L-shaped arthroscopic posterior capsular release in frozen shoulder

Mohamed G. Morsy

Department of Orthopaedic Surgery, El-Hadara Orthopaedic and Traumatology University Hospital, Alexandria University, Alexandria, Egypt

Correspondence to Mohamed G. Morsy, MD, Department of Orthopaedic Surgery, El-Hadara Orthopaedic and Traumatology University Hospital, Alexandria University, Alexandria, 21411, Egypt. Tel: +20 100 170 1563; fax: +20 342 957 92; e-mail: morsimoh@gmail.com

Received 12 December 2016
Accepted 4 March 2017

The Egyptian Orthopaedic Journal
2017, 52:45–49

Background
Arthroscopic capsular release in refractory cases of primary frozen shoulder is a well-established and acknowledged procedure with successful outcome. Nonetheless, postoperative limitation of internal rotation is a common complaint that diminishes the postoperative success.
Purpose
The purpose of this prospective study was to assess the results of a new L-shaped arthroscopic posterior capsular release and compare it with the standard longitudinal technique.
Patients and methods
Forty-three consecutive patients with primary frozen shoulder in whom conservative medical, physiotherapy, and/or local steroid injection failed to relieve the symptoms were included in the study. Arthroscopic capsular release was performed in all cases. Group 1 underwent the standard longitudinal anterior and posterior release only; group 2 underwent an additional L-shaped posterior capsular release. Constant–Murley functional score was used to assess the overall outcome and patient satisfaction.
Results
The mean age of the patients was 49 years (range: 27–67 years), with no statistical difference between the two groups. There were 22 patients in group 1 and 21 patients in group 2. The mean follow-up period was 34 months (range: 24–42 months). At the final follow-up, there was a highly significant improvement in Constant score ($P<0.001$) postoperatively in both groups. A similar finding was noted in the overall range of motions ($P<0.001$). However, group 2 showed a significant difference in the improvement of the internal rotation range of motion postoperatively.
Conclusion
The L-shaped arthroscopic posterior capsular release in patients with primary frozen shoulder is a new technique that significantly improves the postoperative internal rotation range of motion.

Keywords:
frozen shoulder, L-shaped release, posterior capsular release

Egypt Orthop J 52:45–49

1110-1148

Introduction

Idiopathic adhesive capsulitis or primary frozen shoulder can often cause significant shoulder pain and loss of motion [1,2]. Several conservative measures such as physical therapy, anti-inflammatory drugs, and local steroid injection are usually effective for pain control [3,4]. However, it has been shown in multiple studies that there is still a group of patients with refractory shoulder stiffness in whom conservative treatment fails; hence, persistent pain and motion restriction remain. Therefore, in these cases operative intervention is indicated [5–7].

Initially, a standard well-established arthroscopic capsular release (ACR) has been proposed as a minimally invasive surgical option that can be effective in many resistant cases with a reliably successful outcomes [5,7,8–11].

There is still controversy in the literature as to the optimal method of release. However, after these releases, the patient's shoulder internal rotation may remain limited. This is usually attributed to inadequate release of the tight posterior capsule. Therefore, the postoperative limitation of internal rotation is considered a common complaint that diminishes the success of the procedure [12].

Although a standard longitudinal posterior capsular release has been recommended by a number of authors to improve the internal rotation [13,14], others emphasized no significant difference in the overall outcome with the addition of this longitudinal release [12].

A new L-shaped arthroscopic posterior capsular release technique is suggested in refractory primary frozen shoulder cases to increase the opening in the posterior capsule in the hope of improving the postoperative internal rotation range of motion (Fig. 1).

The aim of this work was to compare the overall results between the standard longitudinal and the new L-shaped posterior capsular releases during the arthroscopic release in refractory primary frozen shoulder cases and their effects on the improvement in the internal rotation range of motion.

Patients and methods

The study was conducted in the Department of Orthopedic and Traumatology Surgery, Alexandria University, Egypt, from 2011 to 2013. A written informed consent was obtained from all patients, and the study was approved by the local Ethical Committee. Forty-three consecutive patients with primary frozen shoulder in whom conservative medical, physiotherapy, and/or local steroid injection failed to relieve the symptoms were included in the study. The patients were randomly divided into two groups. Group 1 included 22 patients who underwent standard longitudinal anterior and posterior releases only, and group 2 included 21 patients who underwent an additional L-shaped posterior capsular release. Patients with associated biceps tendon and/or cuff lesions were excluded from the study.

