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Original Article

ARTHROSCOPIC RELEASE OF ROTATOR INTERVAL AS A TREATMENT OF FROZEN SHOULDER

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Abstract

Treatment of frozen shoulder directed to improve the shoulder range of motion. Various interventions have been described including arthroscopic release. The optimal method of release is still controversy. Release of the rotator interval and coracohumeral ligament is considered a minimal invasive technique with promising results. A prospective study of 32 patients suffered from resistant frozen shoulder treated by arthroscopic rotator interval release. Visual Analog Score (VAS), active and passive range of motion of the affected shoulder was measured and UCLA (University of California Los Angeles) score was measured and compared pre-operatively during postoperative 1,3,12 months follow up. The mean VAS was 8±1.02 preoperative, 4±1.05 post after 1 month, 2.59±1.13 post after 3 months and 1.91±1.4 post after 12 months whereas the mean UCLA score was 26.84±3.13 post after 1 month, 30.34±2.88 Post after 3 month31.16±3.57 Post after 1 year 31.16 at 12 months. These patients demonstrated a statistically significant increase in shoulder motion in all 4 directions. VAS and UCLA score were statistically improve postoperatively. Arthroscopic rotator interval and coracohumeral ligament release for adhesive capsulitis are encouraging and provide an effective treatment modality to provide pain relief restore joint function.

Keywords: *Arthroscopic, Rotator interval Frozen shoulder*

1. Introduction

Frozen shoulder (Adhesive capsulitis) is a common disabling musculoskeletal disorder, characterized classically by pain and restriction in active and passive range of motion [1-3]. Its prevalence is about 2-5% in the general population and up to 20% in those with diabetes [3,4], and it is more common at the age of 40-60 years [4-7]. The nondominant side is more often affected [3], 6-17% of patients have bilateral involvement, and there is a slight female preponderance with a female-to-male ratio of about 1.4:1 [8-10]. Lundberg categorized the frozen shoulder into idiopathic or primary adhesive capsulitis and secondary adhesive capsulitis. The pathogenesis of the idiopathic form remains unclear [11]. Secondary frozen shoulder is diagnosed when restricted motion is related to a known cause such as trauma, diabetes mellitus, cervical disease, ischemic heart disease [5,11-12]. The underlying pathology is still uncertain but the contracture of the coracohumeral ligament and rotator interval appears to be the main lesion in chronic frozen shoulder [13]. The primary objective in the treatment of frozen shoulder with stiffness is to improve or restore

the shoulder range of motion. Various interventions, including non-steroidal anti-inflammatory, corticosteroids, corticosteroid local injection, capsular distension, physical therapy, manipulation under anesthesia, and arthroscopy or open surgery, were reported with mixed results [14-17]. With advances in arthroscopic techniques, arthroscopic release is the method of choice for the treatment of frozen shoulder syndrome in patients who have failed to respond to conservative therapy. It provides marked improvement in the range of motion and is associated with low complication rate [1,2,5,18,19]. There is controversy in the literature as to the optimal method of release. Some authors recommend subscapularis release in association with the standard anteroinferior release. A number of authors have also recommended posterior capsular release to improve internal rotation [20-21]. Although the rotator interval is not the only area of the glenohumeral capsule affected, some authors have suggested that the rotator interval and coracohumeral ligament are of central importance in the development of frozen shoulder [2,22,23].

2. Material and methods

A prospective study of 32 patients suffer frozen shoulder underwent arthroscopic rotator interval release. All patients underwent a thorough evaluation regarding history and nature of their symptoms, thorough clinical examination and radiographic evaluation. MRI was done for every patient to confirm the diagnosis and exclude associated pathologies specially rotator cuff tear. An informed consent was taken from every patient and the study was approved by our ethical review board. ***The inclusion criteria***: symptomatic frozen shoulder, affecting patient`s daily activities and failed to respond to conservative therapy including NSAID's, physical therapy and steroids for a minimum period of more than 3 months. ***The exclusion criteria***: patients with rotator cuff tears, gleniohumeral osteoarthritis, history of fracture of upper end humerus, history of any previous open or arthroscopic shoulder surgery, bilateral adhesive capsulitis and those patients who underwent joint mobilization or hydrotherapy. ***The clinical assessment including*** Visual Analog Scale (VAS) score, active and passive range of motion of the affected shoulder was measured and University of California, Los Angeles (UCLA) score, tab. (1) was calculated and compared preoperatively during postoperative 1, 3, 12 months follow up.

