

Adhesive capsulitis: is arthroscopic capsular release necessary? Current review

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Abstract

Introduction

Adhesive capsulitis is a musculoskeletal condition that has a disabling capability. It is said to be a self-limiting process. However, in some patients, the disease can last much longer than 1 year. There are current escalating challenges related to when and how to treat a frozen shoulder. Most patients can be treated conservatively; nevertheless, indications for surgery still exist. Arthroscopic capsular release has become a popular procedure in the last few years and has proven to be a reliable and efficient procedure in selected refractory cases. The purpose of this article is to review the literature on adhesive capsulitis and provide background information on this topic, including pathogenesis, diagnosis and management, and to describe our technique in arthroscopic capsular release.

Conclusion

Adhesive capsulitis is a fairly common shoulder problem where most patients can be treated non-operatively. However, the refractory frozen shoulder is a challenging problem even to the most experienced shoulder surgeons.

Introduction

The shoulder is a unique anatomical structure with an extraordinary range of motion (ROM). Significant morbidity can and does occur, with

loss of mobility at the glenohumeral joint¹.

Adhesive capsulitis is a disabling shoulder condition that results in pain and loss of motion. In 1872, Duplay² used the term 'peri-arthritis scapulohumerale' to describe the condition. In 1934, Codman³ introduced the term 'frozen shoulder' and set a certain criteria for diagnosis and management. In 1945, Neviaser⁴ described the condition as a chronic progressive inflammation and fibrosis of the shoulder joint capsule with tissue shrinkage and obliteration of the inferior and subscapular recesses. He was the first to use the term 'adhesive capsulitis'.

Neviaser and Neviaser⁵ described the term frozen shoulder as 'a waste-can diagnosis' because it was overused and misapplied to patients with a stiff, painful shoulder. Moreover, cases such as calcific tendonitis, bicipital tenosynovitis, glenohumeral arthritis and rotator cuff tears can lead to apparent limitation of active ROM despite the absence of true capsular contracture and restrictions in a passive ROM. As a result, they should not be considered as adhesive capsulitis.

The current consensus of the American shoulder and elbow surgeons defines frozen shoulder as 'a condition of uncertain aetiology characterized by significant restriction of both active and passive shoulder motion that occurs in the absence of known intrinsic shoulder disorder'⁶.

This misunderstanding and confusion over the definition and diagnosis of adhesive capsulitis reflects the generally poor grasp of the aetiology, diagnosis and management of this condition⁷.

This article aims to provide an overview of the nature, pathogenesis, diagnosis and the widely accepted management of this condition based on other studies.

Discussion

Incidence

Generally, the real incidence of adhesive capsulitis is difficult to detect as many patients will not look for medical treatment because of the vague character and insidious onset of the disease⁷. Nonetheless, Hannafin and Chiaia⁸ found the prevalence to be marginally more than 2% in the general population, with women aged between 40 and 60 years most commonly affected. Both shoulders are affected between 6% and 34% of the cases⁹.

Classification

Adhesive capsulitis is usually classified as primary or secondary. Patients with primary adhesive capsulitis have a very gradual onset and progression of symptoms with no predisposing factor that can be detected^{1,7}. Secondary adhesive capsulitis develops from known causes of stiffness and immobility, such as previous shoulder trauma or surgery; patients usually notice symptoms soon after a fall or an inciting trauma^{1,7}. Frozen shoulder commonly occurs in patients with certain medical co-morbidities. By far, the most common is the co-morbid condition of diabetes mellitus¹⁰. This association was first described by Bridgman¹¹, who documented an incidence of 10.8% among 800 diabetic patients and only a 2.3% incidence in 600 non-diabetic patients. Other co-morbid conditions include hyperthyroidism,

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hypothyroidism, hyperadrenalism, Parkinson disease, cardiac disease, pulmonary disease and stroke^{1,12}.

Clinical phases

Adhesive capsulitis presentation is generally divided into three distinct stages¹³. Stage 1 is a freezing or painful stage in which there is an insidious onset of pain; nevertheless, patients may not present in this stage because they think the pain will resolve. As the disease progresses, the pain worsens and the shoulder loses active and passive movements. This phase usually lasts between 3 and 9 months and is characterised by an acute synovitis of the glenohumeral joint¹⁴. Stage 2 is a frozen phase that may last from 4 to 12 months, during which the pain begins to abate leaving global stiffness of the shoulder⁹. Stage 3 is a thawing phase, which shows the return of movement towards normal, and lasts from 12 to 42 months¹⁹. Codman¹⁵ stated that recovery, even in severe cases, occurred in approximately 2 years. Similarly, in 1978, Grey¹⁶ reported that 24 of 25 patients treated conservatively returned to normal within a maximum of 2 years. Nevertheless, Shaffer et al.¹⁷ described a group of patients treated non-operatively, with 50% having some pain or stiffness when examined at a mean follow-up of 7 years.

