International Journal of Medical Science and Clinical Invention 6(3): 4354-4357, 2019
DOI:10.18535/ijmsci/v6i3.01 **ICV 2016: 77.2**
e-ISSN :2348-991X, p-ISSN: 2454-9576

Review Article

Current Concepts in the Treatment of Adhesive Capsulitis of the Shoulder

Luciano Andrés Rossi[1], Maximiliano Ranalletta[2]

[1,2] Hospital Italiano de Buenos Aires. Argentina Shoulder Unit. Department of Orthopedics and Traumatology

Abstract: Adhesive capsulitis is characterized by chronic inflammation of the capsular subsynovial layer, which produces capsular fibrosis, contracture, and adherence of the capsule to itself and to the anatomic neck of the humerus. Physical therapy is the mainstay of treatment, regardless of stage. Based on the natural history of the disease, early corticosteroid injection has a role in shortening the overall duration of symptoms allowing patients to move faster in the stages of rehabilitation and thus return to their daily life activities more rapidly. Most patients will see complete resolution of symptoms with nonsurgical management.

In cases with refractory stiffness, manipulation under anesthesia or arthroscopic capsular release may be indicated. Because of various potential risks of complications with manipulations, arthroscopic capsular release is preferred. There is a lack of high level studies comparing different techniques for capsular release. Both circumferential and limited release have proven to be effective. Regarding postoperative rehabilitation, arthroscopic release should be followed by early, diligent, and directed therapy to prevent recurrent stiffness.

Keywords: adhesive capsulitis - frozen shoulder - capsular release.

Introduction

Adhesive capsulitis (AC), is defined as "a condition of varying severity characterized by the gradual development of global limitation of active and passive shoulder motion where radiographic findings other than osteopenia are absent[1]." AC can be classified as primary and secondary. The primary AC typically has an insidious onset, is idiopathic and is often associated with other diseases mainly endocrinological disorders such as diabetes mellitus and thyroid disease[2,3]. Secondary AC typically follows trauma or injuries to the shoulder such as fractures, surgery, or immobilization[2,3]. Most patients with primary AC are women aged 40 to 60 years[1,2] . The nondominant arm typically is most affected[1,2]. AC is more common in persons in sedentary vocations than in persons who perform manual labor[1,2]. Diabetes is associated with a significantly worse prognosis, greater need for surgery, and suboptimal results[4].

The exact pathophysiology of AC is not completely understood. The most commonly accepted hypothesis states that inflammation initially occurs within the joint capsule and synovial fluid[5]. The inflammation is followed by reactive fibrosis and adhesions of the synovial lining of the joint[5,6]. The initial inflammation of the capsule leads to pain, and the capsular fibrosis and adhesions lead to a decreased range of motion[5,6].

Patients with AC usually present with progressively worsening shoulder pain over months followed by significant limitation in shoulder motion. Frequently, there is a significant reduction in the active and passive range of motion in 2 or more planes of motion compared to the unaffected side. Usually, the range of motion is lost in the following order: external rotation, abduction, internal rotation, forward flexion[7] Typicaly, disease progression is described in 3 clinical phases[8]: Phase 1 involves only inflammation, characterized by capsular pain with sudden shoulder motion, usually in a functional range, but patients do not yet have restricted ROM. Phase 2: The frozen or adhesive phase. This period is characterized by progressive limitation in ROM in all shoulder planes but with the pain gradually becoming less pronounced. This is the most common phase at presentation. Lastly, Phase 3: The thawing or regression phase. The recovery phase where there is a gradual return of the range of motion[8]. Each of the phases can last several months.

