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Evaluation of The Results of Management of Frozen Shoulder Using the Arthroscopic Capsular Release

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SUMMARY

Background. The aim of treatment of frozen shoulder is to regain a painless and functional shoulder range of shoulder motion. In this study we evaluated the results of using the arthroscopic technique for the release of the shoulder joint capsule in patients with a diagnosis of frozen shoulder.

Material and methods. The study included 40 patients with frozen shoulder. They were operated upon with the use of electrocautery for the release of the shoulder joint capsule. The group consisted of 29 women and 11 men with a mean age of 48.2 years (range 38-62).

Results. Preoperatively, the mean Constant and Murly shoulder score was 36.35 (range 21-51). At the end of the follow up period, the mean score was 85.8 (range 62 to 98). The difference between the means of pre- and postoperative total score was statistically significant (t =10.85 and p=0.0001). 22 patients (55%) had excellent results, 14 patients (35%) had good results, 4 patients (10%) had fair results and none had poor results. The 4 cases with fair results were all female, all had insulin-dependent diabetes mellitus and were > 50 years old.

Conclusions. 1. Arthroscopic capsular release is an effective and safe method for the treatment of refractory frozen shoulder. 2. It achieves dramatic pain and motion improvement post-operatively, allowing very early postoperative rehabilitation.

Key words: frozen shoulder, arthroscopic capsular release, physical therapy

BACKGROUND

Frozen shoulder is a condition of uncertain cause characterized by the spontaneous onset of pain with significant restriction of both active and passive range of motion of the shoulder joint [1]. Frozen shoulder is divided into primary and secondary as regards aetiology [2]. Primary or idiopathic frozen shoulder usually ensues without a definite triggering event. Secondary frozen shoulder is often defined in association with a known intrinsic, extrinsic or systemic pathology. Intrinsic shoulder abnormalities include rotator cuff tear, tendonitis of the long head of biceps, calcific tendonitis, acromioclavicular arthritis, trauma and fractures around the shoulder region. Extrinsic disorders include ischaemic heart disease, pulmonary disorders including infections and tumours, cervical disc diseases and radiculopathy. Systemic disorders include diabetes mellitus, hypothyroidism, and hypoadrenalism [3,4]. As regard the pathologic state of frozen shoulder, the joint capsule becomes thickened and non-compliant with loss of the capsular recesses [5]. Neer suggested that the tightened coracohumeral ligament restricts external rotation in frozen shoulder [6]. Other authors based on arthroscopic examination of frozen shoulder found that intra-capsular adhesions, synovitis, a contracted rotator interval, contracted subscapularis tendon, and long head biceps tendonitis may contribute to the pathology of frozen shoulder [7]. Non-operative or supportive treatment is typically prescribed initially. This treatment includes oral nonsteroidal anti-inflammatory drugs (NSAIDs), oral corticosteroids, glenohumeral intra-articular corticosteroid injections, and physical therapy [8]. Operative treatment is reserved for refractory cases and includes manipulation under anaesthesia, hydraulic distension of the joint, arthroscopic release and open surgical release [9]. Arthroscopic treatment of frozen shoulder provides several advantages. It allows joint distension, release of capsular adhesions, and the diagnosis of unsuspected underlying intra-articular disease. It avoids the complications associated with manipulation under anaesthesia such as fracture of the humerus especially in osteoporotic patients, dislocation of the shoulder and subscapularis tendon rupture. Like open surgical release, it is associated with minimal post-operative pain, short hospital stay and early engagement in physiotherapy [10].