The age of the patients in group 1 ranged from 27 to 65 years (mean: 47.2±6.79 years). Of the 22 patients, 14 (64%) were female and the dominant hand was involved in 16 (73%) patients. In group 2, the age of the patients ranged from 32 to 67 years (mean: 51.4 ±4.62 years). Of the 21 patients, 16 (76%) were female and the dominant hand was involved in 17 (81%) patients.

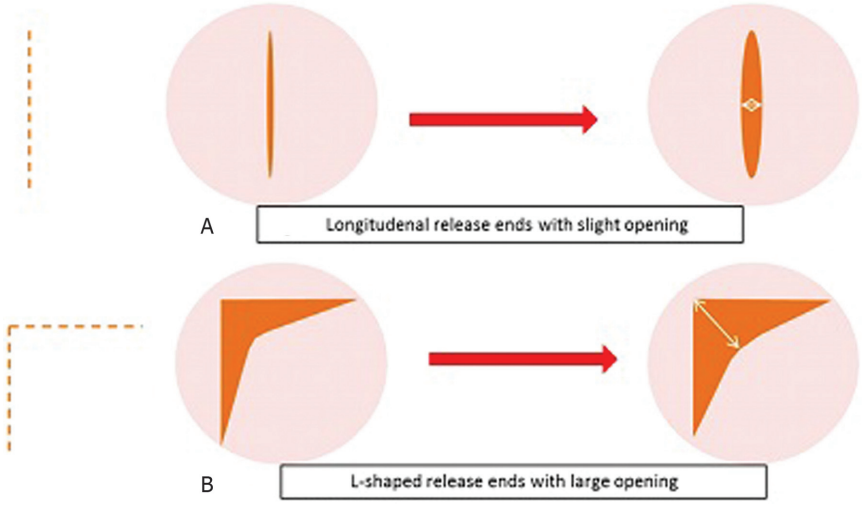
All patients underwent thorough clinical examination followed by radiological evaluation with plain radiography and MRI. Constant–Murley functional score was used to assess the overall outcome and patient satisfaction.

At the time of surgery, the patients were operated upon under general anesthesia and in semisitting position. With the arthroscope in the posterior portal, standard anterior rotator interval and capsular release were performed in all patients using motorized shaver and radiofrequency (RF) ablation device. Thereafter, the scope was shifted to the anterior portal to start the procedure of posterior capsular release by introducing the RF device through the posterior portal.

In the longitudinal technique (group 1), the posterior release begins from the glenoid level down to 6 O'clock position using the RF device. Thereafter, a shaver is inserted to remove any remaining debris and is used to complete the release of the posterior capsule until the back fibers of the infraspinatus muscle appear (Fig. 2).

In group 2, in addition to the longitudinal release described before, the hook-tip part of the RF ablation device is used to perform a transverse release in the posterior capsule, starting from the beginning of the longitudinal limb (Fig. 3).

Figure 1

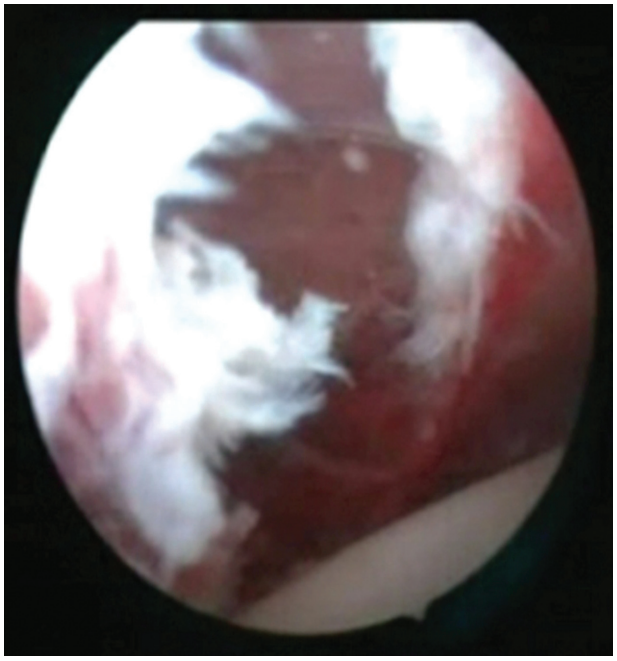


(a) Longitudinal release ends with slight opening. (b) L-shaped release ends with large opening.

