THE SOCIETY OF ORTHOPAEDIC MEDICINE

RESEARCH REPORT

Shoulder subacromial impingement

Pathology

The term is used to describe irritation and inflammation of the rotator cuff, long head of biceps and subacromial bursa due to compression against the anteroinferior aspect of the acromium and corocoacromial ligament (Calis et al 2000) and accounts for 44-60% of all complaints of shoulder pain (Michener et.al 2004).

The humeral tuberosities passing close under the corocoacromial arch during shoulder elevation can compromise subacromial bursa, rotator cuff and long head of biceps tendons. Any reduction in the available space results in pinching of these structures. Other mechanisms are described in the literature some well documented and others more speculative (Hanchard et.al 2004).

Excessive tensile loads may cause sub acromial impingement symptoms from a single traumatic event or repetitive micro trauma (Fukuda 2003). Periarticular soft tissue lesions involving the tendons and bursa are often associated with chronic impingement of the rotator cuff at the osteoligamantous upper boundary of the corocoacromiohumeral space which can occur as the result of occupational or sporting overuse (Naredo et.al 2002, Alvarez-Nemegyei and Canoso 2003).

Other causes can be abnormalities in the tendon itself or fatigue failure of muscles that provide the support mechanisms for the humeral head in the glenoid. This can follow prolonged repetitive over the shoulder physical loads, unhealthy posture and vibration. Disruption of the glenoid capsule, joint instability, anterosuperior gelnohumeral subluxation and secondary rotator cuff tendon impingement against the acromial undersurface then occur (Alvarez-Nemegyei and Canoso 2003).

Primary degenerative rotator cuff tendonopathy results when tendon swelling, calcific or amyloid masses lead directly to mechanical impingement under the corocoacromial arch (Alvarez-Nemegyei and Canoso 2003, Mohtadi et al 2004).

Intrinsic tendinopathy occurs due to changes in the vascularity of the rotator cuff and other age related metabolic changes, which lead to degenerative tears (Fukuda 2003, Michener et.al 2004). This occurs in an area of relative hypovascularity known as Codmans hypovascular critical zone (Alvarez-Nemegyei and Canoso 2003).

Extrinsic subacromial impingement results from narrowing of the supraspinatous outlet by abnormalities of the corocoacromial arch and could aggravate partial thickness tears (Fukuda 2003). Richards et.al (2005)) demonstrated a correlation between narrowed corocohumeral distance and subscapularis tears, Di Mario and Fraracci (2005) with sub acromial impingement.

Dysfunctional glenohumeral and scapulothoracic kinematics, rotator cuff and scapular musculature weakness, capsular laxity or tightness and postural dysfunctions of the upper quarter could also result in structural compression (Michener et.al 2004). Reduced serratus anterior activity can result in medial scapula rotation when the shoulder is elevated against load leading to impingement and is an example of dysfunctional kinematics described by Hanchard et al (2004).

Pathogenesis of sub acromial impingement syndrome is therefore multifactorial. It is not a diagnosis but a clinical presentation (Mohtadi et al 2004). There exists interplay between age-related tissue degeneration, trauma, repetitive micro trauma, internal impingement, hypovascularity, subtle instability and primary tendonopathy (Fukuda 2003 Mohtadi et al 2004). There is a great deal of overlap with the clinical presentation of the signs and symptoms of impingement (Mohtadi et al 2004) and the concept is a unification of this spectrum of disorders (Naredo et.al 2002).

Clinical features/ diagnosis

Characteristically pain is in the deltoid region, triggered by overhead activities and sleep may be disturbed. Crepitus, clunking, catching, weakness and decreased range of movement being common examination findings (Alvarez-Neymegyei and Canoso 2003, Mohtadi et al 2004).

Patients with rotator cuff pathology are also significantly weaker than subjects without rotator cuff pathology in both internal and external rotation and this is associated with pain and disability (Macdermid et.al 2004).