MATERIAL AND METHODS

40 patients diagnosed with frozen shoulder at orthopaedic department outpatient clinic of Alexandria university hospital were operated between March 2013 and October 2013. The inclusion criteria were limitation of both active and passive range of motion, with limited abduction of less than 100° and less than 50% external rotation in adduction of the opposite shoulder, symptoms for at least six months and at least 3 months of physical therapy and anti-inflammatory treatment without improvement. Patients with glenohumeral pathology such as arthritis, rotator cuff tear and other possible intrinsic causes of secondary frozen shoulder were excluded. The active and passive range of motion of the shoulder was assessed in all patients with a goniometer. All ranges were measured in the supine position to eliminate the scapulothoracic movement, but the internal rotation up the back was measured standing. Measurements included measurement of forward flexion in the sagittal plane, abduction in the scapular plane, and external rotation with arm adduction and abduction. Internal rotation was measured with the arm abducted and up the back by identifying the spinous process of the highest vertebra reached. All affected shoulders were investigated with plain radiography in the anterior-posterior and axillary view to exclude any other bony pathology, and plain radiographs of the cervical spine in the anterior-posterior and lateral projections were obtained to exclude any cervical spine pathology. The basic preoperative score for every patient was recorded using the Constant-Murley Shoulder Score for evaluation of pain, activity of daily living, ability to work, range of motion and shoulder strength with a maximum of 100 points [11]. All the operations were done using general anaesthesia. We prefer the beach chair position as it provides for faster and easier patient positioning and reduced risk of neuropraxia because traction was not used. The procedure begins with a careful examination under anaesthesia to accurately define the directions and degree of limited motion. We start with routine shoulder arthroscopy using the standard anterior and posterior portals. An electrocautery probe is introduced through the anterior portal and the superior capsule is released above the glenoid rim along the upper edge of the biceps tendon (Fig. 1). Release of the rotator interval is performed from the upper edge of the subscapularis tendon to the biceps tendon (Fig. 2). Releasing the capsule of the rotator interval will release the coracohumeral ligament (CHL) where the fleshy fibers of subscapularis can be seen. All capsular attachments along the upper rolled edge of the subscapularis tendon should be released. We do not divide the subscapularis tendon. The middle glenohumeral ligament (MGHL) is also divided where it crosses the subscapularis tendon (Fig. 3). The anteri-

or band of the inferior glenohumeral ligament complex is visualized and released to allow for more release of the inferior capsular recess, with the inferior capsule put under tension in arm abduction and external rotation to avoid injury to the axillary nerve (Fig. 4). We examine the range of external rotation at variable degrees of abduction to check whether the degree of external rotation is equal to the opposite