The transverse limb of the release is performed in a stepwise manner going step-by-step laterally but ending before reaching the rotator cuff to avoid any damage of the cuff (Fig. 4).

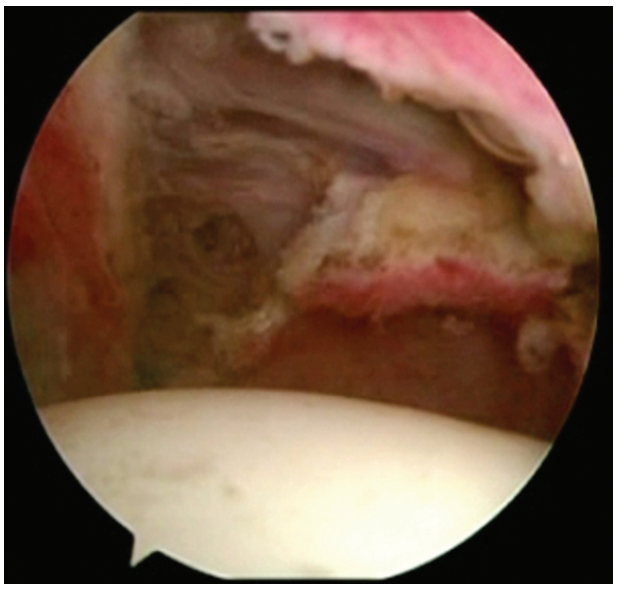
After performing the L-shaped release of the posterior capsule, the area of the opening becomes quite larger (Fig. 5).

Figure 2



The longitudinal release is seen with the appearance of the infraspinatus muscle.

Figure 4



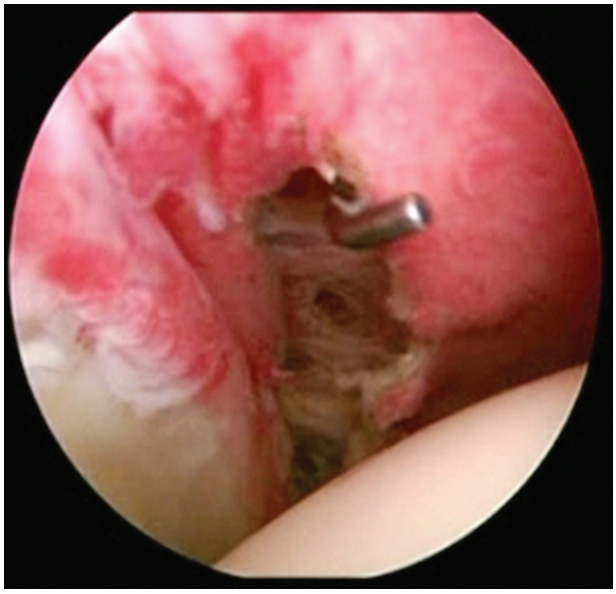
The capsule is adherent to posterior structures.

A postoperative sling is applied in both groups for comfort. The rehabilitation program was the same in both techniques and consisted of immediate postoperative passive and active assisted exercises followed by strengthening exercises.

Results

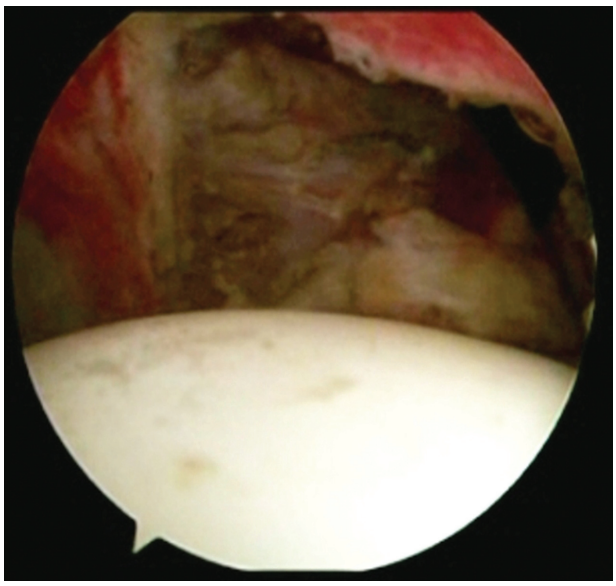
Statistically, there was no difference in the demographic data between the two groups in terms

Figure 3



The transverse release is done using the hook-tip of the radiofrequency ablation device.