The diagnosis of AC is primarily clinical. Radiographs are typically normal, they are important for eliminating other causes, such as arthritis, calcific tendinitis, and occult fracture. Disuse osteopenia may be seen in patients with long-standing disease[9]. MRI in patients with AC often reveals capsular and CHL thickening, poor capsular distension, extracapsular contrast leakage, synovial hypertrophy and scar tissue formation at the rotator interval[9,10]

Treatment Options

Nonoperative treatment

Physical therapy combined with a home exercise program is the mainstay of treatment, regardless of stage[11,12]. Jain et al[11] performed a systematic review of the literature including 39 articles evaluating the best evidence for the use of physical therapy interventions. Therapeutic exercises and mobilization were strongly recommended for reducing pain, improving

range of motion (ROM) and function in patients with stages 2 and 3 of AC. Low-level laser therapy was strongly suggested for pain relief. Corticosteroid injections were most effective for stage 1 frozen shoulder. Acupuncture with therapeutic exercises was moderately recommended for pain relief, improving ROM and function. Electrotherapy and deep heat could help in providing short-term pain relief. Ultrasound for pain relief, improving ROM or function was not recommended[11]. Oral anti-inflammatories, either nonsteroidal (NSAIDs) or a short tapered course of corticosteroids, can be helpful in reducing patients' symptoms, enough to make physical therapy (PT) tolerable. Patients with diabetes should be warned that conservative treatment may take longer and that results may be suboptimal[4].

Corticosteroid injections

Different studies have shown that image-guided intra-articular steroid injections provide significant short-term benefits with regard to pain, ROM, and shoulder function compared with physical therapy alone[13,14,15]. This short-term improvement is clinically relevant because pain reduction not only alleviates symptoms but allows patients to move faster in the stages of rehabilitation and thus return to their daily life activities more rapidly[13,14]. Wang et al[14] recently performed a meta-analysis evaluating the use of intraarticular corticosteroid injections in AC. They found that intra-articular corticosteroid injections were effective in pain relief in the short term and resulted in greater improvement in passive ROM both in the short and the long terms[14]. At our institution, we performed a prospective randomized controlled study comparing a single intra-articular corticosteroid injection without image control applied before the beginning of a physical therapy program compared with oral nonsteroidal anti-inflammatory drugs (NSAIDs) and physical therapy[16]. We found that a single corticosteroid injection applied without image control provides faster pain relief and earlier improvement of shoulder function and motion compared with oral NSAIDs[16]. Controversy exist regarding the need of image control for corticosteroid injections. Raeissadat et al[16], in a recent randomized controlled study of ultrasonography-guided injections versus blind intra- articular injections, found that improvements in pain, ROM, and functional scores were not statistically significant between groups.

Other Nonoperative Treatments

Ultrasonography–Guided Hydrodistention

Ultrasonography-guided hydrodistention describes a process in which capsular distention is achieved by injection of air or fluid under ultrasonography guidance and local anesthetic to stretch the contracted capsule and thereby increasing the intracapsular volume[17]. Mun et al[17] in a prospective randomized controlled study of 121 patients with AC, compared hydrodistention with joint manipulation under an interscalene block and treatment with an intra- articular corticosteroid injection**.** Hydrodistention combined with joint manipulation under an interscalene block provided earlier pain relief and restoration of shoulder ROM and function compared with single intra- articular corticosteroid injection in patients with AC; however, at 12 months no difference existed between the two groups[17].

Hyaluronic Acid Injections

Intraarticular injections with Hyaluronic acid have been proposed as a promising adjuvant teraphy for AC**.** Tamai et al[18] demonstrated that hyaluronate injection leads to a lower coefficient of enhancement (a measurement of synovitis) in the synovium of patients with adhesive capsulitis[18]. However, Lee et al[19] in a recent systematic review including 4 randomized clinical trials evaluating the effects of intra-articular HA for AC found that intra-articular HA administration alone was not superior to conventional AC treatments, and the addition of intra-articular HA administration to conventional therapies did not provide significant added benefits[19].