A diagnostic definition of rotator cuff tendonitis suggested for epidemiological research is pain in the deltoid region during shoulder abduction, external or internal rotation resisted mobilization (Alvarez-Nemegyei and Canoso 2003)

There is a lack of agreed upon diagnostic criteria for sub acromial impingement syndrome (Alvarez-Nemegyei and Canoso 2003). Research has shown that traditional diagnostic tests for conditions such as supraspinatous tendonitis and sub acromial bursitis lack validity and reliability (Curalto and Bogduk 2001) and physical examination is unable to differentiate rotator cuff tendonitis, partial or full thickness tear (Naredo et.al 2002).

The sub-acromial injection test has been defined as the reference standard for sub-acromial impingement syndrome (Alvarez-Nemegyei and Canoso 2003, Calis et al 2000, Michener et.al 2004, Lim et.al 2005). It is a readily applicable tool in clinical research and practice but is invasive in nature

(Alvarez-Nemegyei and Canoso 2003). It is a useful diagnostic and therapeutic intervention in the management of bursitis and rotator cuff tendonitis (Matthews and Glousman 2004). Alvarez- Nemegyei and Canoso (2003) suggest that clinical testing is of use in early screening but the subacromial anesthetic injection test is more reliable in giving a definitive diagnosis and that more work is required to produce a validated clinical test.

Clinical diagnosis often makes use of physical maneuvers designed to increase the encroachment of the acromial arch onto the rotator cuff. Motion against resistance is also used to determine the location of a tendon lesion. Clinically it is difficult to differentiate between rotator cuff lesions, biceps tendon pathology and subacromial bursitis. According to Naredo et.al (2002) ultrasound diagnosis is more accurate than clinical diagnosis.

Positive impingement signs can include resisted, painful or weak abduction, external and internal rotation. Neer test, Hawkins-Kennedy test, painful arc and a point of maximal tenderness over the supraspinatous tendon are indicative of sub acromial impingement syndrome according to Mohtadi et al (2004).

Sensitivity defines the test that best determines the presence of subacromial impingement syndrome and specificity defines the test that best discriminates non sub acromial impingement symptom patients (Calis et al 2000)

The most sensitive clinical diagnostic tests in relation to this standard have been found to be Hawkins, Neer and horizontal adduction tests in that order. The tests with the highest specificity are the drop arm, Yergason and painful arc tests consecutively. Highly sensitive tests tend to have low specificity and the highly specific ones have low sensitivity (Calis et al 2000). A summary of the tests most frequently referred to in the literature is given at the end of this report.

Other tests include Yocums, Jobe's for supraspinatous tendon, Patte's for infraspinatous and teres minor tendons, resisted internal rotation for subscapularis tendon, Gerbers lift off test and palm up test or Speeds test for biceps long head (Naredo et al 2002, Alvarez-Nemegyei and Canoso 2003). However patients with positive impingement signs can have intracapsular abnormalities on arthroscopy (Hanchard et.al 2004).

Investigation

Diagnostic ultrasound can be used to evaluate impingement syndrome. Obtaining a dynamic view of the supraspinatous tendon as the patient's arm is moved from neutral to 90˚ abduction in order to detect encroachment of the acromium on the rotator cuff shows this. However ultrasound examination of asymptomatic shoulders has also shown supraspinatous partial thickness tears, acoromioclavicular degenerative change and mild impingement (Naredo et.al 2002). Ultrasonography is highly sensitive at diagnosing rotator cuff tears and biceps tendon pathology. Magnetic resonance imaging is more effective at diagnosing glenoid labrum tear and subacromial bursal effusion or hypertrophy (Ardic et al 2006).

