

Managing rotator cuff disorders

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- **Mechanical impingement is the most common recognisable source of recurring rotator cuff pain and disability in the active population**
- **Tearing of the rotator cuff as a function of age is a common occurrence, and may be clinically silent**
- **Often, the diagnosis can be made by history and clinical examination alone**
- **Magnetic resonance imaging scans for those anticipating shoulder surgery can be helpful in evaluating tears and muscle atrophy and in establishing the presence of co-morbidities**
- **Most patients with symptomatic rotator cuff disease respond to non-operative treatment**
- **Early surgical management should be considered for acute rotator cuff tears in physiologically young and active individuals**

Introduction

Shoulder pain is the third most common reason for musculoskeletal consultation in general practice, after back and neck pain. Shoulder pain accounts for 5% of all GP encounters, with a lifetime risk of 30% in the general population.^{1,2} In a study of adults consulting for shoulder pain in a UK primary care setting a prevalence of 2.36% and incidence of 1.47% were reported, peaking at 50 years and showing a linear increase with age.³ Shoulder symptoms can cause significant distress to patients, resulting in severe socio-economic loss to society with an increased burden on the health-care budget. Swedish insurance data show that 18% of disability payments made for musculoskeletal disorders was spent on neck and shoulder problems.⁴ On the basis of one comprehensive review of shoulder disorders,⁵ the cost of shoulder pain to society is estimated to be in the region of £100 million.

The cause of shoulder pain can be difficult to diagnose owing to the complex anatomy of the shoulder and the spectrum of disorders affecting this joint. Most shoulder problems fall into three major categories: soft tissue disorders, instability and arthritis. Impingement syndrome and tears of the rotator cuff are the cause of shoulder pain

in over three-quarters of patients.⁶ Occupations as diverse as construction work and hairdressing are associated with a higher risk of shoulder disorders. Physical factors such as lifting heavy loads, repetitive movements in awkward positions and vibrations influence the level of symptoms and disability, and psychosocial factors also play an important role. Shoulder pain is often a chronic problem resulting in long-term morbidity. A prospective cohort study in a primary care setting reported that shoulder pain persisted for more than 18 months in more than half the patients reporting with shoulder pain.⁷ Asymptomatic rotator cuff pathology is also common: in a radiological study full thickness rotator cuff tears were found in 28–51% of the 60–80 year olds and in 80% of the over 80 age group.⁸

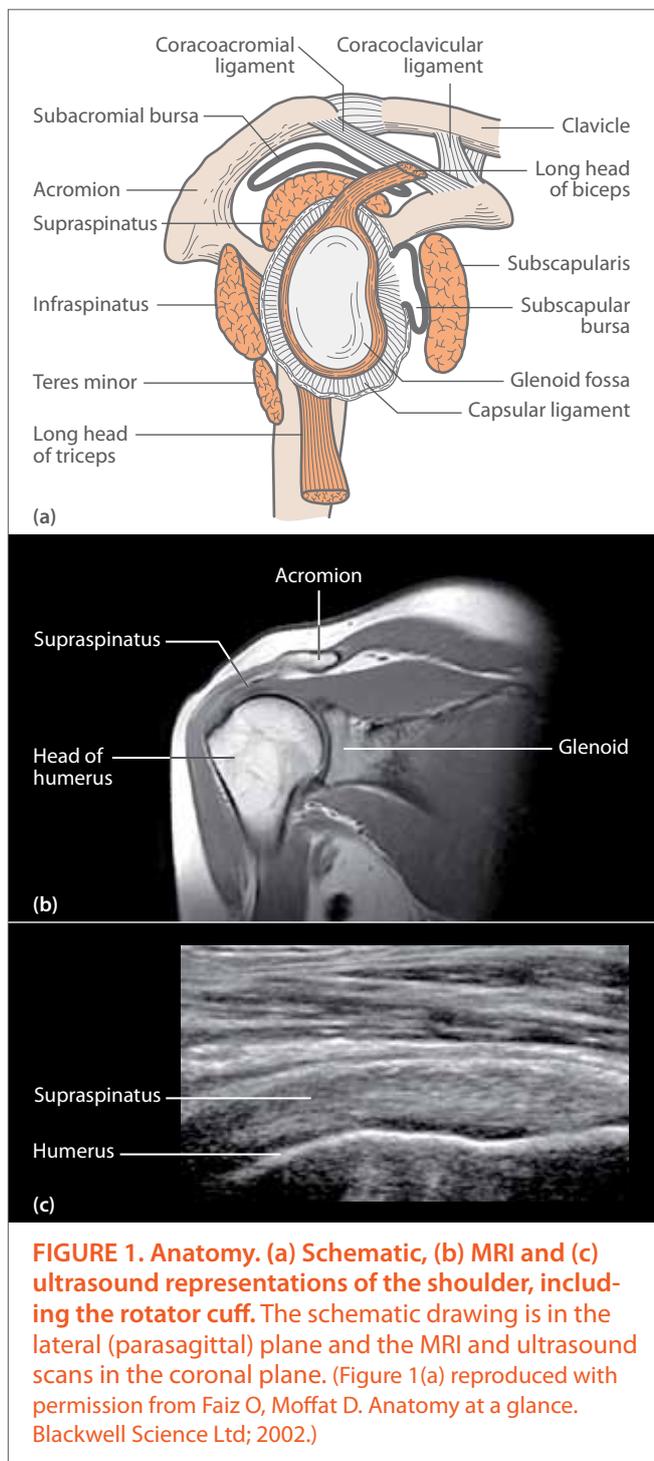
Common shoulder disorders exhibit similar clinical features, and the lack of consensus on diagnostic criteria and concordance in clinical assessment complicates treatment choices. This report reviews the current understanding of the biology, aetiology and diagnosis of rotator cuff disease and its treatment.