Surgical Treatment

Indications

Patients who do not improve with physical therapy (PT) are treated surgically. Generally, a minimum of 6 months of PT is recommended. Levine et al[19] in a retrospective review of 105 patients showed 90% resolution of AC with nonsurgical management. Patients who have more severe symptoms initially, were younger at the time of onset, and who experienced a reduction in motion despite 4 months of compliant therapy were most likely to require surgery[20].

Manipulation Under Anesthesia (MUA)

Prior to the widespread use of arthroscopy, MUA was the standard of care for the management of refractory adhesive capsulitis. Dodenhoff et al[21] reported that 94% of patients treated with manipulation under anesthesia were satisfied with their outcome at a minimum follow-up of 6 months, and most patients regained the ability to do daily tasks within days of the procedure. However, Loew et al[22] in a prospective trial, reported that arthroscopic assessment after MUA revealed multiple potential iatrogenic complications, such as superior labral tears, partial tears of the subscapularis, anterior labral detachments, and tears of the middle glenohumeral ligament[22]. Moreover, there have been reports of glenoid and proximal humerus fractures as well as axillary nerve neurapraxia[1]. In many institutions, arthroscopic capsular release has supplanted manipulation under anesthesia because arthroscopy allows complete inspection of the joint, diagnosis confirmation and a more precise capsulotomy without the risks of manipulation[23]. Moreover, compared with manipulation under anesthesia, the arthroscopic capsular release has shown improved pain relief and restoration of function after 2 to 5 years[23,24].

Arthroscopic capsular release

Numerous studies have supported the role of arthroscopic release as a safe and effective treatment for recalcitrant frozen shoulder in the short term[23,25,26,27]. There is controversy in the literature as to the optimal method of release. Some authors recommended release of the subscapularis tendon[28], inferior

capsule[29], posterior capsule[23,25], or global capsule[26] to improve elevation and internal rotation, as well as external rotation. Some have advocated circumferential release of the capsule or selective posterior release if there is persistent loss of internal rotation after anterior release[27,30]. Although several studies have demonstrated early benefit with routine release of the posterior capsule, outcomes at longer follow-up are similar to those with isolated anterior release[31,32,33,16]. Furthermore, an extended release increases the surgical time, technical difficulty, and potential surgical insult.

There are few studies in which the authors report midterm and long-term outcomes after arthroscopic capsular release for idiopathic adhesive capsulitis. At our institution, we evaluated 32 consecutive patients with idiopathic adhesive capsulitis treated with arthroscopic anteroinferior capsular release after a mean follow up of 63 months. We found that isolated anteroinferior capsular release provides a reliable improvement in pain and range of motion that is maintained in the mid-term follow-up. These favorable outcomes were also confirmed by other authors[34].

Rehabilitation

Regarding postoperative rehabilitation, arthroscopic release should be followed by early, diligent, and directed therapy to prevent recurrent stiffness. An aggressive supervised rehabilitation protocol is crucial in the absence of recurrences[2,19]. Goals for the early phase of rehabilitation are to control pain and inflammation, prevent scar tissue and adhesions, and increase shoulder range of motion[2]. Neviaser and Neviaser[7] recommend inpatient care with postoperative immobilization in 90 abduction and external rotation in the early postoperative period**.** There is no consensus in the literature on the need for immobilization in abduction prior to rehabilitation. Most authors prefer an intensive rehabilitation immediately after surgery with daily stretching exercises[2,30,16,31,32].

Conclusions

Physical therapy combined with a home exercise program is the mainstay of treatment, regardless of stage. Intra-articular steroid injections provide significant short-term benefits with regard to pain, ROM, and shoulder function. Although numerous studies have supported the role of arthroscopic release as a safe and effective treatment for recalcitrant frozen shoulder in the short term, there is controversy in the literature as to the optimal method of release. There are no high quality clinical studies comparing different surgical techniques and there is currently not enough clinical data to determine the functional advantages of various capsular release technique over each other. An aggressive supervised rehabilitation protocol is crucial in the absence of recurrences

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