RESEARCH ARTICLE

Clinical Outcomes after Arthroscopic Release for Recalcitrant Frozen Shoulder

Mohammad H Ebrahimzadeh, MD; Ali Moradi, MD; Mostafa Khalili Pour, MD;
Mohammad Hallaj Moghadam, MD; Amir Reza Kachooei, MD

Research performed at Ortopedic Research Center, Ghaem Hospital, Mashhad University of Medical Sciences, Mashhad, Iran

Received: 19 July 2014 *Accepted: 29 August 2014*

Abstract

Background: To explain the role of arthroscopic release in intractable frozen shoulders. We used different questionnaires and measuring tools to understand whether arthroscopic release is the superior modality to treat patients with intractable frozen shoulders.

Methods: Between 2007 and 2013, in a prospective study, we enrolled 80 patients (52 females and 28 males) with recalcitrant frozen shoulder, who underwent arthroscopic release at Ghaem Hospital, a tertiary referral center, in Mashhad, Iran. Before operation, all patients filled out the Disability of Arm, Shoulder and Hand (DASH), Constant, University of California Los Angeles (UCLA), ROWE and Visual Analogue Scale (VAS) for pain questionnaires. We measured the difference in range of motion between both the normal and the frozen shoulders in each patient.

Results: The average age of the patients was 50.8±7.1 years. In 49 patients, the right shoulder was affected and in the remaining 31 the left side was affected. Before surgery, the patients were suffering from this disease on average for 11.7±10.3 months. The average time to follow-up was 47.2±6.8 months (14 to 60 months). Diabetes mellitus (38%) and history of shoulder trauma (23%) were the most common comorbidities in our patients. We did not find any significant differences between baseline characteristics of diabetics patients with non-diabetics ones. After surgery, the average time to achieve maximum pain improvement and range of motion were 3.6±2.1 and 3.6±2 months, respectively. The VAS score, constant shoulder score, Rowe score, UCLA shoulder score, and DASH score showed significant improvement in shoulder function after surgery, and shoulder range of motion improved in all directions compared to pre-operation range of motion.

Conclusions: According to our results, arthroscopic release of recalcitrant frozen shoulder is a valuable modality in treating this disease. This method could decrease pain and improve both subjective and objective mid-term outcomes.

Key words: Arthroscopic release, Frozen shoulders, Outcome, Recalcitrant

Introduction

Frozen shoulder or adhesive capsulitis is a common musculoskeletal disease, presenting with pain and restriction of shoulder range of motion in all directions (1-2). Frozen shoulder was described by Duplay for the first time in 1879 as "humeroscapular periarthritis" and since then has remained a challenging entity (3).

The incidence of frozen shoulder is 2% of normal population per year and the prevalence is higher in women during fourth and fifth decades (3-5). Previously it was believed that it was self-limited, but recent studies have revealed that its course may last as long as 10 years, and up to 40% of the patients will suffer from this disease their entire lives (4-5). Bilateral involvement has also been reported in 6% to 50% of the patients (4-5).

The exact etiology of frozen shoulder is unclear (6). However, diabetes mellitus is one of the main risk factors associated with disease. Ten to 20% of the patients suffering from diabetes mellitus will eventually develop frozen shoulder (7).

Many treatment options have been described to

Corresponding Author: Ali Moradi, Orthopedic Research Center, Ghaem Hospital, Mashhad University of Medical Sciences, Ahmad-Abad Street, Mashhad, 91766-99199 Iran.
Email: MoradiAL@mums.ac.ir

THE ONLINE VERSION OF THIS ARTICLE
ABJS.MUMS.AC.IR

Table 1. Comparison of shoulder range of motion before and after arthroscopic release in patients suffering from recalcitrant frozen shoulder

Range of motion	Before operation	At last follow-up visit	*P* value
Abduction	35±15	150±10.5	*P*<0.001
Forward flexion	65±20	160±20	*P*<0.001
External rotation	10±5	65±10	*P*<0.001
Internal rotation	15±5	60±10	*P*<0.001

manage this disease. Physical therapy, non-steroidal anti inflammatory drugs (NSAIDs), steroid injections and passive range of motion under general anesthesia (GA) are among the well-known modalities (3, 8-14). However, some patients are resistant to such treatments. Arthroscopic release has an important role in managing recalcitrant frozen shoulders.

