Arthroscopic Capsular Release In Treating Patients With Primary Frozen Shoulder

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Abstract: Introduction: Primary frozen shoulder or idiopathic adhesive capsulitis is a painful, stiff shoulder of unknown etiology. Despite this knowledge of the pathology, there is no consensus on the most favorable method of managing the disease. Suggestions for management range from supervised neglect to corticosteroids, physiotherapy, manipulation, hydrodilatation and arthroscopic capsular release. Aim of the work: The aim of our study was to assess the effectiveness of arthroscopic capsular release in treating patients with primary frozen shoulder. Patients and Methods: twelve patients with fourteen primary frozen shoulder were treated with arthroscopic capsular release of the glenohumeral joint. Of the 12 patients, there were 4 men and 8 women; the right side was affected in 7 patients, the left side was affected in 3 patients, and two patient had bilateral affection. The mean age of the patients was 48.5 years (range 39–62 years). They were assessed preoperatively, post operatively regarding to pain, range of motion and activity level. Results: The mean duration of follow-up was 10 months. Pain was relieved in all patients. With respect to range of motion, the mean of external rotation at 0° improved by 72°, the mean forward flexion improved by 97°, the mean of abduction improved by 125°, and the mean of internal rotation at 0° increased by 7.5° points according to the constant shoulder score. The mean improvement was 57 points There were excellent score in 9 shoulders and good score in 5 shoulders. Conclusion: This study with strict inclusion and exclusion criteria has demonstrated that arthroscopic capsular release is a reliable treatment option for patients with idiopathic frozen shoulder. It was found to reliable not only in restoring motion but also in eliminating pain.


Key words: adhesive capsulitis, frozen shoulder, capsular release

1. Introduction

The term frozen shoulder was first used in 1934 by Codman (1), who described the common features of a slow onset of pain felt near the insertion of the deltoid muscle, inability to sleep on the affected side, and restriction in both active and passive elevation and external rotation. Idiopathic adhesive capsulitis, a painful, stiff shoulder of unknown etiology that is also referred to as a frozen shoulder. Pain and stiffness in the shoulder, passing through phases of pain, pain and stiffness, stiffness and resolution, and typically leading to a functional recovery after two to three years (2,3,7). Although there is a functional recovery, Shaffer et al. (8) showed that up to 50% of patients continued to have mild pain or stiffness seven years after the initial symptoms as well as a deficit in shoulder range of motion compared with the contralateral shoulder. It has a prevalence of 2% in the general population (9). It affects more women than men and is most common between the ages of thirty-five and sixty-five years (9,10).

The pathology of frozen shoulder involves active fibroblastic proliferation in the capsule of the shoulder joint, accompanied by some transformation of fibroblasts to myofibroblasts yet with a normal radiological appearance (1,11,12). There is a decrease in intra-articular volume and capsular compliance so that glenohumeral motion is limited in all planes (13). Despite this knowledge of the pathology, there is no consensus on the most favorable method of managing the disease. Suggestions for management range from supervised neglect to corticosteroids, physiotherapy, manipulation, hydrodilatation and arthroscopic capsular release (14). Surgical interventions include open release, manipulation under anesthesia, arthroscopic capsular release, and combinations of open or arthroscopic capsular release with manipulation under anesthesia (2,4,6). Arthroscopic capsular release was first described, as far as we know, in 1979 by Conti (15), and has been favored over manipulation under anesthesia as it is believed to allow a more controlled and complete release of the contracted capsule, to reduce the chance of fracture (7), and to provide more immediate improvement (8).

Aim of the work

The aim of our study was to assess the effectiveness of arthroscopic capsular release in treating twelve patients with primary frozen shoulder.

2. Patients and methods

Between June 2008 and October 2012, we performed arthroscopic capsular release for 12 patients with primary frozen shoulders in Zagazig University Hospitals.

Inclusion and Exclusion Criteria

The criteria for a diagnosis of primary frozen shoulder were (1) a painful stiff shoulder for at least four weeks; (2) restriction of passive external rotation...
of at least 50% compared with the contralateral shoulder; (3) difficulty using the affected arm, with restriction of movement and loss of function; and (4) pain at night causing a sleep disturbance and inability to lie on the affected side\(^5,8\).