Subacromial impingement is defined as shoulder pain resulting from the catching of the rotator cuff under the coracoacromial arch of the shoulder. Repeated impingement can lead to a tear in the tendon of rotator cuff muscles which can be either partial (partial-thickness tear) or complete (full-thickness tear).

Functional anatomy

The rotator cuff comprises the shoulder joint capsule and insertional tendons of four scapulo-humeral muscles: the subscapularis, supraspinatus, infraspinatus and teres minor, all of which arise from the scapula and insert into the proximal humerus.⁹

The subacromial arch is defined radiologically as the space between the distal clavicle and acromion superiorly and the humeral head inferiorly (Figure 1). This space between the acromion and humeral head averages 8–12 mm on normal plain x-ray. If it is less than 6 mm it is considered pathologic and strongly indicative of rotator cuff tear. The key anatomical structure underlying the radiological subacromial arch is the coracoacromial arch which is formed by the acromion, coracoacromial ligament and coracoid



process. As the rotator cuff passes beneath the coracoacromial arch, contact between the tendons and the arch can occur, leading to tendon pathology as well as secondary changes to the arch in the form of traction-based ossification within the coracoacromial ligament at the acromial attachment site. The cuff has several key functions: to stabilise the humeral head by compressing it into the glenoid concavity, to create a smooth articulation with the undersurface of the coracoacromial arch, and to provide rotational torque in internal rotation (subscapularis), elevation (supraspinatus) and external rotation (infraspinatus and teres minor). Each of these functions is critical.

Pathophysiology

The pathogenesis of rotator cuff tears is considered to be the end result of a common pathway involving both intrinsic and extrinsic causes. Intrinsic causes include age-related metabolic and vascular changes leading to degenerative tearing and differential shear stress within the tendon causing intratendinous tears. Extrinsic causes include mechanical wear, glenohumeral instability, internal impingement, acute traumatic events and repetitive microtrauma. Classically, outlet impingement theory as first described by Neer¹⁰ suggests that the bony and soft-tissue parts of the coracoacromial arch can impinge on and cause abrasion and tearing of the rotator cuff. Bigliani et al¹¹ developed a hypothesis as to how differences in acromial morphology might predispose to rotator cuff disease, describing three distinct acromial morphologies (Figure 2). They suggested an increased incidence of rotator cuff tears with the hooked, Type III acromial morphology. However this theory has recently been challenged by Chang et al,¹² who found no evidence that acromial morphology influenced the incidence of impingement or rotator cuff tears