Figure 5



Increased movement of the posterior capsule at the end of the L-shaped release.

of age, sex, etiology, and length of preoperative symptoms. The follow-up period ranged from 24 to 42 months with a mean of 34 months. Overall, across both groups, there was a significant improvement in the Constant score ($P<0.001$) postoperatively. A similar finding was noted with the range of motion ($P<0.001$).

In group 1 (standard release), the Constant score improved significantly from a mean of 27.4 points preoperatively (range: 15–40 points) to a mean of 90.8 points postoperatively (range: 74–98 points) ($P<0.001$). Similarly, in group 2 (L-shaped posterior release), the final score improved significantly from a mean of 30.6 points preoperatively (range: 20–45 points) to a mean of 93.7 points postoperatively (range: 80–100 points) ($P<0.001$). However, there was no significant difference in the overall Constant score between the two groups ($P=0.48$ and 0.26, respectively). At the final follow-up, 41 (95%) of the 43 shoulders were considered by the patients to be much better or better as a result of the operation.

A summary of preoperative and postoperative range of motion is shown in Table 1. There was no significant difference in abduction ($P>0.25$), forward flexion ($P>0.36$), or external rotation ($P>0.23$) between the two groups. With regard to internal rotation, the preoperative range of internal rotation was grade 0 (dorsal surface of the hand to the lateral thigh) in both groups. Postoperatively, both groups achieved a significant improvement; in group 1, the mean score improved to 5.8 points (range: 4–6 points), whereas in group 2 the mean score improved to 9.2 points (range: 8–10 points). However, there was a statistically significant improvement in the internal rotation range of motion in group 2 compared with group 1 ($P<0.001$).

There was no loss of function over time. Moreover, there were no infections, instability, or axillary nerve injury in either group.

Table 1 Summary of postoperative results in both groups

Groups	Abduction (deg.)		Flexion (deg.)		External rotation (Constant grade)		Internal rotation (Constant grade)		Constant score	
	Preoperative	Postoperative	Preoperative	Postoperative	Preoperative	Postoperative	Preoperative	Postoperative	Preoperative	Postoperative
Group 1	59	168	65	174	2	8.78	0	5.8	27.4	90.8
Group 2	61	171	63	178	2	8.89	0	9.2	30.6	93.7

Discussion

ACR has been shown to be a useful tool in the treatment of resistant frozen shoulder [12]. Although manipulation under anesthesia significantly improves shoulder elevation and abduction, Hill and Bogumill [15] found that rotation remained restricted and was a persisting problem.

ACR allows the shoulder to be released in a precise and controlled manner, avoiding the possible complications encountered by forceful manipulation maneuvers. It is

also a safer technique preventing bone fractures and labral or rotator cuff injuries that might occur with aggressive rotation during manipulation. Moreover, the arthroscopic release decreases the soft-tissue trauma and intra-articular bleeding, thus avoiding further adhesions [16,17].

In the current study, there was a significant improvement in patient function following arthroscopic release. The mean Constant scores postoperatively were 90 and 93, respectively.

The optimal degree of release required during the procedure is currently variable and usually depends on the assessment of motion loss before surgery [18]. A release of the superior and middle glenohumeral ligaments, the rotator interval, and the coracohumeral ligament with or without the subscapularis tendon is essential to restore the lost external rotation range of motion. Although the subscapularis tendon release has been suggested by Pearsall *et al.* [19], the patients in this study have achieved good return of external rotation without freeing or sacrificing the subscapularis. Loss of elevation is regained with the release of the anteroinferior capsule and the anterior band of the inferior glenohumeral ligament [12].

Restriction of internal rotation of the shoulder joint has been believed to be related to posterior capsular tightness [20,21]. A number of authors have advised the inclusion of a posterior release in the hope of restoring the lost internal rotation range of motion [13,14]. In contrast, Snow *et al.* [12]in 48 shoulder releases found no benefit with the addition of a posterior capsular release in improving the function or internal rotation range of motion. In their study, they performed the standard longitudinal posterior capsular release, which failed to prove any significant improvement in the postoperative internal rotation range of motion.

In the present study, the new L-shaped posterior capsular release technique aims at creating a large controlled opening in the posterior capsule that once cured will eventually heal in a wide position, and this explains the improvement encountered in the patients range of internal rotation. Moreover, the posterior capsule will be able to move more after this L-shaped release, and this in turn prevents the postoperative reclosure of the release with subsequent recurrence of stiffness.