Pathology

Prolonged immobilisation of the shoulder has been shown to cause several detrimental pathophysiological findings, including decreased collagen length, fibrofatty infiltration into the capsular recess, ligament atrophy resulting in decreased stress absorption and altered sarcomere number in muscle tissue¹⁸. The biochemical rationale for the high incidence of frozen shoulder in patients with diabetes is speculative. It is thought that excessive glucose concentration in diabetic patients can lead to a faster collagen

glycosylation and cross-linking in the shoulder capsule restricting the ROM of the shoulder¹⁹.

Clinical evaluation

A thorough shoulder history of the patient is crucial for evaluation of adhesive capsulitis. Patients often describe an insidious onset of vague, dull pain at the deltoid insertion. Night pain is a very common feature, and sleeping on the affected shoulder is usually symptomatic. Painful and restricted elevation and external rotation are common¹⁷.

The physical examination is marked by the loss of both passive and active ROM. Patients usually have tenderness at the deltoid insertion and over the anterior and posterior capsule. Mild disuse atrophy of the deltoid and supraspinatus in long-standing cases is usually observed. An intra-articular lidocaine injection can assist in differentiating limited motion due to pain versus contracture. Monitoring the shoulder motion over the course of the disease can determine the efficacy of the treatment, and whether surgical release is eventually needed¹⁷.

Radiographic findings

Adhesive capsulitis is primarily a clinical diagnosis. Radiographic studies are used to exclude other causes of shoulder pain and can be complementary in the diagnosis. Many studies have associated osteopaenia of the proximal humerus with frozen shoulder^{7,20}. Mengiardi et al.²¹ reported that thickening of the coracohumeral ligament and joint capsule in the rotator interval are characteristic magnetic resonance (MR) arthrographic findings in the frozen shoulder. Conversely, the study by Manton et al.²² showed no useful MR arthrographic signs of adhesive capsulitis. Therefore, MR imaging (MRI) scans should not be routinely ordered in the evaluation of the frozen shoulder. However, MRI can be useful in diagnosing other disease

processes presenting with shoulder pain and stiffness, such as infection or rotator cuff tear²³.

Management of adhesive capsulitis

Treatment policies for adhesive capsulitis include a trail of physiotherapy followed by more invasive procedures for resistant cases. However, the number of the level of evidence studies regarding the various treatments for frozen shoulder is limited especially in relation to surgical treatments. Moreover, controlled prospective studies are not easy to design and carry out because of the difficulties in diagnosing the condition in addition to the various stages of the disease at which patients present⁷.

Non-operative treatment

Anti-inflammatories

There is a little support in the literature for the use of non-steroidal anti-inflammatory drugs in adhesive capsulitis. Nevertheless, they are often prescribed in the early inflammatory phases of the disease to provide pain relief⁷. Oral corticosteroids can also be prescribed and have been shown to improve pain, especially night pain and ROM in the short term²⁴. In their study, Buchbinder et al.²⁵ showed that a 3-week course of 30 mg of prednisolone had a significant short-term benefit, but this is not maintained beyond 6 weeks.

Intra-articular corticosteroid injections

Intra-articular steroid injections are useful in the treatment of the inflammatory phase of adhesive capsulitis²³. Currence et al.²⁶ showed that there is significant improvement after treatment with corticosteroid injections plus exercise, versus exercise alone. In view of the low likelihood of complications with this approach, the use of either a subacromial injection or glenohumeral injection should be considered¹. Nevertheless, recent

evidence concluded that injections done blindly may be inaccurate in approximately 60% of cases, which could affect the clinical outcome. This problem could be overcome with the use of an ultrasound-guided joint injection^{1,27}.

Physiotherapy

It is widely accepted that physical therapy and stretching should be used in the conservative management of frozen shoulder²⁰. Diercks and Stevens²⁸ described a prospective study of 77 patients that compared exercise (within the limits of pain) with intensive physiotherapy in patients with idiopathic frozen shoulder. In this study, they found that exercise performed within those limits yielded better results than those with intensive physiotherapy²⁸. Leung and Cheing²⁹ reported that improvement in daily activities, pain relief and ROM is more significant with deep heating combined with stretching exercises than with superficial heating.