Fig. 1. Order of viewing and working portals

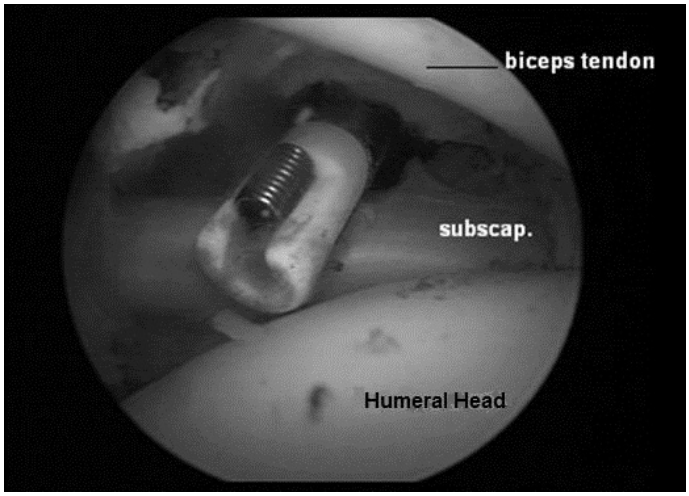

Fig. 2. Release of the rotator interval

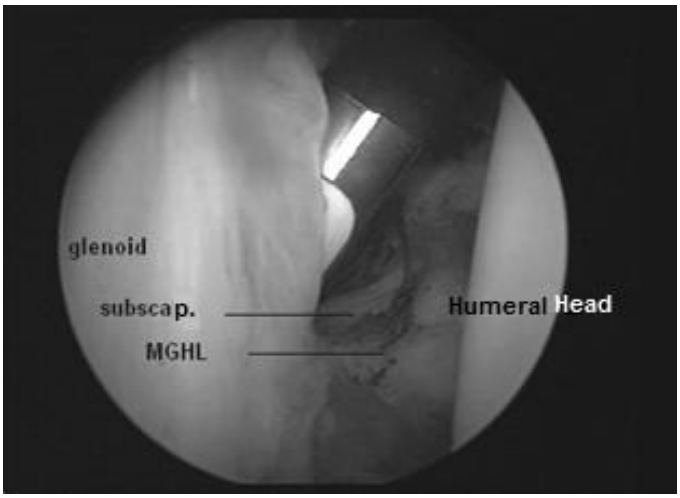

Fig. 3. Release of the MGHL

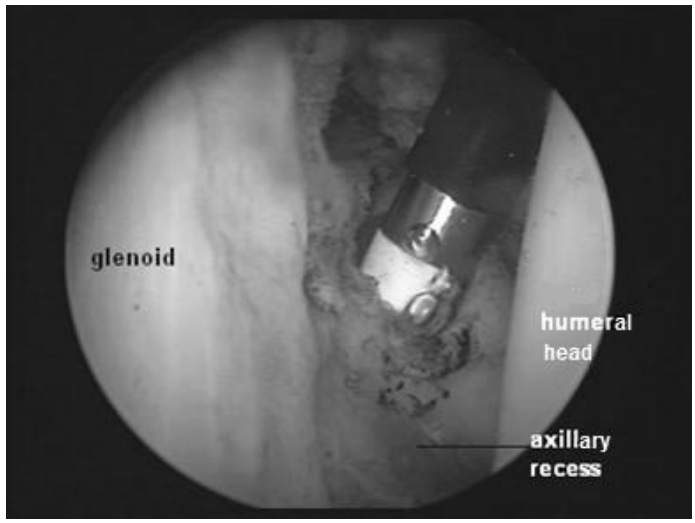

Fig. 4. Release of the IGHL, anterior band

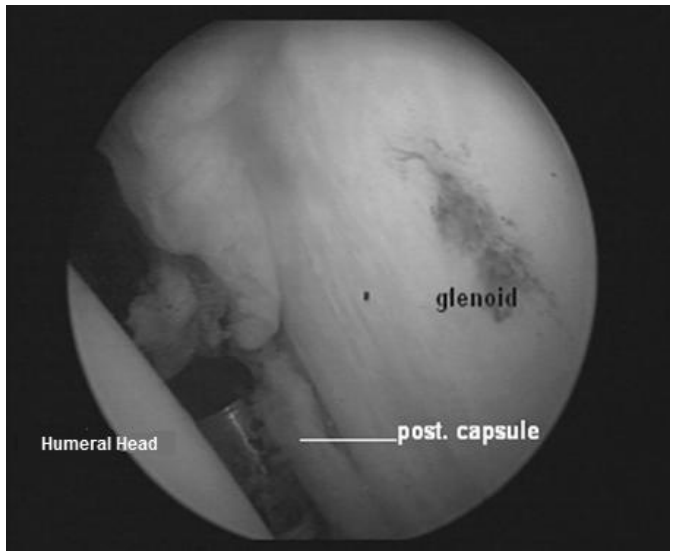

Fig. 5. Electrocautery probe inserted through posterior portal to access posterior capsule

side. The viewing and working portals are switched and a posterior capsular release is performed near the glenoid rim, starting inferior to the biceps tendon and extending as far inferiorly as possible to complete the release of the posterior band of inferior glenohumeral ligament (IGHL) (Fig. 5, 6). A motorized shaver is inserted inside the joint to thoroughly remove residual synovitis and resected debris as well as to widen the capsular margins. We manipulate the shoulder gently in all directions of motion to disrupt any residual adhesions. The first 24 hours postoperatively were covered with adequate analgesia to minimize the pain and help in the rehabilitation programme. Patients were encouraged to use pendulum exercises, stretching against a door jam and butterfly motions. On the first post-operative day, patients were taught a home-based shoulder stretching exercise programme including six different types of stretching exercises performed in four planes: forward elevation, external rotation, internal rotation and cross body adduction. Four or five short sessions lasting 5 to 10 minutes are performed per day. The patients were followed up every two weeks for the first 3 months and every month for the following three months for a total follow-up period of 6 months. At the end of the follow-up, patients' range of motion and Constant-Murley shoulder scores were recorded for statistical analysis.