The exclusion criteria included (1) evidence of glenohumeral joint arthritis at the primary procedure, (2) a full-thickness rotator cuff tear, (3) any fracture involving the shoulder girdle, (4) diabetes (5) previous surgery to the involved shoulder because the rehabilitation protocol is different from only capsular release. Arthroscopic capsular release was performed if there is no response to conservative treatment (NSAID, physiotherapy, local corticosteroid injection) for at least 3 months.

Of the 12 patients, there were 4 men and 8 women; the right side was affected in 7 patients, the left side was affected in 3 patients, and two patients had bilateral affection. The mean age of the patients was 48.5 years (range 39–62 years). The preoperative range of motion was examined and measured with the patient seated with scapular fixation.

**Radiologic assessment**

Plain radiographs were performed as a routine in all patients. Anteroposterior (AP) view and AP view in maximum abduction were performed; no significant finding was detected in AP view except for osteopenia in 3 patients.

MRI was not performed routinely in all patients but if other pathology was suspected to present. Five patients with primary frozen shoulder had already undergone MRI; the MRI showed indistinct edematous inferior capsule (axillary pouch) on T2WI on coronal and axial images, with thickening and increased signal on T2WI of rotator interval, with intact labrum and rotator cuff muscles.

**Operative Procedure and Rehabilitation**

Following general anesthesia, patients were positioned in the beach-chair position for arthroscopy. The passive shoulder motion was assessed as detailed above. Injection of adrenaline saline in the ratio of 1:200 000 in the glenohumeral and infiltrate the entry root after sterilization of the operative field.

An arthroscopic capsular release was initiated by inserting an arthroscope into the glenohumeral joint via a standard posterior portal. An anterior portal was established under direct vision with use of a spinal needle lateral to the coracoid process. The portal was established just superior to the superior border of subscapularis. A spinal needle was utilized to ensure that instruments could access the inferior capsule and, if possible, the posterior capsule. Then, diagnostic shoulder arthroscopy was initially performed. In all patients, the typical findings of frozen shoulder were present, the joint volume was reduced, the rotator interval was filled with fibrotic tissue, Inflamed hypertrophied synovium and the intra-articular part of the long head of the biceps tendon showed inflammation without mechanical damage (Fig.1). Through this opening using radiofrequency probe, the anterior and inferior capsule were cut lateral to the glenoid labrum. The tissue in the rotator interval was released to the anterior border of the long head of the biceps muscle and medially to the base of the coracoid process under direct vision (Figs.2,3). We began the release superiorly with the coracohumeral and superior glenohumeral ligament. Thereafter, we continued the release until the coracoid and the conjoint tendon were visualized to insure that the coracohumeral ligament has been completely divided. Subscapularis tendon sheath was also divided to improve shoulder motion outcomes in persistent limited external rotation. Through the same anterior portal the inferior and posterior aspects of the capsule were released if there still limited internal rotation and abduction, to achieve a complete 360° release (Fig.4). After the release, the arthroscope was removed, a gentle manipulation was performed, and shoulder motion was assessed. The portals were closed, and the shoulder was dressed with a soft bulky dressing. Postoperative analgesia was obtained by repeat lidocaine hydrochloride injection through interscalien root that was performed preoperatively (Fig.5) The extent of the release and the shoulder motion were recorded on a specifically designed, standardized form. Patients were discharged on the day of the surgery without a sling.

**Postoperative rehabilitation**

All patients were referred to physiotherapy from the second day postoperative where they started range of motion exercises. In addition, we learned the patients exercises to be performed at home.

All patients were followed up in the outpatient clinic at weekly interval for the first 4 weeks postoperative, then at monthly interval until the end of the follow-up period (Fig 6). Results were evaluated according to the Constant shoulder score\(^16,17\) (Table I).
Fig. 1: Inflamed tissues in frozen shoulder

Fig. 2: Anterior capsular release

Fig. 3: Inferior capsular release

Fig. 4: Posterior capsular release

Fig. 5: Catheter for lidocaine hydrochloride injection through interscalien root

A Preoperative external rotation

B Preoperative abduction
Fig. 6 (case No. 4): Female patient 45 years old with primary frozen shoulder treated by arthroscopic capsular release

I: Preoperative and postoperative range of motion of left shoulder compared to the right side
Table 1: Constant shoulder score

Answer all questions, selecting just one unless otherwise stated. During the past 4 weeks......