Mri findings of undersurface tears of the supraspinatus or infraspinatus tendon, cystic changes in the posterior aspect of the humeral head and associated posterosuperior labral pathology are diagnostic of internal impingement (Giaroli et.al 2005)

Arthroscopic findings involving tendons include, bursal and humeral surface fraying of supraspinatous, inflammation, partial and full thickness tears and fraying of supraspinatous, infraspinatous, subscapularis and long head of biceps. Spurs, osteophytes, os acromiale and arthritic change in the acromioclavicular joint can also be found. The presence of a curved or hook shaped acromium can also be detected at arthroscopy. Further findings include labral and joint surface abnormalities such as Hill Sachs (humeral head defects), bankart (glenoid insertion), SLAP(superior labrum anterior to posterior lesions) and PSGI (posterior superior glenoid impingement). The variety of pathologic findings on athroscopy demonstrates that patients with impingement symptoms do not necessarily have extrinsic compression of the rotator cuff (Mohtadi et al 2004, Hanchard et al 2004).

Physical therapies

If signs and symptoms of inflammation are alleviated and if those due to the mechanical deficiency of the torn cuff are compensated for by the residual cuff muscles and the prime movers then a clinical cure is achieved. (Fukuda 2003).

A number of physical treatment modalities are described in the literature. These include application of cold or heat, massage, correction of forward head posture, non-steroidal anti-inflammatory medication, ultrasound or pulsed electromagnetic fields in the presence of calcific tendonitis, modification of activities, stretching exercises and strengthening of the rotator cuff and pericapsular musculature to restore normal mechanics of the shoulder girdle (Fukuda 2003, Hanchard et al 2004).

Motor control techniques, joint mobilizations, manual techniques, patient education and functional mobility retraining are advocated by Michener et al (2004) and Mohtadi (2004). Karduna et al (2005) describe changes in upward scapular rotation observed in patients with impingement syndrome may serve to open the subacromial space. Lin et al (2005) demonstrated altered shoulder girdle kinematics in subjects with shoulder dysfunctions and suggest this has implications for rehabilitation.

Michener et.al (2004) reports improvements in pain, patient satisfaction, disability, function, strength and range of movement in patients treated with a therapeutic exercise programs compared to placebo or no treatment. Treatment comprised of active range of movement exercises, soft tissue mobilization and massage to stretch the anterior and posterior shoulder girdle. Muscle relaxation techniques and motor learning to normalise dysfunctional neuromuscular patterns of movement. Strengthening of rotator cuff and scapular muscles, initiated with antigravity exercises, progressing to rotator cuff and scapular musculature strengthening.

Michener et al (2004) conclude exercise is effective for patients with sub acromial symptoms but it is not possible to identify which patients specifically will respond to exercise. Manual therapy in combination with therapeutic exercise, particularly upper quadrant joint mobilization gives better outcomes than exercise alone (Michener et.al 2004, Hanchard et.al 2004). The Michener et.al (2004) study is a valuable study as much of the literature does not reflect the complementary way in which therapies are used clinically (Hanchard et al 2004).

Injection therapy

In addition to exercise and physical treatment modalities Fukuda (2003) suggests up to four injections of steroid into the sub acromial space or around the biceps tendon. Alvarez-Nemegyei and Canoso (2003) also report successful treatment of rotator cuff tendinopathy with glucocorticoid subacromial injection compared with placebo. Accurate steroid placement demonstrated radiographically is associated with improved clinical benefit at a 2 week evaluation (Matthews and Glousman 2004). Chen et al (2006) also

describe improved abduction range if injection into the subacromial bursa is carried out under ultrasound guidance compared to a blind injection. Anterior, posterior and lateral approaches are described in the literature.

The anterior approach involves identifying the acromioclavicular joint line and anterior edge of acromium. The point of the needle is placed immediately below the anterior edge of the acromium and needle introduction is assisted by gentle longitudinal traction on the arm to increase the gap between the acromium and the humeral head (Calis et.al 2000). Matthews and Glousman (2005) describe introducing the needle 2cm lateral to the acromium edge at the level of the acromioclavicular joint in the coronal plane.

The posterior approach involves introducing the needle 2cm caudal and 1cm medial to posterolateral corner of the acromium (Matthews and Glousman 2005). The accuracy rates of the anterolateral and posterior approaches to the subacromial bursa injections are not significantly different according to Matthews and Glousmann (2005).