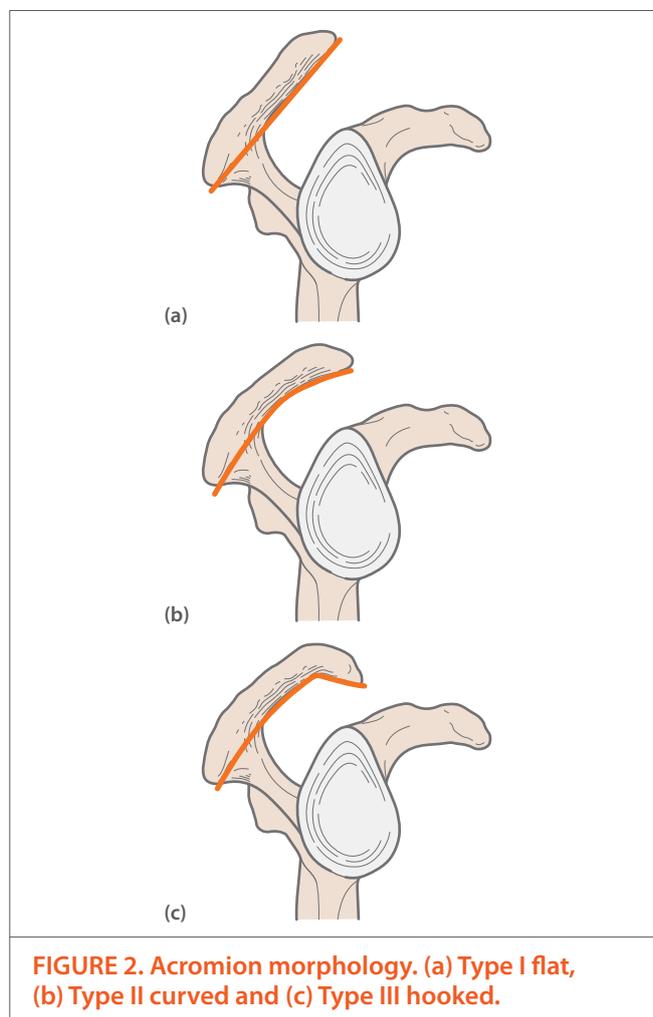


FIGURE 2. Acromion morphology. (a) Type I flat, (b) Type II curved and (c) Type III hooked.

based on 3-dimensional magnetic resonance imaging (MRI)-based modelling of the acromial undersurface. Ko et al¹³ have suggested that outlet impingement may play a role in rotator cuff tears that originate on the subacromial (bursal) side of the tendon, but the attritional changes within the substance of the tendon caused by tendinopathy may be more important in the development of tears that originate on the articular side.

Overuse has been implicated as a possible factor in the pathogenesis of rotator cuff disease and tendinopathy.^{14,15} Overuse may result in transformation of the supraspinatus tendon into a fibrocartilage phenotype that has poorer biomechanical properties and is more susceptible to tears. The exact mechanism by which overuse results in tendinopathy is uncertain, but one theory is that in the face of overuse, physiological levels of stress can result in microtears in a tendon. These microtears become more pronounced as the repetition rate of the cyclic loading increases. A possible consequence of these microtears is a loss of normal strain within the tendon. In the absence of normal strain, tenocytes have been shown to increase collagenase (MMP-13) production in a rat-tail tendon model with a subsequent decrease in mechanical properties of the tendon.¹⁶⁻¹⁸

Cell biology: apoptosis, stem cells and genetics

Apoptosis plays a critical role in the homeostasis of normal tissue; however increased rates of apoptosis have been demonstrated in tendon samples from torn rotator cuffs obtained at the time of repair.¹⁹ This suggests that increased levels of programmed cell death in tenocytes may play a role in the degenerative process seen in tendons with chronic tendinopathy. There is increasing evidence that hypoxic damage throughout the spectrum of pathology of the rotator cuff may contribute to the loss of cells by apoptosis.²⁰

It is suggested that since apoptosis is a potentially reversible process, novel treatment methods could aim at reversing this process. Pro- and anti-apoptotic proteins compete within the cell to determine their fate. Production of these proteins could theoretically be manipulated to stimulate a greater healing response at the time of repair. This could also be achieved using stem cell therapy to replace lost tenocytes.