Table (1) UCLA rating scale

	No. of points
Pain	
Present always and unbearable; strong medication needed frequently	1
	2
Present always but bearable; strong medication needed occasionally	4
None or little at rest; present during light activities; salicylates needed frequently	6
	8
Present during heavy or particular activities only; salicylates needed occasionally.	10
Occasional and slight	
None	1
Function	2
Unable to use limb	4
Only light activities possible	6
Able to do light housework and most activities of daily living	8
Most housework, shopping, and driving possible; able to brush hair and to dress and undress, including fastening of brassiere	10
Slight restriction only; able to work above shoulder level	
Normal activities	5
Active flexion	4
>150 degrees	3
121-150 degrees	2
91-120 degrees	1
46-90 degrees	0
30-45 degrees	
<30 degrees	5
Strength of flexion (on manual muscle testing	4
	3
Grade 5	2
Grade 4	1
Grade 3	0
Grade 2	
Grade 1	5
Grade 0	0
Satisfaction of patient	
Satisfied and better	
Not satisfied and worse	

2.1. *Operative technique*

The surgical procedure was performed under general anesthesia in beach chair position. All surgeries were performed by the same surgeon. Before beginning the procedure, range of motion of the shoulder under anesthesia was noted. Standard posterior portal, 2 cm inferior and medial to the posterolateral edge of the acromion, was marked. Approximately 20-30cc of normal saline was introduced into the shoulder joint, following which; the arthroscopy was introduced through this posterior portal. Anterior portal was then established. A radiofrequency ablation device was introduced through the anterior portal, fig. (1). RI release with coracohumeral ligament release was then done. Tenotomy of the long head of the biceps tendon was done in 10 cases. Increased range of motion was tested under anesthesia.

2.2. *Postoperative protocol*

Shoulder was immobilized in a forearm sling for a period of one week. However, within the week pendulum exercises were encouraged. After a week, the sling was discontinued and passive range of motion exercises & capsular stretching exercises were initiated. Active-assisted and active range of motion exercises was introduced. At the end of 4 weeks, strengthening exercises were allowed.

2.2. *Statistical analysis*

The mean and standard deviation values were calculated for each group in each test. Data were explored for normality using Kolmogorov-Smirnov and Shapiro-Wilk tests and showed non-parametric (not normal) distribution. The Wilcoxon test was performed to compare (VAS and UCLA scores) between preoperative and each of post after 1 month, post after 3 months and post after 12 months. The significance level was set at $P \leq 0.05$. Statistical analysis was performed with IBM® SPSS® Statistics Version 20 for Windows.

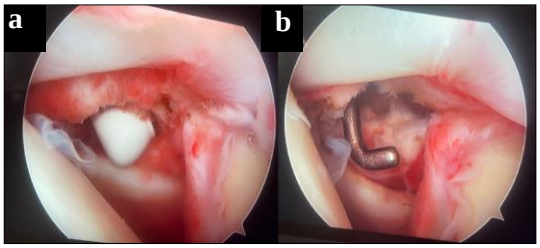

Figure (1) R.I. Arthroscopic release of rotator interval of left Shoulder viewing from posterior poratal; **a.** Bipolar Radiofrequency ablator used to release capsule and ligament, **b.** Rotator interval after complete release.

3. Results

This study included 32 patients tab. (2), 6 male (18.8%) and 26 female (81.2%) with the mean age of 48.56±6.05 yrs. The right shoulder was involved in 12 patients (37.5%) whereas the left shoulder was involved in 20 patients (62.5%).The dominant hand was involved in 11 patients (34.4%). Based on their etiology, 19 patients (59.4%) were diabetic, 11patients (34.4%) had primary idiopathic adhesive capsulitis whereas 2 patients (6.2%) had a history of preceding trauma. The mean duration of follow-up was 12 months. Clinical assessment and functional status of the patients was evaluated using VAS (Visual Analog Scale) scoring system which has been elaborated in tab$_s$. (3, 4) and UCLA (University of California Los Angeles) score has been elaborated in tab$_s$. (5, 6).We used the rating scale of the University of California at Los Angeles (UCLA) tab. (1) as objective scoring systems. The mean VAS was 8±1.02 preoperative, 4±1.05 post after 1 month, 2.59±1.13 post after 3 months and 1.91± 1.4 post after 12 months whereas the mean UCLA score was 26.84±3.13 post after 1 month, 30.34±2.88 post after 3 month31.16±3.57 Post after 1 year 31.16 at 12 months. These patients demonstrated a statistically significant increase in shoulder motion in all 4 directions. There was a statistically significant difference between preoperative of VAS score and each of post after 1 month, post after 3 months and post after 12 months where (P= <0.001**), (P= <0.001**) and (P= <0.001**) respectively. Also there was a statistically significant difference between post after 1 month and each of post after 3 months and post after 12 months where (P= <0.001**), and (P= <0.001**) respectively. Finally; there was a statistically significant difference between post after 3 months and post after 12 months where (P= <0.001**). There was a statistically significant difference between preoperative of UCLA score and each of post after 1 month, post after 3 months and post after 12 months where (P= <0.001**), (P= <0.001**) and (P= <0.001**) respectively. Also there was a statistically significant difference between post after 1 month and each of post after 3 months and post after 12 months where (P= <0.001**) , and (P= <0.001**) respectively. Finally; there was a statistically significant difference between post after 3 months and post after 12 months where (P= 0.002**).