<table>
<thead>
<tr>
<th>1. Pain</th>
<th>2. Activity Level (check all that apply)</th>
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<tbody>
<tr>
<td>□ Severe</td>
<td>□ yes</td>
</tr>
<tr>
<td>□ Moderate</td>
<td>□ no</td>
</tr>
<tr>
<td>□ Mild</td>
<td>□ yes</td>
</tr>
<tr>
<td>□ None</td>
<td>□ no</td>
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Unaffected Sleep

Full Recreation/Sport

Full Work

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<th></th>
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<tbody>
<tr>
<td>□ Up to Waist</td>
<td>□ 0 13-15</td>
</tr>
<tr>
<td>□ Up to Xiphoid</td>
<td>□ 1-3 15-18</td>
</tr>
<tr>
<td>□ Up to Neck</td>
<td>□ 4-6 19-21</td>
</tr>
<tr>
<td>□ Up to Top of Head</td>
<td>□ 7-9 22-24</td>
</tr>
<tr>
<td>□ Above Head</td>
<td>□ 10-12 &gt;24</td>
</tr>
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RANGE OF MOTION

<table>
<thead>
<tr>
<th>5. Forward Flexion</th>
<th>6. Lateral Elevation</th>
</tr>
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<tbody>
<tr>
<td>□ 31-60 degrees</td>
<td>□ 31-60 degrees</td>
</tr>
<tr>
<td>□ 61-90 degrees</td>
<td>□ 61-90 degrees</td>
</tr>
<tr>
<td>□ 91-120 degrees</td>
<td>□ 91-120 degrees</td>
</tr>
<tr>
<td>□ 121-150 degrees</td>
<td>□ 121-150 degrees</td>
</tr>
<tr>
<td>□ 151-180 degrees</td>
<td>□ 151-180 degrees</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>7. External Rotation</th>
<th>8. Internal Rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Hand behind Head, Elbow forward</td>
<td>□ Lateral Thigh</td>
</tr>
<tr>
<td>□ Hand behind Head, Elbow back</td>
<td>□ Buttock</td>
</tr>
<tr>
<td>□ Hand to top of Head, Elbow forward</td>
<td>□ Lumbosacral Junction</td>
</tr>
<tr>
<td>□ Hand to top of Head, Elbow back -</td>
<td>□ Waist (L3)</td>
</tr>
<tr>
<td>□ Full Elevation</td>
<td>□ T12 Vertebra</td>
</tr>
<tr>
<td></td>
<td>□ Interscapular (T7)</td>
</tr>
</tbody>
</table>

Grading the Constant Shoulder Score (Difference between normal and Abnormal Side)

<table>
<thead>
<tr>
<th></th>
<th>Poor</th>
<th>21-30</th>
<th>Fair</th>
<th>11-20</th>
<th>Good</th>
<th>&lt;11</th>
<th>Excellent</th>
</tr>
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<tbody>
<tr>
<td>&gt;30</td>
<td></td>
<td></td>
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</table>
3. Results

All the twelve patients were available for follow up. The mean duration of follow-up was 10 months (range 6-19 months). The ratio of right-side to left-side affection was 9 : 5. In all, 12 patients with 14 shoulders had severe pain affecting their sleep according to the constant shoulder score preoperatively; 10 patients had no pain, whereas 2 patients with three shoulders had mild pain. With respect to range of motion, the mean of external rotation at 0° improved by 72°, the mean of flexion improved by 97°, the mean of abduction improved by 125°, and the mean of internal rotation at 0° increased by 7.5 points according to the constant shoulder score (Table 2).

At the end of follow up period all patients were evaluated according to the constant shoulder score. The mean improvement was 52 points. There were excellent score in 9 shoulders and good score in 5 shoulders.