Full-thickness tears of the rotator cuff in siblings are significantly more likely to progress over a 5-year period than in a control population, implying genetic factors have a role not only in development but also in progression of cuff tears.²¹ Genetic factors may predispose the tendon to degeneration through apoptosis or regenerative capacity. A decrease in rotator cuff blood flow with genetic predisposition for age-related degeneration may contribute to the increased incidence of rotator cuff tears seen in the older population.²²

Pathological changes in chronic cuff tears

The majority of rotator cuff tears are thought to be caused by failure of a pathologic, biomechanically compromised tendon. Once the tendon tears it appears to undergo further degenerative changes. A consequence of chronic massive rotator cuff tears is fatty atrophy of the corresponding muscle. The presence of fatty atrophy in the supraspinatus muscle belly has been correlated with poor healing and outcome after rotator cuff repair.^{23,24} Structures outside the tendons and muscles may be affected by a rotator cuff tear; chronic degenerative changes can also develop in the glenohumeral joint. This cuff tear arthropathy has been well described, but its pathogenesis remains unclear – in particular, why some patients with chronic rotator cuff tears develop severe, debilitating osteoarthritis whereas others show few degenerative changes in the glenohumeral joint.

Clinical evaluation

The aim of clinical evaluation is to establish the cause of the presenting shoulder pain.

History

Shoulder pain, especially that related to rotator cuff impingement, is usually evident from the history alone. A painful range of motion from 70° to 120° of forward flexion is commonplace, with pain localising to the anterior-superior region of the shoulder, often radiating down the lateral upper arm into the deltoid insertion. Overhead activities are usually provocative, with night pain and difficulty sleeping as other associated complaints. Range of shoulder movement is usually not restricted, except due to pain; however, for longer-standing injuries a secondary frozen shoulder pattern may be encountered, especially in the older population. Most often the onset of

pain is insidious and takes place over days or weeks, but for those with an acute injury a sudden tearing sensation associated with profound early weakness may be the presenting history.

Rotator cuff disease reflects a spectrum of pathology ranging from simple impingement to full-thickness tear of the rotator cuff, so the history and physical findings may overlap. There may be little difference in the presentation and findings of patients with isolated impingement, partial- and even small full-thickness rotator cuff tears.

Physical examination

The aim of physical examination in suspected rotator cuff tendinopathy is to rule out other causes of shoulder pain. Clinical examination also helps demonstrate subacromial impingement and identify any weakness in the cuff muscles. Adequate exposure of bilateral shoulder girdle and scapulae is essential for comparison and examination. Long-standing rotator cuff tears are often accompanied by significant, visible atrophy and therefore one should survey for atrophy or asymmetry, especially in the supra- and infra-spinatus fossae. Assessment of range of motion (both active and passive), observing forward flexion, abduction in the scapular plane, internal rotation and external rotation, should be performed. The active range of movement (ROM) may be limited due to pain or weakness; however the passive range is usually full. Careful evaluation of scapular movement (tracking) should be included as poor scapulothoracic mechanics can lead to secondary subacromial pathology. The scapular tracking should be bilaterally symmetrical.

The impingement test (Figure 3.a) as originally described by Neer²⁵ forms the basis of establishing the diagnosis of impingement. Impingement is confirmed if there is complete resolution of pain on performing Neer's test after a local anaesthetic has been injected into the subacromial space (see Figure 4). A variation on Neer's test is the Hawkins–Kennedy test (Figure 3.b).²⁶ Rotation of the greater tuberosity under the arch in this position decreases space for the rotator cuff, leading to impingement pain. Both tests have similar sensitivity (85%) and specificity (50%) for diagnosing impingement.²⁷

Strength testing should be performed in an attempt to isolate the different components of the rotator cuff to assess weakness. The 'lift-off' test (Figure 3.c) can help to assess subscapularis integrity.²⁸

Although clinically useful, placing the arm in the testing position can be provocative and difficult to achieve, especially in the older population. The 'belly-press' test (Figure 3.d) can also help determine integrity of the subscapularis.²⁹ Resisted external rotation with the elbow by the side is useful in detecting tears extending into the infraspinatus (Figure 3.e). Jobe's test (Figure 3.f) is most useful in isolating the integrity of supraspinatus.³⁰ A recent study suggested that if a patient was older than 60 years and had a positive Neer or Hawkins–Kennedy impingement test with weakness in abduction (positive Jobe's), there was a 98% chance that the patient had a full-thickness rotator cuff tear.²⁷

Investigations

Investigating rotator cuff pathology usually involves radiography. Blood tests are indicated only if there are 'red flag' indicators such as symptoms and signs of systemic disease (weight loss, generalised joint pains, fever, lymphadenopathy, new respiratory symptoms), history of cancer, or local features such as a palpable mass or bony tenderness.