In this study, we report our results of arthroscopic release of recalcitrant frozen shoulders. We have used different clinical outcome questionnaires and measurement tools to determine the results of arthroscopic release in resistant cases of adhesive capsuliitis.

Materials and Methods

Patient Population

Between 2007 and 2013, 89 patients with recalcitrant frozen shoulder underwent arthroscopic release of frozen shoulder at our referral shoulder clinic. We ruled out the other pathologies by plane X-rays and magnetic resonance imaging (MRI). Patients older than 18 years, with recalcitrant unilateral frozen shoulders, who were not responsive to six months of conservative therapy (physical therapy, NSAIDs, one to three attempts of steroid injection) were included. Patients with bilateral involvement or those with history of previous arthroscopic or open surgical release were excluded from our study. The Ethics Committee of the Mashhad University of Medical Sciences approved our study. Eight patients refused to enroll in our study and were excluded. One patient died because of heart attack seven months after operation, so eventually 80 patients were available for further evaluation.

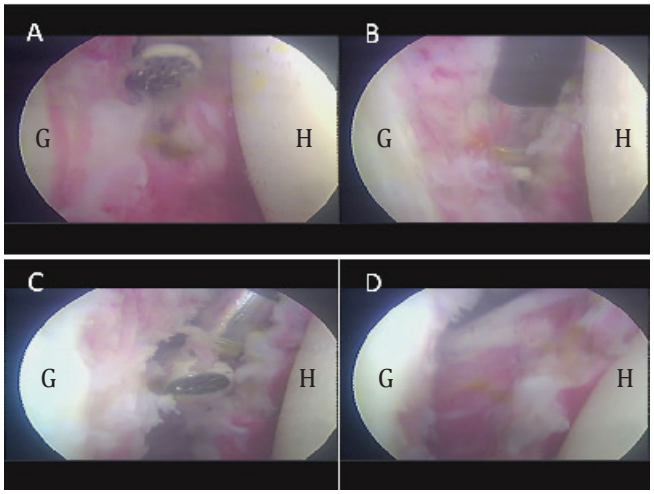

Figure1. Arthroscopic release for adhesive capsulitis.

Before surgery, all the patients filled out the the Disability of Arm, Shoulder and Hand (DASH), Constant, University of California Los Angeles (UCLA), Rowe and Visual Analogous Scale (VAS) for pain questionnaires (1, 15-17). Subsequently, we measured the shoulder range of motion (abduction, forward flexion, external, and internal rotation) in both normal and involved joints.

Surgical technique

All surgeries were performed by the senior author, under hypotensive GA (systolic blood pressure of 80-100 mmHg), in beach-chair position. In the absence of any cardiovascular contraindications, we used 1 mL of 1:1000 epinephrine dissolved in 3 L of 0.9% normal saline to decrease bleeding. First we created the posterior portal, which was subsequently followed by the anterior portal through rotator interval to remove synovium and release contractures. At this stage, by using a coblation probe, we released the rotator interval triangle contractures (the space surrounded with biceps tendon, subscapularis, and superior portion of the glenoid). All capsular ligaments, including coracohumeral ligament, anterior capsule, superior, anterior, and anterior-inferior glenohumeral ligaments, the inferior capsular pouch, and posterior-inferior capsule were released (Figure 1). After release we manipulated the shoulder in all directions gently. At the end of the operation, 10 mL of bupivacaine was injected into the joint for postoperative pain relief. On the first postoperative day, passive range of motion exercises were started after injecting 50 mg of meperidine. Aggressive physical therapy started immediately after the surgery.