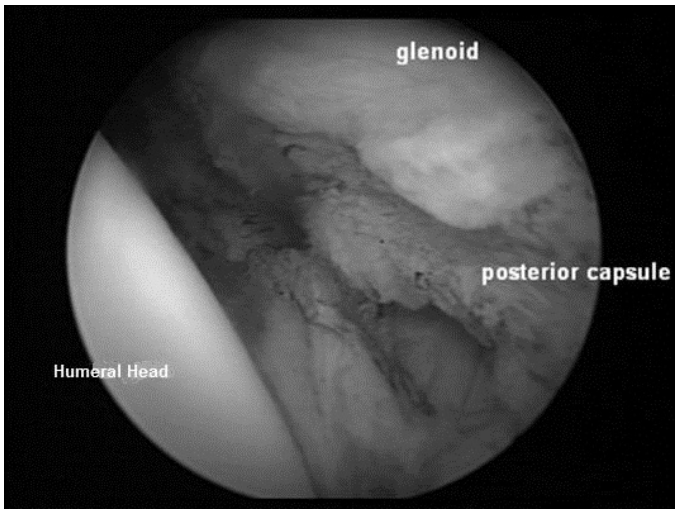

Fig. 6. Released posterior capsule down to the posterior band of IGHL

RESULTS

The study involved 40 patients, of whom 72.5% were females (29 patients), and 27.5% were males (11 patients). The youngest patient was 38 years old and the oldest was 62 years old, with a mean age of 48.2 years. 26 patients were housewives, 6 were manual workers, and 8 office workers. Preoperatively, the mean Constant and Murly shoulder score was 36.35 (range 21-51). At the end of the follow up period, the mean final Constant score was 85.8 (range 62- 98) (Table 2, Fig.7). 22 patients (55%) had excellent results, 14 patients (35%) had good results, 4 patients (10%) had fair results and none had poor results (Fig. 8). In total, 36 patients (90%) showed satisfactory results (excellent or good), whereas 4 patients (10%) showed unsatisfactory (fair) results. The 4 cases with fair results were all females who all had insulin-dependent diabetes mellitus and were in the age group of more than 50 years. The difference between the mean pre- and postoperative total scores was statistically significant (t =10.85 and p=0.0001). Mean forward flexion improved from 95° to 160°. Mean abduction improved from 85° to 155°. Mean external rotation with arm abduction improved from 10° preoperatively to 80°. Mean external rotation with arm adduction improved from 8° preoperatively to 74°. Mean internal rotation in abduction improved from 5° preoperatively to 55° (Fig. 9). The four patients with fair results showed the least improvement in the range of internal rotation postoperatively with residual restriction in internal rotation with arm abduction of more than 50% of the contralateral side; they were graded as fair. Preoperatively, the mean final Constant score for pain was 2.75 (range 0 to 10) and at the end of follow up was 12 (range 10-15). No patient had any complications related to wound heal-

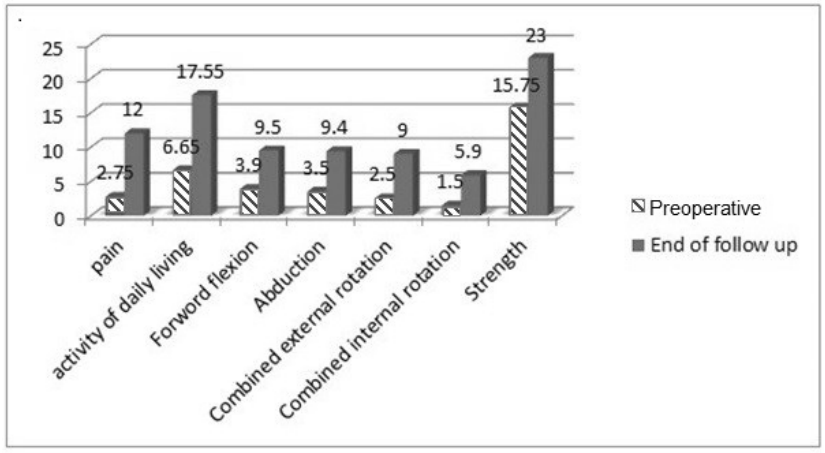

Fig. 7. Preoperative and final mean values of different parameters of Constant shoulder score