In a hospital setting, standard radiographs to investigate shoulder pain should include a true anterior–posterior view, with the shoulder in the internal and neutral position, and an axillary view. An outlet (supraspinatus) view as described by Neer and Poppen,³¹ used to evaluate and classify acromial morphology and arch anatomy, can be useful. These radiographs are rarely helpful in making a specific diagnosis; however they can rule out other causes of shoulder pain. The standard anterior–posterior views may show superior migration of the humeral head consistent with a cuff tear and potential subscapularis involvement. Cystic and/or sclerotic change in the greater tuberosity may also signal tendon pathology. The axillary view is most helpful in assessing concomitant glenohumeral degenerative changes.

Ultrasound and MRI scanning (see Figure 1) are the two most useful investigations in diagnosis of rotator cuff impingement pathology. In the past MRI was considered as the investigation of choice,^{32,33} however in a recent systematic review³⁴ and meta-analysis³⁵ (see Table 1) MRI and ultrasound were found to be comparable in both sensitivity and specificity in diagnosing a partial- or a full-thickness cuff tear. The only limitation of ultrasound is that it is largely operator-

dependent. Most of the specialist shoulder surgeons in the UK utilise ultrasound to screen patients with shoulder pain as it is the most cost-effective imaging method for investigating rotator cuff tears. Caution must be exercised when interpreting MR findings because some individuals may have significant rotator cuff findings on MRI but remain completely clinically asymptomatic.

For those anticipating a surgical procedure, a pre-operative scan can be helpful in determining the size and potential tear configuration, including retraction, delamination and thinning – factors that need to be considered in surgical planning; in assessing the presence or absence of atrophy or fatty infiltration, both important prognostic factors;³⁶ and in establishing the presence of comorbidities such as partial biceps or labral tears. These scans are specialist investigations and should be requested preferably in the secondary care setting.

TABLE 1. Sensitivity and specificity of various diagnostic modalities in establishing a diagnosis of rotator cuff disorders.

	Sensitivity (%)	Specificity (%)
Clinical examination	90	50
Ultrasound	85	92
Magnetic resonance imaging	86	90
Magnetic resonance arthrography	92	97

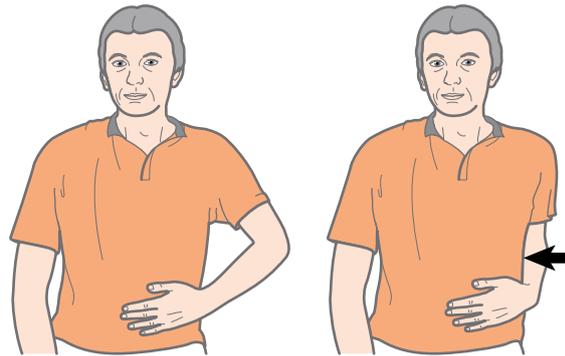
Treatment

Rotator cuff disorders encompass a wide spectrum of tendon pathology. Choice of treatment is determined in large part by the severity of tendon damage, and it is therefore helpful to categorise changes within the rotator cuff according to the degree of damage. To assist in developing a treatment plan, Neer¹⁰ described three stages of rotator cuff pathology:

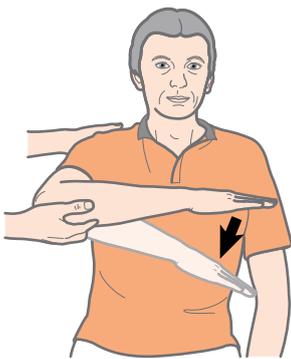
- Stage 1: reversible oedema and inflammation (subacromial impingement)
- Stage 2: tendon fibrosis and chronic inflammation (subacromial impingement with or without partial tear)
- Stage 3: complete fibre failure with a full-thickness tear.



(a) Neer's impingement test. The examiner stabilises the scapula while elevating the shoulder in the scapular plane. Impingement is considered to be present if pain is elicited in the arc from 70° to 120°.



(d) Belly-press test. This is an alternative to the lift-off test if the patient cannot fully internally rotate the shoulder. The patient is asked to push on their belly while keeping their elbow pushed forwards (L of figure). If subscapularis is weak, pressure on the belly can only be maintained by moving the elbow backwards and flexing the wrist (R of figure).