The patients were seen in follow up at two weeks, six weeks, and three months after the surgery and at six months intervals after that. At the last visit in which the patient gained a plateau state in shoulder recovery patients filled out the DASH, Constant, UCLA, Rowe and

Table 2. Patient comorbidities for recalcitrant frozen shoulder

Risk factor	Frequency	Percent
Diabetes Mellitus	29	37%
Trauma history	19	23%
Hypertension	12	15%
Heart disease	10	12%
Seizure	4	5%

Table 3. Baseline characteristics of diabetic and non-diabetic patients suffering from frozen shoulder

Variable		Diabetics	Non-diabetics	*P* value
Number		30	50	0.07
Age (Years)		52.5	49.5	0.78
Female to male ratio		2.8	1.5	0.11
Affected side	Right	23	26	0.34
	Left	7	24	
Average time to Follow-up (Months)		48±9	46±8	0.87
Average duration of being symptomatic before operation (months)		12±11	9±10	0.15
Number of pain free hours while performing daily activities		14±7	13±7	0.67

VAS pain score questionnaires and the shoulder range of motion was recorded again.

Statistical analysis

We used SPSS version 16 (SPSS Inc., Chicago, IL, USA) for statistical analysis. We used independent t-test to compare two independent means of variables in subgroups. Non-parametric variables were assessed using Fisher Exact test and K2 test. A *P*-value of less than 0.05 was significant.

Results

Among patients suffering from frozen shoulder who underwent arthroscopic release, 80 patients (52 females and 28 males) were enrolled in our study. The average age of the participants was 50.8±7.1 years (36 to 66 years). In 49 patients (62%), the right shoulder was affected and in 31 (38%) the left shoulder was the affected side. Before surgery, the patients were suffering from frozen shoulder symptoms for a mean of 11.7±10.3 months (2 to 48 months). The average time to follow-up was 47.2±6.8 months (14 to 60 months).

Diabetes mellitus (38%) and history of previous shoulder trauma (23%) were the most prevalent comorbidities present in our patients (Table 1). We compared baseline characteristics of diabetic patients with those of non-diabetics and did not find any significant differences between the two groups (Table 2).

After surgery, the average time to achieve maximum pain improvement and range of motion were 3.6±2.1 and 3.6±2 months, respectively. The average number of physical therapy sessions attended after surgery was 21.7±11.

To evaluate the functional status of our patients, we used the VAS score, constant shoulder score, Rowe score, UCLA shoulder score, and DASH score. All of these clinical measurements showed significant improvement in shoulder function after surgery (*P*<0.001) (Table 3). Shoulder range of motion improved in all directions compared to the pre-operation range of motion (Table 4). We did not have any cases of postoperative infection, neurologic impairment, vascular injury or shoulder dislocation after this extensive ligament-capsular release.

Discussion

In our study, most of the patients with recalcitrant frozen shoulder were female, with the mean age of 51 years old. Left shoulder was affected more frequently than the right side. Almost 40% of patients suffered from diabetes mellitus. All of the 80 patients recovered from pain and achieved their highest range of motion in less than four months. Shoulder range of motion and clinical outcomes improved significantly compared with pre-operation according to different scores were used. The mean age of our patients was 51 years old, which was comparable to that reported in other studies (18-19). The average age of patients suffering from recalcitrant frozen shoulder were 54 and 50 in studies by Musil et al. and Cinaret al. respectively (18-19). Similar to our results, Sheridan et al. reported more involvement in women compared to men (20).

It is unclear whether arthroscopic release is superior to other more simple procedures such as manipulation under GA. In a current systematic review, 989 patients were reviewed and the authors did not find any difference between the outcomes of arthroscopic release and those of manipulation under GA (21).