Steroids are used for their anti-inflammatory effect in musculoskeletal medicine however there is little evidence that inflammation is involved in a lot of the conditions they are used to treat including shoulder pain. Systematic reviews have shown adding steroids to lidocaine gives no additional benefit in the treatment of rotator cuff tendonitis. However the use of steroid injection has been shown to be superior to physiotherapy in the treatment of shoulder pain (Curalto and Bogduk 2001)

According to Hanchard et.al (2004) directly applicable studies of good quality are absent to support the use of steroid injections in the treatment of sub acromial impingement syndrome. In light of the limited available evidence and associated risks they recommend steroid injections be used to facilitate mobilisation and conservative therapy should precede their use unless severe pain is present. Evidence is lacking regarding patient selection for and appropriate timing of injection.

Referral to surgeon

Fukuda (2003) divides physical signs and symptoms of rotator cuff disease into 2 groups. Those resulting from sub acromial bursitis and tendonitis characterized by signs of fluid, painful arc, impingement sign, positive procaine test, contracture and suggest these findings are reversible with conservative treatment. The second group results from a torn tendon and demonstrates the drop arm sign, crepitus, muscle weakness and spinati atrophy, findings that Fukuda (2003) suggests are irreversible with conservative treatment.

According to Fukuda (2003) partial tears can continue to deteriorate despite conservative treatment due to degenerative change or in younger patient repetitive microtrauma or internal impingement. Spontaneous healing is unlikely due to ageing, separation of the tear from muscle contraction and by weight of the arm, hypovascularity, shear stress and sub acromial impingement.

Partial thickness tears of the rotator cuff have been classified according to site and extent of the tear. Stage 1 tears with a depth less than 3mm, subacromial oedema and haemorrhage are reversible and best managed conservatively. Stage 2 tears with a depth 3-6mm, fibrosis and tendonitis following repeated episodes of mechanical inflammation are less likely to be reversible with conservative treatment and are appropriate for surgery if symptoms are severe and conservative treatment has failed. Stage 3 tears involve more than half the thickness of the tendon and may include bony changes and surgical treatment is the only option (Fukuda 2003, Hanchard et.al 2004).

Surgery should be considered in failures of conservative therapy after 6 months (Alvarez-Nemegyei and Canoso 2003, Hanchard et.al 2004), 3 months of continuous rehabilitation (Hanchard 2004) or those who have failed exercise or injection (Michener et.al 2004). Vad et.al (2005) found sub acromial shoulder irrigation to be safe, well tolerated, and effective at providing relief for patients with rotator cuff tendinosis.

Massive full thickness tears are unlikely to respond to conservative treatment (Alvarez-Nemegyei and Canoso 2003, Hanchard et.al 2004). Clinical presentation includes marked weakness of elevation and abduction, muscle atrophy, positive drop arm test or lift off test. Testing contractile function in conjunction with local anesthesia, ultrasound, MRI and MRA (magnetic resonance arthrography) can also aid diagnosis (Hanchard et. al 2004).

Conclusions

Further research is required into etiology, diagnosis, natural course and validity of many treatments currently used for sub acromial impingement syndrome (Alvarez-Nemegyei and Canoso 2003).

Evidence exists to support rehabilitation of patients with sub acromial impingement (Hanchard et.al 2004). Studies exist that have examined varied interventions, outcome measures are inconsistent and results are conflicting. Extensive clinical investigation is therefore required into the optimum interventions for patients with subacromial impingement syndrome, using long and short- term outcomes (Michener et.al 2004)

Research would be of value to determine clinical measurements that predict a favorable response among patients with sub acromial impingement to therapeutic exercise. Identification of those most likely to respond to exercise or surgery would be particularly useful in choosing the best intervention for the individual. (Michener et.al 2004).

Relevance to SOM practice

SOM principles describe the patient with chronic sub acromial bursitis as having a classic muddle of signs and patients with tendonitis having pain on a specific isometric resisted test with the joint in a neutral position. Sub acromial impingement is a non specific diagnosis but does acknowledge the intimate

relationship between capsule, rotator cuff and biceps tendons and lesions can co-exist. Therefore not all patients will be easily categorized into a chronic sub acromial bursitis or a specific rotator cuff tendonitis and may present with elements of both.

