficult it requires help

Washing your hair?	0 1 2 3 4 5 6 7 8 9 10
Washing your back?	0 1 2 3 4 5 6 7 8 9 10
Putting on an undershirt or jumper?	0 1 2 3 4 5 6 7 8 9 10
Putting on a shirt that buttons down the front?	0 1 2 3 4 5 6 7 8 9 10
Putting on your pants?	0 1 2 3 4 5 6 7 8 9 10
Placing an object on a high shelf?	0 1 2 3 4 5 6 7 8 9 10
Carrying a heavy object of 10 pounds (4.5kg)	0 1 2 3 4 5 6 7 8 9 10
Removing something from your back pocket?	0 1 2 3 4 5 6 7 8 9 10

Total disability score: _____ / 80 x 100 = %

(Note: If a person does not answer all questions divide by the total possible score, e.g. if 1 question missed divide by 70)

Total Spadi score: _____ 130 x 100 = %

(Note: If a person does not answer all questions divide by the total possible score, eg if 1 question missed divide by 120)

Minimum Detectable Change (90% confidence) = 13 points

(Change less than this may be attributable to measurement error)

Source: Roach et al. (1991). Development of a shoulder pain and disability index.

Appendix 2 - SDQ items

- 1 I wake up at night because of shoulder pain.
- 2 My shoulder hurts when I lie on it.
- 3 Because of pain in my shoulder it is difficult to put on a coat or a sweater.
- 4 My shoulder hurts during my usual daily activities.
- 5 My shoulder hurts when I lean on my elbow or hand.
- 6 My shoulder hurts when I move my arm.
- 7 My shoulder hurts when I write or type.
- 8 My shoulder is painful when I hold the driving wheel of my car or handle bars of my bike.
- 9 When I lift and carry something my shoulder hurts.
- 10 During reaching and grasping above shoulder level my shoulder hurts.
- 11 My shoulder is painful when I open or close a door
- 12 My shoulder is painful when I bring my hand to the back of my head.
- 13 My shoulder is painful when I bring my hand to my buttock.
- 14 My shoulder is painful when I bring my hand to my low back.
- 15 I rub my painful shoulder more than once during the day.
- 16 Because of my shoulder pain I am more irritable and bad tempered with people than usual.

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