Tab. 1. Comparison between total score pre- and post-operatively

	Pre-operative	Post-operative
Range	21 - 51	62 - 98
Mean	36.35	85.8
S.D.	8.63	9.31
T	10.85	
P	0.0001*	

*significant

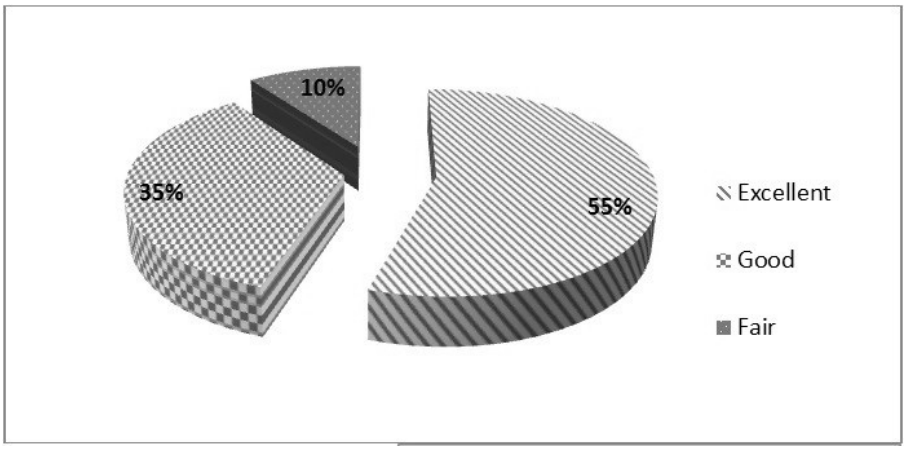

Fig. 8. Distribution of the net results in the study group

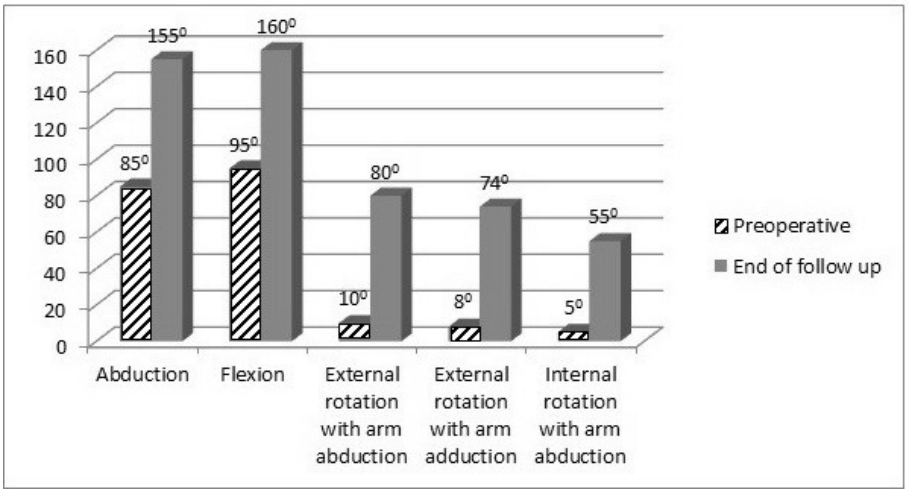

Fig. 9. Preoperative and final mean values of the range of shoulder motion

ing, infection, or damage to nerves or vessels, no deterioration during follow up and no recurrences. One 55-year-old, insulin-dependent diabetic female patient complained from recurrence of moderate to severe pain at 2 months' follow up. She received an intra-articular steroid injection and the pain significantly improved; the patient was graded as good.