The Constant shoulder score was 30 before surgery,

Table 4. Comparison of different clinical outcome measures before and after arthroscopic release in patients suffering from recalcitrant frozen shoulder

	VAS score	Constant score	DASH score	ROWE score	UCLA score
Before operation	9.3±1.8	30.1±9.3	56.6±19.7	46.4±14.2	13.8±4.9
During the last follow up visit	2.2±0.8	82.9±12.5	21±23.9	92.1±11.9	29.5±4.8
P value	*P*<0.001	*P*<0.001	*P*<0.001	*P*<0.001	*P*<0.001

which is in accordance with results of Berghset al., and Lafosse et al. (25 and 21 respectively) (22-23). This score improved to 83 postoperatively in our study, which is consistent with results from studies by Snow, Marquart, and Lafosse et al. (86, 92, and 72 respectively) (23-25). The result of ROWE score in our study was 92.1, which was also in comparable with those from studies by Marquart and (ROWE score of 92.1 and 92.3, respectively) (25-26). In terms of UCLA shoulder rating scale, our results improved after surgery from 14 to 29. Using the same scale, Ozbaydar et al. reported a score improvement from 12 to 30 (27).

Patients reported significantly improved pain control after arthroscopy. Ellmam et al., Lafosse et al. and Fuchs et al. showed similar results (23, 28-29). In our study VAS scores decreased from 9 to 2, which was comparable with results from Lafosse et al., who used lateral arthroscopic approach to release recalcitrant frozen shoulders and VAS score changed from 7 to 1.6 (23). Range of motion showed a constant improvement similar to other studies (21).

There were some limitations to our study. Namely, this is a single center study and we did not have a control group.

According to our results, arthroscopic release of recalcitrant frozen shoulders is a valuable technique, which could decrease pain and improve both subjective and objective outcomes in mid-term period of time.

Mohammad H Ebrahimzadeh MD
Ali Moradi MD
Mostafa Khalili Pour MD
Amir Reza Kachooei MD
Department of Orthopedic Surgery, Orthopedic Research Center, Ghaem Hospital, Mashhad University of Medical Sciences, Mashhad, Iran

Mohammad Hallaj Moghadam MD
Department of Orthopedic Surgery, Imam Reza Hospital Mashhad University of Medical Science, Mashhad, Iran

References

1. Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. Clin Orthop Relat Res. 1987; 214:160-4.
2. Bunker TD. Frozen shoulder: unravelling the enigma. Ann R Coll Surg Engl. 1997;79(3):210-3.
3. Goldberg BA, Scarlat MM, Harryman DT, 2nd. Management of the stiff shoulder. J Orthop Sci. 1999; 4(6):462-71.
4. Lundberg BJ. The frozen shoulder. Clinical and radiographical observations. The effect of manipulation under general anesthesia. Structure and glycosaminoglycan content of the joint capsule. Local bone metabolism. Acta Orthop Scand Suppl. 1969; 119:1-59.
5. Wolf JM, Green A. Influence of comorbidity on self-assessment instrument scores of patients with idiopathic adhesive capsulitis. J Bone Joint Surg Am. 2002; 84(7):1167-73.
6. Bunker TD, Anthony PP. The pathology of frozen shoulder. A Dupuytren-like disease. J Bone Joint Surg Br. 1995; 77(5):677-83.
7. Mohtadi NG, Bitar IJ, Sasyniuk TM, Hollinshead RM, Harper WP. Arthroscopic versus open repair for traumatic anterior shoulder instability: a meta-analysis. Arthroscopy. 2005; 21(6):652-8.
8. Simpson JK, Budge R. Treatment of frozen shoulder using distension arthrography (hydrodilatation): a case series. Australas Chiropr Osteopathy. 2004; 12(1):25-35.
9. Jurgel J, Rannama L, Gapeyeva H, Ereline J, Kolts I, Paasuke M. Shoulder function in patients with frozen shoulder before and after 4-week rehabilitation. Medicina (Kaunas). 2005; 41(1):30-8.
10. Vermeulen HM, Rozing PM, Obermann WR, le Cessie S, Vliet Vlieland TP. Comparison of high-grade and low-grade mobilization techniques in the management of adhesive capsulitis of the shoulder: randomized controlled trial. Phys Ther. 2006; 86(3):355-68.
11. Carette S, Moffet H, Tardif J, Bessette L, Morin F, Fremont P, et al. Intraarticular corticosteroids, supervised physiotherapy, or a combination of the two in the treatment of adhesive capsulitis of the shoulder: a placebo-controlled trial. Arthritis Rheum. 2003; 48(3):829-38.
12. Farrell CM, Sperling JW, Cofield RH. Manipulation for frozen shoulder: long-term results. J Shoulder Elbow Surg. 2005; 14(5):480-4.
13. Flannery O, Mullett H, Colville J. Adhesive shoulder

