Adhesive capsulitis of the shoulder

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**Abstract**

**Introduction**

Adhesive capsulitis of the shoulder, or frozen shoulder, is a common upper limb orthopaedic condition affecting up to 10% of the population. It is characterised by pain in the shoulder of insidious onset, limiting range of movement globally, little local tenderness and crucially the lack of radiographic abnormalities. It is associated with certain medical conditions such as diabetes mellitus and Dupuytren contracture. Pathologically, the joint capsule becomes inflamed and subsequently contracts. Underlying inflammatory and fibroproliferative processes are likely to drive the disease process but these are still poorly understood. Clinically, the phases of ‘freezing’, ‘frozen’ and ‘thawing’ can be observed. Non-operative management involves corticosteroid injections, oral corticosteroid administration and physiotherapy. Operative management involves manipulation under anaesthesia, distension arthrography, arthroscopic release and open release. The aim of this critical review was to discuss adhesive capsulitis of the shoulder.

**Conclusion**

Higher level studies are required to compare common management options.

**Introduction**

Adhesive capsulitis of the shoulder, commonly known as frozen shoulder, was first described by Duplay and then by Codman. The former termed the condition scapulohumeral periarthritis, while the latter compiled a case series which featured pain in the shoulder of insidious onset, limiting range of movement globally, little local tenderness, lack of radiographic abnormalities and atrophy of the spinati. Codman’s description remains the clinical diagnostic criteria of frozen shoulder to this day.

In this article we aim to critically appraise the existing evidence about this common shoulder condition with specific focus on recently published evidence.

**Discussion**

**Epidemiology**

The incidence and prevalence of frozen shoulder has not been accurately determined due to the lack of population based data analysis. Historically experts believed that it affects 2–10% of the population and makes up around 5% of upper limb specialist referrals in the UK. Recent population data from the UK suggest the incidence from 2 to 3 per 1000 and this is increasing in women of a younger age. The true incidence may be higher as many patients delay seeking medical attention. It affects more women than men, and age of onset is usually in the fifth decade.

**Primary and secondary frozen shoulder**

Frozen shoulder can be classified as primary, or idiopathic and secondary. The relationship between diabetes mellitus and frozen shoulder has been extensively studied. The prevalence of frozen shoulder in diabetics is as high as 71.5%. Diabetics fare worse with surgical treatment in the peroperative setting.

**Pathophysiology**

In idiopathic frozen shoulder, despite termed adhesive capsulitis, adhesions are not a feature, but rather inflammation and contracture of the joint capsule. The true incidence may be responsible for the increased level of pain. Other diseases associated with frozen shoulder include, Parkinson Disease, Dupuytren contracture, hypothyroidism and hyperthyroidism. Secondary frozen shoulder can also develop as a result of trauma, impingement or as a post-operative complication.

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Clinical features and diagnosis
In the majority of patients, the diagnosis of frozen shoulder is made clinically by using Codman’s criteria. Many of the features are shared by shoulder impingement, another common cause of shoulder pain. The loss of passive movement, specifically external rotation, differentiates between the two.

With regards to imaging, standard views of the shoulder may be normal or helpful in determining the cause in secondary frozen shoulder. Beyond plain radiographs, recent studies with MRI scanning have yielded interesting findings. Li and colleagues focused on the appearance of the coracohumeral ligament on MRI scans and concluded that a thickened and shortened ligament is strongly suggestive of frozen shoulder. Zhao and colleagues studied MRI scans of symptomatic patients with frozen shoulder and observed thickening of the coracohumeral ligament, thickening of the capsule at the rotator interval and the obliteration of the fat triangle under the coracoid process to be the most marked abnormalities. Ahn and colleagues observed thickening and gadolinium enhancement of the capsule at the axillary recess in symptomatic frozen shoulder patients. Distension of the bursa in the subscapular recess and T2 hyperintensity of the inferior glenohumeral ligament have also been associated with frozen shoulder.

Natural history
Classically three stages have been described for frozen shoulder: ‘freezing’, ‘frozen’ or adhesive phase and ‘thawing’ or resolution. In the first stage, the shoulder is exquisitely painful, analgesia is ineffective and stiffness sets in. In the ‘frozen’ phase, the pain begins to subside but the shoulder remains stiff. In the ‘thawing’ phase, the range of movement is gradually regained.

There have been many studies looking into the natural history and disease duration for frozen shoulder, which can vary greatly between individuals. Shaffer and colleagues subjectively and objectively evaluated a cohort with a mean follow-up time of 7 years with non-operative treatment and found that half of the cohort still experienced pain or stiffness at their last follow-up. More recent evidence appears to offer a brighter outlook into the condition. Hand and colleagues observed a 48 h onset of symptoms for their cohort, and from 1 to 3 years for symptoms to peak and resolve, as measured with improvements in the Oxford Shoulder Score. Vastamäki and colleagues observed a cohort for a mean of 9 years, and concluded that even without any treatment, symptoms resolve after 15 months and the vast majority in the cohort regained normal function.

Treatment
Non-operative
Two randomised controlled trials exist in the literature examining the role of oral corticosteroids in providing symptomatic relief in frozen shoulder, both of which concluded this may be useful only in the short term. Blockey and colleague conducted a controlled trial of 32 patients and assessed them for 18 weeks. They concluded oral corticosteroids may provide some symptomatic relief and reduce the need for manipulation. Half a century later, Buchbinder and colleagues conducted a randomised controlled trial with oral prednisolone. They concluded corticosteroids may provide a short-term relief but this is only observed within 6 weeks from onset.