DISSCUSION

The aim of management of frozen shoulder is to restore a painless functional range of shoulder motion. While the literature states that even the most severe cases recover with or without treatment in about 2 years, more recent opinion is that there is a residual restriction of motion in 40-60% of patients [12]. Hand et al. studied the outcome of frozen shoulder in 269 shoulders in 223 patients managed by supportive therapy, reporting 41% unsatisfactory results, implying that more active treatment should be applied to obtain better outcomes [13]. Active treatments include manipulation under anaesthesia, capsular distension and open and arthroscopic capsular

release [14]. Corbeil et al. reported in a double-blind prospective study of 45 patients with adhesive capsulitis in which the therapeutic efficacy of intra-articular steroids with and without distension arthrography was compared. They reported early pain relief in up to 80% of their patients subjected to distension. However, they did not find any advantage of capsular distension in regaining motion and pain relief at 3 months' follow up [15]. Manipulation under anaesthesia (MUA) can prove to be effective, but this does not allow for controlled release of pathologic tissue and has an increased risk of causing a humeral shaft fracture. Contraindications and relative contraindications to manipulation are no improvement or worsening in ROM or discomfort after previous manipulation and patients with significant osteopenia, rotator cuff tear, or long-term insulin-dependent diabetes [16]. Hamdan and Al-Essa, treated 100 patients with idiopathic frozen shoulder of at least 3 months' duration with MUA. Fifteen patients (21 shoulders) had poor results, of whom nine were diabetic. Complications included two patients with a post-manipulation simple undisplaced crack fracture of the surgical neck of the humerus. The shoulders of two other patients required immediate reduction of an anterior dislocation resulting from the manipulation [17]. Open capsular release is not very common owing to its high complication rate. It is technically difficult to achieve a complete posterior release, and postoperative pain and the need to protect the lengthened subscapularis tendon inhibit the unrestricted ROM needed to maintain motion [18].Braun et al recommend open release in patients with severe restriction in motion secondary to head injuries or strokes [19]. Open release might occasionally be indicated in post-traumatic and post-surgical cases of adhesive capsulitis in which extensive subdeltoid scarring and also extensive intra-articular and extra-articular contractures have occurred, which are not amenable to arthroscopic release [18]. Arthroscopic surgical release was first described in 1979 by Conti [20]. Since then, it has become a common operative treatment of adhesive capsulitis. The advantages of this approach include the complete release of the contracted capsule in a controlled manner. Also, complete synovectomy is possible. Patients have minimal postoperative pain, and aggressive active and passive motion can be started immediately. Other shoulder pathology that can cause shoulder pain and disability can also be identified. Some of the risks of arthroscopic capsular release include recurrent stiffness, anterior dislocation immediately after the operation and axillary nerve palsy; however, these complications are rare [21]. Our procedure involved arthroscopic release of the anterior capsule (including the rotator interval, MGHL), inferior and posterior capsule of the shoulder joint. We did not release the fibres of the intracapsular portion of the subscapularis muscle but the capsular adhesions around. We used an electrocautery probe for all releases taking special care to avoid injuring the axillary nerve while releasing the inferior recess by putting the shoulder in abduction and external rotation; with this manoeuvre, the nerve is farthest from the inferior capsule as reported in an anatomical study by Uno et al. [22].

Arthroscopic release is a safe and effective method for the treatment of refractory frozen shoulder. It avoids the complications associated with manipulation under anaesthesia and open surgical release. Full capsular release is mandatory for achieving the best range of motion. The immediate increase in the shoulder range of motion postoperatively facilitates the early onset of effective physical therapy. From our results, it could be said that a long history of diabetes is associated with a poorer prognosis. Also, we found in our study that internal rotation showed the least improvement compared to external rotation, abduction and flexion.

CONCLUSIONS

1. Arthroscopic capsular release is an effective and safe method for the treatment of refractory frozen shoulder.
2. It achieves dramatic pain and motion improvement post-operatively, allowing very early post-operative rehabilitation.

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