SOM advocate a lateral approach to sub acromial injection where the needle is introduced into the sub acromial space just below the mid point of the acromium, angling slightly upwards to lie between the acromium and the head of the humerus. Other approaches are possible, anterior and posterior approaches have been evaluated in the literature.

Tests for subacromial impingement

Neer test

Scapular rotation is prevented with one hand; the arm of the patient is elevated at an angle between flexion and abduction, by the other hand. Test is positive if pain occurs.

(Repeating the test following injection of local anesthetic under the acromium will separate impingement lesions from other causes of shoulder pain if symptoms are relieved)

Painful arc

Elevate the arm in the scapular plane. A painful arc between 60˚ and 120˚ indicates some disorder of the subacromial region. An arc of pain becoming increasingly worse to full elevation indicates a disorder of the acromioclavicular joint.

Hawkins test

The arm of the patient is flexed up to 90˚ and then forced into internal rotation. If pain occurs the test is positive

Horizontal adduction test

The arm is forced into adduction towards the other shoulder whilst the elbow is flexed. Test is positive if pain occurs.

Drop arm test

The patient is asked to abduct the shoulder to 90˚ then to let the arm down slowly. If they are unable to do this and the arm drops immediately with pain the test is positive.

Yergason

Identifies biceps tendon injury. Supination of the forearm is resisted with the elbow flexed to 90 degrees. The test is positive if this resistance produces pain in the biceps tendon.

References

Alvarez-Nemegyei, J and Canoso, J (2003). 'Evidence-based soft tissue rheumatology part1. Subacromial impingement syndrome'. Journal of clinical rheumatology. 9 (3) p193-199.

Ardic F, Kahraman Y, Kacar M, Kahraman MC, Findikoglu G, Yorgancioglu ZR (2006).
'Shoulder impingement syndrome: relationships between clinical, functional, and radiologic findings' American Journal Physical Medicine and Rehabilitation. 85(1) p53-60.

Calis, M, Kenan, A, Birtane, M, Karacan, I, Calis, H and Tuzun, F (2000). 'Diagnostic values of clinical diagnostic tests in subacromial impingement syndrome.' Annals of rheumatic diseases 59, p 44-47

Chen MJ, Lew HL, Hsu TC, Tsai WC, Lin WC, Tang SF, Lee YC, Hsu RC, Chen CP (2006)
Ultrasound-guided shoulder injections in the treatment of subacromial bursitis. American Journal Physical Medicine and Rehabilitation. 85(1) p31-5.

Curalto, M and Bogduk, N (2001) 'Pharmacologic pain treatment of musculoskeletal disorders: current perspectives and future prospects' The clinical journal of pain 17 p25-32.

Di Mario M, Fraracci L (2005) 'MR study of the intrinsic acromial angle in 74 symptomatic patients'
Radiol Med (Torino) 110 (3) p273-9.

Fukudu, H (2003) 'The management of partial thickness tears of the rotator cuff' The journal of bone and joint surgery. 85-B (1) p3-10

Giaroli EL, Major NM, Higgins LD (2005) 'MRI of internal impingement of the shoulder' AJR Am J Roentgenol 185(4) p 925-9.

Hanchard N, Cummins J and Jeffries C (2004) Evidence-based clinical guidelines for the diagnosis, assessment and physiotherapy management of shoulder impingement syndrome. Chartered Society of Physiotherapy, London, UK.

Karduna AR, Kerner PJ, Lazarus MD (2005) 'Contact forces in the subacromial space: effects of scapular orientation.' J Shoulder Elbow Surg. 14(4) p393-9.

Lim JT, Acornley A, Dodenhoff RM (2005) 'Recovery after arthroscopic subacromial decompression: prognostic value of the subacromial injection test.'
Arthroscopy 21(6) p 680-3.