The role of corticosteroid injections in the management of frozen shoulder is still subject to much debate but has been well investigated. The earliest trials included Hollingworth and colleague’s, observed a 26% success rate in relieving symptoms and Bulgen and colleagues concluded corticosteroid injections may have a role in relieving symptoms in the short term. Carette and colleagues found corticosteroid injections under fluoroscopy, combined with or without physiotherapy, are effective in providing early relief and improvement in the shoulder pain and disability index. A randomised controlled trial by Ryans and colleagues concluded triamcinolone is useful in limiting shoulder disability as measured by the shoulder disability questionnaire score. The dosage of triamcinolone injected does not seem to affect outcome in a randomised controlled trial by Yoon and colleagues. There have been several recent studies looking into the role of corticosteroid injections in diabetic patients. Roh and colleagues performed a randomised controlled trial into the use of corticosteroid injections in diabetic patients and concluded this was effective in early relief of pain and restoration of movement up to 12 weeks. Dehghan and colleagues compared corticosteroid injections and Non-steroidal anti-inflammatory drugs for diabetic patients and found little difference in outcomes. Finally, the site of corticosteroid injection, whether it is intra-articular, subacromial or both, seem to provide equivalent and faster pain relief than oral medication, as shown in a randomised controlled trial by Shin and colleagues.

Patients with frozen shoulder are often referred to physiotherapy. Evidence in the literature does not support utilising physiotherapy alone as mainstay of treatment and is demonstrated in trials by Bulgen and colleagues and Carette and colleagues. Conversely, intensive physiotherapy may actually be harmful, as Diercks and colleagues have shown this to be related to a worse outcome measured by pain and the Constant score, when compared with supervised neglect.
Manipulation under anaesthesia (MUA) remains the first choice of operative management to many orthopaedic surgeons. The technique is well described in the papers by Castellarin and colleagues\(^5\) and Robinson and colleagues\(^12\) which involves taking the shoulder through the full range of motion in a controlled fashion. Fracturing the humeral shaft is a risk but is uncommon. Evidence in the literature mainly comprises of case series\(^37\), with an acceptable success rate. Hill and colleagues\(^30\) performed one of the earliest studies, reported a 70% success rate in a small cohort. Farrell and colleagues\(^39\) observed 19 shoulders post manipulation over an average of 15 years and 16 of these (84%) were pain free at the end point. Vastamäki and colleagues\(^40\) observed 16 shoulders post manipulation for a mean of 23 years and concluded MUA regained and maintained shoulder function in the long term. There may also be merits in performing MUA early, as shown by Thomas and colleagues\(^41\), where patients undergoing MUA within 32 weeks on average from onset of symptoms have satisfactory outcomes after an average of 42 months.

Distension arthrography has been discussed in the literature since the 1960s. Some experienced clinicians have recommended this as the first line of surgical management for both diagnostic and therapeutic purposes\(^2\). However, the quality of evidence in the literature is limited to mainly case series\(^12\) and often with poor outcome measures and inadequate follow-up period. Mulcahy and colleagues\(^43\) have the largest case series of 51 patients with a follow-up period of 6 months and they concluded distension arthrography which may be useful in patients without a cuff tear and limited external rotation. A recent paper by Park and colleagues\(^44\) utilised ultrasoundography for capsular distension in a cohort study and concluded this is as effective as steroid injection for pain relief and regaining movement.

Arthroscopic release has become more popular in the past 20 years and originally devised for patients who have failed to respond to non-operative treatment or MUA. The procedure includes releasing contractures at the rotator interval, within the capsule and in the axillary pouch\(^11,12\). Subacromial decompression with acromioplasty may be performed at the same time. Previous evidence often reported single cohort outcomes, such as the one by Warner and colleagues\(^45\). In Ogilvie-Harris and colleagues’ study\(^46\), they compared MUA against arthroscopic release and found better pain relief and improvement in function with the latter. This study remains one of the few comparing cohorts receiving different operative treatment. Arthroscopic release has also been combined with MUA in studies featuring case series by Castellarin and colleagues\(^36\) and Baum and colleagues\(^47\). In the recent years, more evidence has come to light with regards to outcomes in the longer term for arthroscopic release. Baums and colleagues\(^49\) observed a cohort for a median of 36 months with improvements in pain and functional scores. Le Lievre and colleagues\(^50\) concluded from their study with a mean follow-up of 7 years that arthroscopic release is safe and effective in improving pain and function. Dattani and colleagues\(^51\) calculated the cost effectiveness of arthroscopic release and concluded that normal function and quality of life is restored within six months from the procedure. However, despite the aforementioned evidence, there are no higher level studies comparing arthroscopic release against other management options\(^37\).

Open release is not commonly performed. The evidence in literature is extremely limited. Omari and colleagues\(^52\) employed open release as second line management for 25 shoulders which failed to respond to MUA. 23 (92%) patients had either good or fair results.

**Conclusion**

Adhesive capsulitis of the shoulder remains one of the commonest shoulder pathologies and a leading presentation to general practice and upper limb orthopaedic specialists. The pathophysiology is poorly understood but is likely to involve an inflammatory process with fibroblastic proliferation. The natural history can be divided into three classic stages. Non-operative management with corticosteroid injections may be helpful. Surgically, manipulation under anaesthesia is a successful treatment with increasing evidence of a good outcome maintained in the long term. Evidence behind arthroscopic release is gradually being published supporting it as an effective alternative. The overall quality of evidence is low, pointing to a need for randomised controlled trials to compare between the newer management options.

**References**

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The coracohumeral ligament is a valuable structure for stabilizing the shoulder joint. The integrity of this ligament is essential for maintaining normal shoulder function. Its role in preventing anterior dislocation of the humeral head has been well-documented in various studies. 


34. All authors contributed to the conception, design, and preparation of the manuscript, as well as read and approved the final manuscript. All authors abide by the Association for Medical Ethics (AME) ethical rules of disclosure.