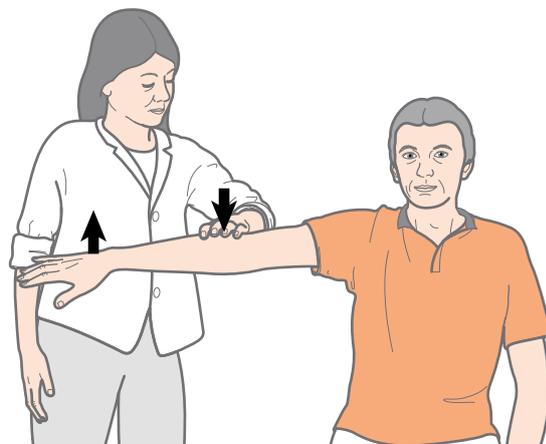
(b) Hawkins-Kennedy test. The shoulder is placed in 90° of forward flexion with the elbow flexed to a right-angle. The shoulder is then internally rotated. The test is positive if this manoeuvre reproduces the patient's pain.



(e) Infraspinatus test. To test the function of infraspinatus, the patient is required to hold the arm against the body with the elbow flexed, and then externally rotate the shoulder against resistance. Inability to externally rotate indicates weakness or rupture of infraspinatus.



(c) Lift-off test. This is to test the integrity and function of the subscapularis muscle. The arm is completely rotated internally and placed behind the back with the elbow flexed. The patient is then asked to lift the hand off the back against resistance. Inability to lift off the hand indicates weakness or rupture of subscapularis.



(f) Jobe's supraspinatus test. To test supraspinatus, the arm is abducted to 90° in the scapular plane. The patient is then asked to resist downward pressure exerted by the examiner. Inability to maintain position of the arm indicates weakness of supraspinatus.

FIGURE 3. Clinical tests for impingement and integrity of the rotator cuff.

The objectives of treatment of symptomatic rotator cuff disease are to relieve pain and restore movement and function of the shoulder. Clearly patient expectations and preferences must also be taken into account when making decisions about treatment.

Impingement

NSAIDs and corticosteroid injections

The majority of patients with impingement syndrome improve with conservative treatment, including rest, activity modification, non-steroidal anti-inflammatory drugs (NSAIDs), subacromial corticosteroid injections and physiotherapy. In a study of 616 patients Morrison et al³⁷ established the diagnosis of subacromial impingement on the basis of a positive impingement test and treated all patients with a 3-week course of NSAIDs accompanied by specific physiotherapy. Physiotherapy included an initial 3-week period of stretching exercises at home followed by supervised rotator cuff strengthening exercises. A successful outcome was reported in 67% of cases, implying that if impingement is diagnosed the initial treatment should be conservative in all cases.

Inflammatory cytokines have been demonstrated in the subacromial bursa in patients with rotator cuff disease and may be a pain generator in this condition.³⁸ One pro-inflammatory chemokine seen in the bursal tissue and in many models of inflammation is stromal cell-derived factor 1 (SDF-1). Increased levels of SDF-1 expression in bursal cells obtained from patients with rotator cuff disease has been found compared to cells obtained from controls.³⁹ Bursal cells from patients with bursitis cultured with a cyclooxygenase-2 (COX-2) inhibitor or with dexamethasone resulted in a significant reduction in SDF-1 expression, providing biological evidence for the use of NSAIDs and corticosteroids in the treatment of subacromial bursitis.

The use of subacromial corticosteroid injections has been considered an inexpensive and efficacious way both to diagnose and to treat symptomatic rotator cuff disease and subacromial impingement. Accurately placed corticosteroid injections into the subacromial space (Figure 4) under sterile conditions have generally led to good short-term outcomes. Pain relief, in turn, allows patients to participate better in a therapy programme aimed at increasing shoulder ROM and strength. As reported in a Cochrane review,⁴⁰