Lin JJ, Hanten WP, Olson SL, Roddey TS, Soto-quijano DA, Lim HK, Sherwood AM (2005) 'Functional activity characteristics of individuals with shoulder dysfunctions.' J Electromyogr Kinesiol.15 (6) p576-86. Epub

Macdermid,J, Ramos,J, Drosdowech,D, Faber,K and Patterson,S (2004) 'The impact of rotator cuff pathology on isometric and isokinetic strength, function and quality of life' Journal of shoulder and elbow surgery 13 (6) p593-597

Matthews, P & Glousman, R (2004) 'accuracy of subacromial injection: Anterolateral versus posterior approach' journal of shoulder and elbow surgery 14(2) p145-148

Michener LA, Boardman ND, Pidcoe PE, Frith AM (2005). 'Scapular muscle tests in subjects with shoulder pain and functional loss: reliability and construct validity'
Physical Therapy 85(11) p1128-38.

Michener, L, Walsworth, M, & Burnet, E (2004) 'Effectiveness of rehabilitation for patients with sub acromial impingement syndrome' A systematic review. Journal of hand therapy. 17 (2) p152-163

Mohtadi,N, Vellet,D, Clark,M, Hollinshead,R, Sasyniuk,T, Fick,G& Burton,P (2004) 'A prospective, double blind comparison of magnetic resonance imaging and arthroscopy in the evaluation of patients presenting with shoulder pain' Journal of shoulder and elbow surgery 13 (3)p258-265

Naredo, E, Aguado, P, De Miguel, E, Uson, J, Mayordomo, L, Gijon-Banos, J (2002) 'Painful shoulder: comparison of physical examination and ultrasonographic findings' Annals of rheumatic diseases 61 p132-136

Richards DP, Burkhart SS, Campbell SE (2005). 'Relation between narrowed coracohumeral distance and subscapularis tears.'Arthroscopy. 21(10) p1223-8.

Vad VB, Solomon J, Adin DR (2005) 'The role of subacromial shoulder irrigation in the treatment of calcific rotator cuff tendinosis: a case series' Arch Phys Med Rehabilitation 86(6) p1270-2.

Further shoulder articles

**Henkus HE, cobben LP, Coerkamp EG, Nelisson RG, van Arkel ER. The accuracy of subacromial injections: a prospective randomized magnetic resonance imaging study. Arthroscopy 2006 Mar; 22 (3):227-82.
PMID: 16517311**

Comparison of anteromedial and posterior approaches. Many surrounding structures including rotator cuff were hit as well as subacromial bursa. Only injection of bursa alone was found to decrease pain and increase function. Infiltration of bursa and cuff showing an increase in pain. This could be argued to support the SOM approach of differential diagnosis and

management of sub acromial bursitis and rotator cuff tendonitis as separate entities.
76% injections in bursa with posterior approach and 69% with anteromedial approach. It is not clear whether this difference is clinically significant.
There does appear to be a larger volume of literature describing the intimate nature of rotator cuff, biceps tendons and subacromial bursa and how pathology is seldom isolated to one of these structures therefore backing diagnostic and management approaches based on the concept of sub acromial impingement. A recent example is:
Chen CH, Hsu KY, Chen WJ, Shih CH. Incidence and severity of biceps long head tendon lesion in patients with complete rotator cuff tears J Trauma. 2005 Jun; 58(6):1189-93. PMID: 15995469 [PubMed - indexed for MEDLINE]

Chen MJ, LewHL, Hsu TC, Tsai WC, Lin WC, Tang SF, Lee YC, HSU RC, Chen CP. Ultrasound guided shoulder injections in the treatment of subacromial bursitis. Am J Phys Med Rebabil. 2006 jan;85 (1):242-6. PMID:16357546

Comparison of ultrasound guided injection with blind injection using abduction range as outcome measure. Increase in both groups statistically significant in ultrasound guided group but not blind group. Article suggests ultrasound guidance a useful adjunct to sub acromial injection to improve results. Practically this will not be available to most clinicians and statistical significance does not necessarily correlate with clinical significance. Perhaps more research is required using a broader range of outcome measures to determine whether the additional cost involved with ultrasound guidance is justified by proven increased efficacy over blind injection.