Surgical treatment

Surgical treatment should be reserved for patients who do not respond to conservative treatment after a minimum of 3–6 months of appropriate non-operative treatment²³.

Manipulation under anaesthesia

Manipulation under anaesthesia may improve shoulder function and ROM; however, it does not allow for the controlled release of pathologic tissue²³. In this procedure, the patient can be placed supine or in the seated beach-chair position. The shoulder is gently passively stretched in forward flexion, abduction, and adduction, while the scapula is being stabilised. With the elbow at a right angle, the upper arm is finally gently rotated through extremes of internal and external rotation by the use of a short lever arm. Tearing of the contracted capsule may be palpated and even audibly confirmed by the physician.

Closed manipulation should not be attempted in more resistant cases of post-traumatic and post-surgical frozen shoulder because of the increased risk of fracture⁷. A long-term follow up of patients who underwent closed manipulation for frozen shoulder showed that the majority of patients achieved sustained improvements in ROM at a mean of 15 years after manipulation³⁰. However, a recent blind, randomised, controlled trial, comparing patients undergoing manipulation under anaesthesia with a control group, did not show a benefit to manipulation: improvement in the two groups was similar at all time points up to 12 months³¹. Some complications can occur as a result of excessively forceful manipulation, such as iatrogenic fractures of the humerus, glenohumeral dislocation, rotator cuff and labral tears, brachial plexus injuries, and haemorrhagic effusions and haematomas, which can be detrimental to articular cartilage⁷.

Arthroscopic release

Arthroscopic release is considered as an effective treatment for resistant cases especially in diabetics. Arthroscopic surgical release was first described in 1979 and despite the initial recommendations that arthroscopy has no role in the treatment of adhesive capsulitis, arthroscopic release has become commonplace^{7,23}. Arthroscopy is an excellent tool for addressing the shoulder with adhesive capsulitis, and it allows full evaluation of the shoulder anatomy. The essential lesion is the tightened coracohumeral ligament and the rotator interval with the contracted capsule, including the axillary pouch^{1,23}. The release can be performed before, during or after the manipulation. However, the manipulation may need to precede the procedure to gain access to the joint^{1,23}. Segmüller et al.³² described arthroscopic release of the inferior and middle glenohumeral ligament

with a follow up of 13.5 months in 26 shoulders; 88% were satisfied and 76% had normal function. They concluded that the arthroscopic release is safe and effective in treating adhesive capsulitis. Ogilvie-Harris et al.³³ compared manipulation under anaesthesia (MUA) with arthroscopic release in a prospective study of 40 patients. The release included the removal of synovium from the rotator interval, release of the anterior glenohumeral ligament and the intra-articular portion of the subscapularis tendon, and division of the anterior half of the inferior capsule. After a follow-up between 2 and 5 years, the results showed a similar ROM; nevertheless, the arthroscopic release had a better outcome in terms of pain and function. The overall outcome was excellent in 15 of 20 patients in the arthroscopic group, but only in 7 of 18 patients in the MUA group. Warner et al.³⁴ studied 23 patients with idiopathic adhesive capsulitis that had failed to respond to physical therapy or closed manipulation. All patients had an anteroinferior release combined with an MUA; six also had subacromial decompression. They had inpatient physiotherapy for 48 h under interscalene local anaesthetic blockade. The mean improvement in the constant score was 48 points (13–77) with a significant improvement in the range of movement.

Pearsall et al.³⁵ reviewed and treated 43 patients with a diagnosis of primary or secondary frozen shoulder who had symptoms for an average of 12 months and who failed conservative treatment of at least 12 weeks of physical therapy. Following arthroscopic capsular release, all the patients showed a significant reduction in shoulder pain and improvement in shoulder ROM. Gerber et al.³⁶ reviewed 45 patients after an arthroscopic release with a mean follow-up of 26 months. In addition, all had an MUA. Nine patients had a primary frozen shoulder; 21 patients had a

postoperative frozen shoulder and in 15 patients the condition followed an injury. The primary patients had a better outcome than the postoperative patients; the trauma patients had the least favourable results. The outcome was dependent on the initial disability and the severity of stiffness. Massoud et al.³⁷ reviewed the management of a subgroup of diabetic patients, 43 of the patients who had diabetes (47 shoulders) were included in the study. A manipulation under anaesthesia only was done in 24 shoulders; a manipulation under anaesthesia followed by an arthroscopy was done in 12 shoulders, or an arthroscopic release in 11 shoulders. All patients had adhesive capsulitis. The mean period of follow up was 35 months. The outcome was satisfactory in 13 of 15 shoulders (86.7%) in patients with non-insulin-dependent diabetes and in 17 of 21 shoulders (81%) in patients with insulin-dependent diabetes. Insulin-dependent patients with diabetes were more likely to require an arthroscopic release than patients with non-insulin-dependent diabetes. Massoud et al.³⁷ concluded that manipulation under anaesthesia is recommended for the resistant frozen shoulder in patients with diabetes. Arthroscopic release is required when mobilisation under anaesthesia is not possible.