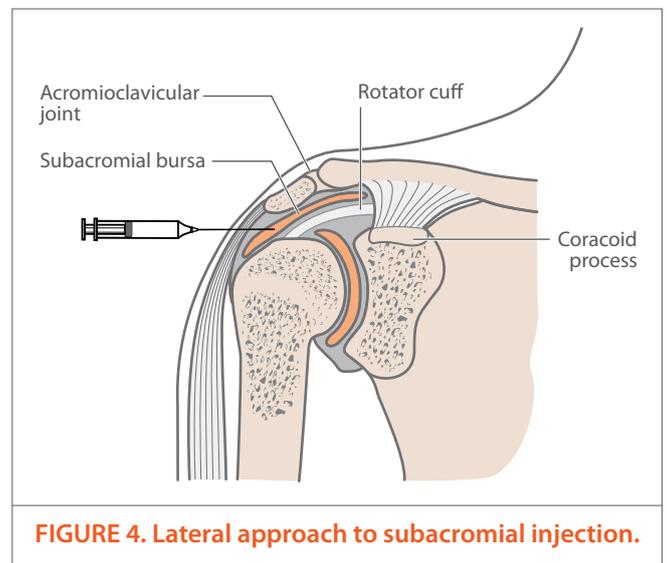


FIGURE 4. Lateral approach to subacromial injection.

duration of impingement symptoms before subacromial injection, the number of injections administered, the amount of medication injected and use of adjunct NSAIDs and physiotherapy regimens vary among studies reporting efficacy of subacromial corticosteroid injections.⁴⁰ The review concluded that the available evidence from randomised controlled trials supports the use of subacromial corticosteroid injection for rotator cuff disease, although its effect may be small and short-lived and it may be no more effective than NSAIDs. It should be noted that conclusions of systematic reviews and meta-analyses are inconsistent and hampered by small sample sizes, variable methodological quality and the heterogeneity of the included studies. In a recent meta-analysis Arroll et al calculated the numbers needed to treat and focused on overall 'improvement' in shoulder symptoms as an outcome measure.⁴¹ They concluded that subacromial injections of corticosteroids are effective for improvement for rotator cuff tendinitis up to a 9-month period. They also found injections more effective than NSAID therapy.

Physiotherapy

In addition to proper activity modification, physiotherapy exercises can be beneficial, focusing not only on rehabilitating the rotator cuff musculature but also on re-establishing a full, pain-free range of motion and normal scapulothoracic rhythm and on addressing postural muscle imbalance. The classic muscle imbalance is where the internal rotators of the shoulder are stronger and tighter than the external rotators. This vector creates an anteriorly placed humeral head which will decrease the subacromial space. Adequate strength of the scapula is required to provide a stable base, then

light-resistance external rotation with abduction provides stability to maintain centring of the humeral head in the glenoid, optimising the subacromial space.

Several studies have supported the role of physiotherapy in treatment of subacromial impingement. In a prospective, randomised trial results of treating subacromial impingement by a guided self-training programme and with conventional physiotherapy were compared;⁴² this reported improvement of symptoms in both groups with no statistical difference between the groups. In a further systematic review of the effectiveness of physiotherapy in patients with subacromial impingement⁴³ moderate evidence was found for an equal effectiveness of physiotherapy-led exercises compared with surgery at 1-year follow-up. Ultrasound treatment was not more effective than sham treatment and its use is not recommended by the study. Further studies are required to focus on specific types of exercise interventions that are most effective in the treatment of shoulder impingement symptoms. It is suggested that all patients must undergo a course of physiotherapy before considering surgery for subacromial impingement.

Subacromial decompression

For those who fail with conservative care, surgery may be appropriate. Most patients who respond to a non-operative programme will do so within a 6-month period. If surgery is indicated, an MRI or ultrasound scan is useful for determining whether or not there is concomitant significant cuff pathology. If the cuff is intact, a simple arthroscopic subacromial decompression may be performed. Subacromial decompression is usually a day-case procedure performed under general anaesthesia combined with interscalene block for post-operative pain relief. It involves releasing the coracoacromial ligament from the edge of the anterior acromion accompanied by shaving the anterior bony edge of the acromion. In the properly selected patient, the results of subacromial decompression have been reliable and durable.⁴⁴ Arthroscopic subacromial decompression has now become one of the most common procedures performed by shoulder surgeons, with a success rate of 80–90%, and there is evidence it reduces the prevalence of rotator cuff tears in impingement patients 15 years after the procedure.^{45,46}

Partial-thickness cuff tears

Patients with a suspected partial tear are treated in a similar fashion to those with impingement syndrome. Subacromial bursal inflammation is controlled with activity modification, physiotherapy, NSAIDs and the judicious use of injectable corticosteroids. Partial-thickness tears that fail to respond to a conservative trial of 6 months require surgical intervention, including debridement alone, debridement in conjunction with a subacromial decompression, and decompression combined with a rotator cuff repair, either mini-open or arthroscopic.⁴⁷⁻⁵¹ Current evidence⁵² would suggest that partial-thickness articular side tears involving less than 50% of tendon insertion should be debrided. Tears greater than 50% on the articular side may be treated better by repair, either trans-tendon or by completing the tear and converting to a full-thickness lesion.