capsulitis: does the timing of manipulation influence outcome? Acta Orthop Belg. 2007; 73(1):21-5.
14. Homsi C, Bordalo-Rodrigues M, da Silva JJ, Stump XM. Ultrasound in adhesive capsulitis of the shoulder: is assessment of the coracohumeral ligament a valuable diagnostic tool? Skeletal Radiol. 2006; 35(9):673-8.
15. Hudak PL, Amadio PC, Bombardier C. Development of an upper extremity outcome measure: the DASH (disabilities of the arm, shoulder and hand) [corrected]. The Upper Extremity Collaborative Group (UECG). Am J Ind Med. 1996; 29(6):602-8.
16. Ellman H, Hanker G, Bayer M. Repair of the rotator cuff. End-result study of factors influencing reconstruction. J Bone Joint Surg Am. 1986;68(8):1136-44.
17. Rowe CR, Patel D, Southmayd WW. The Bankart procedure: a long-term end-result study. J Bone Joint Surg Am. 1978; 60(1):1-16.
18. Musil D, Sadovsky P, Stehlik J, Filip L, Vodicka Z. [Arthroscopic capsular release in frozen shoulder syndrome]. Acta Chir Orthop Traumatol Cech. 2009; 76(2):98-103.
19. 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(3):401-6.
20. Sheridan MA, Hannafin JA. Upper extremity: emphasis on frozen shoulder. Orthop Clin North Am. 2006; 37(4):531-9.
21. Grant JA, Schroeder N, Miller BS, Carpenter JE. Comparison of manipulation and arthroscopic capsular release for adhesive capsulitis: a systematic review. Journal of Shoulder and Elbow Surgery. 2013; 22(8):1135-45.
22. Berghs BM, Sole-Molins X, Bunker TD. Arthroscopic release of adhesive capsulitis. J Shoulder Elbow Surg. 2004; 13(2):180-5.
23. Lafosse L, Boyle S, Kordasiewicz B, Guttierez-Arramberi M, Fritsch B, Meller R. Arthroscopic arthrolysis for recalcitrant frozen shoulder: a lateral approach. Arthroscopy: The Journal of Arthroscopic & Related Surgery. 2012; 28(7):916-23.
24. Snow M, Boutros I, Funk L. Posterior arthroscopic capsular release in frozen shoulder. Arthroscopy. 2009; 25(1):19-23.
25. Marquardt B, Witt KA, Liem D, Steinbeck J, Potzl W. Arthroscopic Bankart repair in traumatic anterior shoulder instability using a suture anchor technique. Arthroscopy. 2006; 22(9):931-6.
26. Kim SH, Ha KI. Bankart repair in traumatic anterior shoulder instability: open versus arthroscopic technique. Arthroscopy. 2002; 18(7):755-63.
27. Ozbaydar MU, Bekmezci T, Tonbul M, Yurdoglu C. The results of arthroscopic repair in partial rotator cuff tears. Acta Orthop Traumatol Turc. 2006; 40(1):49-55.
28. Ellman H, Kay SP, Wirth M. Arthroscopic treatment of full-thickness rotator cuff tears: 2- to 7-year follow-up study. Arthroscopy. 1993; 9(2):195-200.
29. Fuchs B, Gilbart MK, Hodler J, Gerber C. Clinical and structural results of open repair of an isolated one-tendon tear of the rotator cuff. J Bone Joint Surg Am. 2006; 88(2):309-16.