<table>
<thead>
<tr>
<th>Mean range of motion</th>
<th>Preoperative</th>
<th>Postoperative</th>
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</thead>
<tbody>
<tr>
<td>External rotation at 0</td>
<td>4°</td>
<td>76°</td>
</tr>
<tr>
<td>Forward flexion</td>
<td>70°</td>
<td>167°</td>
</tr>
<tr>
<td>Abduction</td>
<td>40°</td>
<td>165°</td>
</tr>
<tr>
<td>Internal rotation (constant shoulder score)</td>
<td>1.5 points</td>
<td>9 points</td>
</tr>
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4. Discussion

Frozen shoulder is a disease that causes pain, affects daily activities negatively, and may restrict shoulder functions drastically. It is a common problem that remains difficult to diagnose and difficult to treat.

The natural history of frozen shoulder is ill understood but is not as benign as Codman suggested in 1934. A number of studies have evaluated the short-term results of nonoperative management of frozen shoulder. At two years, most patients who had non-operative treatment had significant improvement, but the shoulders were not normal.

This study has identified patients with arthroscopically proven frozen shoulder. The clinical diagnosis of frozen shoulder can be misdiagnosed as other conditions such as mild arthritis and stiffness secondary to rotator cuff disease. These secondary causes can only be excluded by arthroscopy. Our study is made with 12 patients undergoing arthroscopic capsular release for isolated proven stage II (severe pain and stiffness) idiopathic frozen shoulder.

Night pain is a key component of frozen shoulder and the main indication for intervention. In this study, all patients stated that the surgery allowed them to have an uninterrupted night’s sleep. The purpose of any intervention in stage II idiopathic frozen shoulder must be to shorten the natural history of the disease process. For an intervention to have any use it must show rapid improvement (pain free, sleeping and moving within 1–2 weeks) and there is no purpose in demonstrating improvement at one year’s follow-up in a condition where the natural history is for subjective improvement in at least 50% of patients without any treatment.

With the advances in arthroscopic surgery, arthroscopic capsular release has been shown to be a useful tool in the treatment of resistant frozen shoulder. It is a minimally invasive method aimed at pathologic tissue; it allows precise and controlled release of the capsule and ligaments, reducing the potential complications of a more traumatic manipulation. Intensive and precise arthroscopic debridement of the inflated tissue or other associate pathology and control of any potential hemorrhage would relieve the postoperative pain significantly.

The CHL and rotator interval were recognized as the major affected area in frozen shoulder so the rotator interval and the anterior capsule should be released to restore passive external rotation and abduction. Pearsall et al. recommended releasing the intraarticular subscapularis tendon without significant morbidity. In our study we only released the subscapularis tendon sheath in cases in which the external rotation still affected after anterior capsular release. Although Many authors have recommended release of the posterior capsule, We did not routinely perform it except in 4 patients that still present limited passive internal rotation intra-operatively.

There was a marked improvement in pain post-operatively, with improvement in all range of movements in all patients with no associated postoperative complications.

This study confirmed that arthroscopic capsular release resulted in significant reduction in pain severity and frequency at the follow up period with no complications.

With continued significant improvement in overall shoulder function, relief of shoulder stiffness, and relief of difficulty in reaching behind the back or above the head. Another important finding was the continued significant relief in terms of the severity and frequency of pain with activity, at rest, and when trying
to sleep. These data are consistent with short-term outcome studies on arthroscopic capsular release for adhesive capsulitis.\(^{34,35}\)

Potential complications of this arthroscopic capsular release include axillary nerve injury, infection, and iatrogenic chondral injury from the insertion of the arthroscope\(^{36}\). In the present study, these complications were not observed. No patient had iatrogenic arthritis.

In one study of Warner\(^{33}\) in 23 patients and follow up period 24–64 months the mean improvement in constant shoulder score is 48 points which is near our results in which the mean improvement according to CSS is 52 points.

Our results is comparable to the study Abdelrahman and Morsi\(^{37}\) with an average follow-up period of 6 months among 39 patients, with respect to pain improvement and improvement of movement in all directions and the final evaluation according to the constant shoulder score.

Conclusions

This study with strict inclusion and exclusion criteria has demonstrated that arthroscopic capsular release is a reliable treatment option for patients with idiopathic frozen shoulder. It was found to reliable not only in restoring motion but also in eliminating pain. This is an effective procedure with minimal complications.

References