Full-thickness cuff tears

Smaller tears are easily missed as patients present with findings and symptoms consistent with impingement. Occasionally weakness is present, but even following the Neer's test significant weakness may not be detected. Small tears treated with decompression alone can achieve significant pain relief while maintaining good function.⁵³ In an older patient unable or unwilling to undergo the more arduous rehabilitation associated with a full-thickness repair, the simple decompression alternative is a realistic solution. In the younger, more active population, obvious concern regarding propagation of the tear remains if the tears are not repaired. The study by Yamaguchi et al⁵⁴ revealed a 51% incidence of asymptomatic to symptomatic tearing over a 5-year period, raising doubts about a simple decompression resulting in a lasting and durable outcome for those who lead a more active lifestyle. For those individuals, a decompression in conjunction with a repair is more likely to be the treatment of choice.

Although open acromioplasty and rotator cuff repair has been associated with a high success rate, the technique has been largely superseded by the arthroscopically assisted mini-open and the all-arthroscopic techniques.⁵⁵⁻⁵⁷ The mini-open and all-arthroscopic techniques have demonstrated little or no difference when compared in clinical studies so far.⁵⁷

Massive tears of the rotator cuff are challenging to treat. In general, 'massive tears' refers to those

chronic, retracted tears that exceed 5 cm in length and are usually accompanied by fatty infiltration and muscle-belly atrophy as well as thinning and scarring of the torn end of the rotator cuff. The approach to these massive, retracted tears can be difficult and requires that the clinician gather as much information as possible before embarking on a therapeutic course. These patients often present with pain as their overwhelming symptom and on examination can exhibit significant motion restriction. Not uncommonly, if motion is restored and the anterior deltoid can be trained eccentrically with a well-supervised physiotherapy programme the pain can be significantly reduced. If functioning force couples of the remaining rotator cuff are in effect, restoration of motion may be all that is required to attain a satisfactory result without surgery. For those with significant strength deficits the prospect of a repair, tissue augmentation and muscle transfer can be considered, although clinical efficacy of these procedures has not yet been established. Rotator cuff repair in patients with co-existing systemic conditions can be challenging. In one of the largest case series on rotator cuff repair in rheumatoid arthritis (RA) patients Smith et al⁵⁸ reported that functional gains should not be expected in patients with full-thickness rotator cuff tears in the presence of RA; however, durable pain relief and patient satisfaction can be achieved. Simple debridement and acromial 'contouring' have been described as salvage-type procedures that may palliate some of the pain;⁵⁹ however, the risk of violating the coracoacromial arch and of losing anterior-superior head containment must be carefully considered before embarking on a debridement-only approach.

Conclusion

Rotator cuff pathology is one of the most common musculoskeletal problems presenting in general practice. Most cases can be diagnosed and treated conservatively in primary care. In recent years there has been a proliferation of diagnostic and therapeutic technologies, particularly for those not responding to conservative treatment. However, to date research into rotator cuff disorders has been inconclusive and cannot provide clear and conclusive guidance on diagnostic and therapeutic decision-making. In particular there is a lack of good quality studies that clearly identify the subgroup of impingement

patients who will benefit from surgery. In the absence of robust evidence from the literature,⁴⁵ most surgeons and shoulder units have evolved guidelines for treating rotator cuff disease based on previous experience and the best evidence available.^{60,61} Well-designed large multicentre randomised studies are required to develop clearer guidelines for the treatment of rotator cuff disease in our patients.

When to refer

- Pain and disability lasting >6 months despite conservative treatment including steroid injection
- Diagnostic uncertainty
- Acute rotator cuff tear due to recent trauma
- Neurological lesion
- History of cancer or signs and symptoms of cancer
- Unexplained mass or swelling
- Infection

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Medical Editor: Neil Snowden. Project Editor: Frances Mawer.
ISSN 1759-7846. Published 3 times a year by Arthritis Research UK.