Surgical technique

First, full examination under anaesthesia is completed by examining the free passive ROM of both shoulders. This gives the surgeon a realistic idea as to what ROM can be obtained. Two standard positions can be chosen for the patient, either the lateral decubitus position or the beach chair position. We use the latter and usually do not give preoperative antibiotics. The bony landmarks are marked carefully to maintain orientation throughout the procedure.

The posterior portal is established in the standard way. Sometimes entry to the shoulder through this portal

is difficult because of the restricted joint capsule and diminished space. This can be facilitated by palpation of the glenoid joint line with a blunt trocar.

The sheath of the arthroscope is then placed in the upper triangle of the glenohumeral joint between the supraspinatus and the biceps tendon on one side and the glenoid and the humeral head on the other side. This triangle is considered safe for joint entry. Furthermore, additional traction and rotation can aid in entering the joint. It is common to encounter some early bleeding once the joint is successfully entered due to synovitis and reactive capsulitis in the joint. This can be avoided or minimised by using a pump starting a 45 mm Hg pressure. Epinephrine can be used in an irrigation solution. Additionally, hypotensive anaesthesia is advisable with a systolic pressure below 95 mm Hg. The anterior portal is established by outside in technique. The capsular release begins with the rotator cuff interval and coracohumeral ligament down to the anterior capsule, staying close to the labrum, and attempting to reach the 6 o'clock position having started at the 1 o'clock position. The subscapularis tendon is defined and preserved. Failure to do so may result in accidentally dividing the tendon. We do not usually release the subscapularis tendon. When the 5 o'clock position is approached, great care is needed in spotting the axillary nerve. Certain technical points can be encountered to avoid injury to the axillary nerve, first using the bipolar radiofrequency device and dividing the tissue close to the glenoid. In addition, on the basis of a cadaveric study conducted by Jerosch³⁸, it is recommended that the incision of the glenohumeral capsule during arthroscopic release should be undertaken at the glenoid insertion while the shoulder is in the abducted and externally rotated position. This could reduce the risk of injury to the axillary nerve. Besides the release of

the anterior capsule, there has been controversy about whether the posterior structures should be released. On the basis of a cadaveric study done by Bowen and Warren³⁹, it was indicated that release of the antero-inferior capsule and posterosuperior capsule would improve elevation and internal rotation, respectively.

Conversely, Snow et al.⁴⁰ performed a retrospective comparative study and found no improvement in function or internal rotation with the addition of posterior release.

We do selective additional posterior release in patients with significant limitation of the internal rotation. When a posterior release is carried out, the arthroscope is then positioned in the anterior portal and the cautery is placed through the posterior portal. The posterior capsule is released from 11 o'clock to 6 o'clock, staying very close to the glenoid.

After the operation, the patient is started on physical therapy and a home exercise programme, both passive and active assisted. In some refractory cases, continuous passive motion (CPM) can be helpful. Interscalene block can be helpful postoperatively. Patients should be followed-up closely and monitored for home-therapy progress²³.

The advantages of the arthroscopic capsular release include complete release of the contracted capsule in a controlled manner; synovectomy can be done; other shoulder pathology can be identified; there is minimal postoperative pain; and aggressive active and passive motion can be started immediately. Some of the hazards of the arthroscopic capsular release include recurrent stiffness, anterior dislocation immediately after the operation and axillary nerve palsy. However, these complications are rare²³.

Open surgical release

Open release for frozen shoulder can be considered after failed arthroscopic release with manipulation.

Nevertheless, with the current evolving arthroscopic procedures, open release is rarely performed and is largely considered a historical treatment option⁷.

Conclusion

Adhesive capsulitis is a fairly common shoulder problem where most patients can be treated non-operatively. However, the refractory frozen shoulder is a challenging problem even to the most experienced shoulder surgeons. Numerous treatment methods have been tried in the past with mixed results. We believe that selected arthroscopic capsular release is an effective and reliable treatment option in refractory cases.

Abbreviations list

MR, magnetic resonance; MRI, MR imaging; ROM, range of motion.

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