Table (2) Patients' Demographics

	No. (n=32)	%
Age		
Range	37 – 61	
Mean±SD	48.56±6.05	
Gender		
Male	6	18.8
Female	26	81.2
Side affected		
Left	20	62.5
Right	12	37.5
Hand		
Dominant	11	34.4
Non dominant	21	65.6
Etiology		
Diabetes Mellitus	19	59.4
Idiopathic	11	34.4
Trauma	2	6.2

Table (3) VAS score

	VAS score (n=32)			
	Preoperative	**Post after 1 month**	**Post after 3 months**	**Post after 12 months**
Mean±SD	8±1.02	4±1.05	2.59±1.13	1.91±1.4

Table (4) Multi-comparison matrix according to VAS score

	Multi-comparison matrix between all times according to VAS score			
	Preoperative	**Post after 1 month**	**Post after 3 month**	**Post after 1 year**
Preoperative	1.000			
Post after 1 month	<0.001**	1.000		
Post after 3 month	<0.001**	<0.001**	1.000	
Post after 1 year	<0.001**	<0.001**	<0.001**	1.000

Table (5) UCLA score

	UCLA score (n=32)			
	Preoperative	**Post after 1 month**	**Post after 3 month**	**Post after 1 year**
Mean±SD	12.81±3.53	26.84±3.13	30.34±2.88	31.16±3.57

Table (6) Multi-comparison matrix according to UCLA score

	Multi-comparison matrix between all times according to UCLA score			
	Preoperative	**Post after 1 month**	**Post after 3 month**	**Post after 1 year**
Preoperative	1.000			
Post after 1 month	<0.001**	1.000		
Post after 3 month	<0.001**	<0.001**	1.000	
Post after 1 year	<0.001**	<0.001**	0.002**	1.000

4. Discussion

Frozen shoulder is a disease that causes pain, affects daily activities negatively, and may restrict shoulder functions drastically [24] . It is a common problem that remains easy to diagnose and difficult to treat [25]. The pathogenesis of adhesive capsulitis is uncertain. Ozaki et al. attributed the contracture of coracohumeral ligament and the rotator interval as the primary lesion of adhesive capsulitis [13]. In our study, the mean age of the patients was 48.56 years, which was consistent with the studies performed by Musil et al (54 years), Ebrahimzadeh et al (51 years), Trsek et al (49 years) and Cinaret et al (50 years) [19,26-29]. In our study, females were affected more than males, which is consistent with the study performed by Ebrahimzadeh et al, Cinaret et al and Sheridan et al. [26,28,29]. Arthroscopic capsular release has been shown to improve shoulder mobility and reduce pain, and has emerged as one of the most successful method for management of refractory adhesive capsulitis. In the study by Ebrahimzadeh et al, they showed significant improvement in VAS score, as well as improvement in mobility and decreased pain [26]. Lafosse et al demonstrated improvement in Vas Socre from preoperative 7 to 1.6 [30]. Umesh and. Dhaval demonstrated improvement in VAS score from 8.7 to 2.3 [1]. In our study we showed significant improvement in VAS score from 8 to 1.91 as well as improvement in mobility and decreased pain. Oglivie-Harris et al recommended anterior and inferior capsular release, but not posterior release, and demonstrated their results in their case series [31]. Posterior release was added in studies performed by Snow et & Jerosch et al al, but showed no significant difference in the post-operative range of motion [5-25]. Bhatia et al in 2013 performed a circumferential capsular release and demonstrated superior results in gain in range of motion [32]. Ogilivie-Harris et al & Pearsall et al, in their study released the intra-articular portion of the subscapularis, as it acts as a restraint to external rotation [31,33] None of their patients showed any signs of post-operative anterior instability. Jerosch et al, Cinar et al & Chen et al demonstrated similar results without performing subscapular release [28,34]. In our study, subscapular release was not performed. The coracohumeral ligament is the thickest part of the capsule in adhesive capsulitis [23], and it was released in all the patients included in our study. Marcos Fernandes in his study has described the aim and importance of its release to restore external rotation and relieve pain [35]. In our study, we performed release of rotator interval capsule and of coracohumeral ligament in 32 shoulders with subacromial bursectomy in 6 patients, and acromioplasty and removal of osteophytes from the acromioclavicular joint were performed in 2 patients. There was a marked improvement in pain postoperatively, with improvement in all range of movements in all patients with no associated postoperative complications. There are a few limitations to our study. First, our study is a prospective case study with a small study population. Secondly, there was no control group to compare results with other methods described in literature. However, our results demonstrated significant success in clinical outcomes with arthroscopic RI release technique, it is a simple technique, not time consuming and not associated with any complications.

5. Conclusion

The results of arthroscopic rotator interval and coracohumeral ligament release for adhesive capsulitis are encouraging and provide an effective treatment modality to provide pain relief restore joint function in cases resistant to conservative management.

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