Tyler TF, Nahow RC, Nicholas SJ, McHugh MP.
Quantifying shoulder rotation weakness in patients with shoulder impingement.
J Shoulder Elbow Surg. 2005 Nov-Dec;14(6):570-4.
PMID: 16337522 [PubMed - indexed for MEDLINE]
Use of isokinetic and handheld dynamometer to test internal and external rotation strength in patients with sub acromial impingement symptoms who had normal strength on manual muscle testing. This may have implications for the use of resisted testing to identify rotator cuff problems as some could be missed using a manual grading system. However article does not correlate with pain response and it is possible these patients would fall into SOM strong and painful category.
A useful piece of research might be to compare SOM classifications with dynamometer/isokinetic results in patients with SOM diagnoses of rotator cuff/ biceps tendonitis/subacromial bursitis. This would help to either justify the current system as adequate or identify a need to include a quantitative strength measure in SOM assessment.

Mitchell C, Adebajo A, Hay E, Carr A.
Shoulder pain: diagnosis and management in primary care.
BMJ. 2005 Nov 12;331(7525):1124-8. Review. No abstract available.
PMID: 16282408 [PubMed - indexed for MEDLINE]

Nothing new or different to SOM principles in this article but gives nice summary of red flags and criteria for surgical referral. Gives some mention to non musculoskeletal causes of shoulder pain, useful for those working as first contact practitioners.

Red flag indicators

- History of cancer; symptoms and signs of cancer; unexplained deformity, mass, or swelling? tumour
- Red skin, fever, systemically unwell? infection
- Trauma, epileptic fit, electric shock; loss of rotation and normal shape? unreduced dislocation
- Trauma, acute disabling pain and significant weakness, positive drop arm test? acute rotator cuff tear
- Unexplained significant sensory or motor deficit? neurological lesion

Orthopaedic referral

- Pain and significant disability lasting more than six months, despite attention to occupation or sporting factors and, if indicated, physiotherapy and steroid injections
- History of instability ("Has your shoulder ever partly or completely come out of joint?" "Are you worried that your shoulder might slip on certain movements?") or acute, severe post-traumatic acromioclavicular pain
- Diagnostic uncertainty or red flag criteria

Karduna AR, Kerner PJ, Lazarus MD. Contact forces in the subacromial space: effects of scapular orientation. J Shoulder Elbow Surg. 2005 Jul-Aug;14(4):393-9. PMID: 16015239 [PubMed - indexed for MEDLINE]

Lewis JS, Green A, Wright C. Subacromial impingement syndrome: the role of posture and muscle imbalance.J Shoulder Elbow Surg. 2005 Jul-Aug;14(4):385-92. PMID: 16015238 [PubMed - indexed for MEDLINE]

These articles investigate the relationship between posture, scapulothoracic kinematics and sub acromial impingement. They acknowledge a relationship exists which therefore has implications for rehabilitation. However the exact nature of the relationship is unclear and further investigation is required if specific recommendations for rehabilitation are to be made.

Cloke DJ, Lynn SE, Watson H, Steen IN, Purdy S, Williams JR.
A comparison of functional, patient-based scores in subacromial impingement.
J Shoulder Elbow Surg. 2005 Jul-Aug;14(4):380-4.
PMID: 16015237 [PubMed - indexed for MEDLINE]

Useful review to help select outcome measures for clinical practice/audit research

Physical therapist examination, evaluation and intervention following the surgical reconstruction of a grade III acoromioclavicular joint separation. Physical therapy 2006 June 86 (6) 857-69

This case report describes the examination, intervention, and outcome of a patient following the surgical reconstruction of a grade III acromioclavicular (AC) joint separation. A useful description of indications for surgery, examples of outcome measures, assessment tools and suggestions for rehabilitation exercises