Conclusion

The L-shaped arthroscopic posterior capsular release in patients with primary frozen shoulder is a novel technique that significantly improves the postoperative internal rotation range of motion.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1 Zuckerman JD, Rokito A. Frozen shoulder: a consensus definition. J Shoulder Elbow Surg 2011; 20:322–325.

2 Nagy MT, Macfarlanc RJ, Khan Y, Waseem M. The frozen shoulder: myths and realities. Open Orthop J 2013; 7:352–355.

3 Lorbach O, Kieb M, Scherf C, Seil R, Kohn O, Pape D. Good results after flouoroscopic-guided intra-articular injections in the treatment of adhesive capsulitis of the shoulder. Knee Surg Sports Traumatol Arthrosc 2010; 18:1435–1441.

4 Lorbach O, Anagnostakos K, Scherf C, Seii R, Kohn D, Pape D. Nonoperative management of adhesive capsulitis of the shoulder: oral cortisone application versus intraarticular cortisone injections. J Shoulder Elbow Surg 2010; 19:172–179.

5 Elhassan B, Ozbaydar M, Massimini D, Higgins L, Warner J. Arthroscopic capsular release for refractory shoulder stiffness: a critical analysis of effectiveness in specific etiologies. J shoulder Elbow Surg 2010; 19:50–87.

6 Griggs SM, Ahn A, Green A. Idiopathic adhesive capsulitis. A prospective functional outcome study of nonoperative treatment. J Bone Joint Surg Am 2000; 82:1398–1407.

7 Shaffer B, Tibone JE, Kerlan RK Frozen shoulder. A long-term follow-up. J Bone Joint Surg Am 1992; 74:738–746.

8 Cuomo F, Flatow EL, Schneider JA, Bishop JY. Idiopathic and diabetic stiff shoulder: decision-making and treatment. In: Warner JJ, Iannotti JP, Flatow EL, editors. Complex and revision problems in shoulder surgery. Philadelphia, PA: Lippincott Williams & Wilkins; 2005. pp. 205–29.

9 Cuomo F, Holloway GB. Diagnosis and management of the stiff shoulder. In: Lannotti JP, Williams GR, editors. Disorders of the shoulder; diagnosis and management. Philadelphia, PA: Lippincot Williams & Wilkins; 2007. pp. 541–59.

10 Harryman DT II, Matsen FA III, Sidles JA. Arthroscopic management of refractory shoulder stiffness. Arthroscopy 1997; 13:133–147.

11 Smith SP, Devaraj VS, Bunker TD. The association between frozen shoulder and Dupuytren's disease. J Shoulder Elbow Surg 2001; 10:149–151.

12 Snow M, Boutros I, Funk L. Posterior arthroscopic capsular release in frozen shoulder. Arthroscopy 2009; 25:19–23.

13 Nicholson GP. Arthroscopic capsular release for stiff shoulders: effect of etiology on outcomes. Arthroscopy 2003; 19:40–49.

14 Ide J, Takagi M. Early and long-term results of arthroscopic treatment for shoulder stiffness. J Shoulder Elbow Surg 2004; 13:174–179.

15 Hill JJ, Bogumill H. Manipulation in the treatment of frozen shoulder. Orthopedics 1988; 11:1255–1260.

16 Menendez M, Ishihara A, Weisbrode S, Bertone A. Radiofrequency energy on cortical bone and soft tissue: a pilot study. Clin Orthop Relat Res 2010; 468:1157–1164.

17 Cinar M, Akpinar S, Derincek A, Circi E, Uysal M. Comparison of arthroscopic capsular release in diabetic and idiopathic frozen shoulder patients. Arch Orthop Trauma Surg 2010; 130:401–406.

18 Arce G. Primary frozen shoulder syndrome: arthroscopic capsular release. Arthrosc Tech 2015; 4:717–720.

19 Pearsall AW, Holovacs TF, Speer KP. The intra-articular component of the subscapularis tendon: anatomic and histological correlation in reference to surgical release in patients with frozen shoulder syndrome. Arthroscopy 2000; 16:236–242.

20 Burkhart SS, Morgan CD, Ben Kibler W. The disabled throwing shoulder: spectrum of pathology: pathoanatomy and biomechanics. Arthroscopy 2003; 19:404–420.

21 Tehranzadeh AD, Fronek J, Resnick D. Posterior capsular fibrosis in professional baseball pitchers: case series of MR arthrographic findings in six patients with glenohumeral internal rotational deficit. Clin Imaging 2007; 31:343–348.