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ORIGINAL ARTICLE

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Early arthroscopic release in refractory shoulder stiffness

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Abstract Frozen shoulder is still an enigma in shoulder surgery. It is reported that at 2 years after onset most patients will have recovered whether treated or not. To decrease time to recovery and improve the results of this condition, a number of different treatment modalities have been used. In our unit, all patients with frozen shoulder were selected for the arthroscopic release technique if a conservative program of physical therapy had failed to restore motion after 6 months and if they had no known extra-articular contractures. A prospective study was undertaken of 36 patients with refractory frozen shoulder who were treated with an arthroscopic capsulotomy between November 1997 and October 1999. There were 22 women and 14 men with an average age of 49 years (range 32–63 years). All of the patients were assessed for pain, function, and range of motion before surgery. Five patients were diabetic. An arthroscopic capsular release improved motion in all patients, with substantial relief of pain. Follow-up averaged 18 months (range 10–26 months). The median preoperative Constant score rose from 29 to 66 at the time of follow-up. By a mean of 8 weeks after treatment, 75% of the patients had returned to work. One patient developed recurrent refractory stiffness. There were no complications related to the procedure. This study demonstrates that arthroscopic capsular release can be a safe and effective tool in the management of refractory shoulder stiffness and is an effective way of shortening the course of an apparently self-limiting disease.

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Introduction

The frozen shoulder is a general term used to describe stiff and painful shoulders. Duplay is credited as first describing a frozen shoulder in 1872 [6]. He hypothesized that the pathology in these painful, stiff shoulders was linked to the periarticular soft tissues rather than arthritis of the glenohumeral joint. Numerous authors have published definitions since that time, making interpretation of clinical findings and treatment results difficult. Codman [4] first coined the term frozen shoulder in 1934: 'A class of cases which are difficult to define, difficult to treat and difficult to explain from the point of view of pathology.' Unfortunately, the term frozen shoulder is more colloquial than diagnostic; it has been described as a wastecan diagnosis, often overused and misapplied [11]. Currently, there is no agreement about its etiology. Traditionally, frozen shoulder has been regarded as a self-limiting condition, lasting 18–30 months and with no significant long-term follow-up [3, 9]. Frozen shoulder was defined in 1994 by the American Shoulder and Elbow Society [25] as a condition characterized by functional restriction of both active and passive shoulder motion. A classification scheme divided frozen shoulder into primary and secondary types. Secondary types were further subdivided into those associated with systemic, extrinsic, and intrinsic disorders. To decrease the time of recovery and improve the results of these conditions, a number of different treatment modalities have been used. Many frozen shoulder patients are frustrated from their lack of improvement after conservative therapy. Even in 1986 Ogilvie-Harris and Wiley [13] recommended arthroscopic treatment for this condition. During the past 20 years, shoulder arthroscopy has evolved from a limited diagnostic modality to a surgical tool capable of treating a number of pathologic conditions in the shoulder. A multitude of arthroscopic techniques have been developed to manage different shoulder problems while

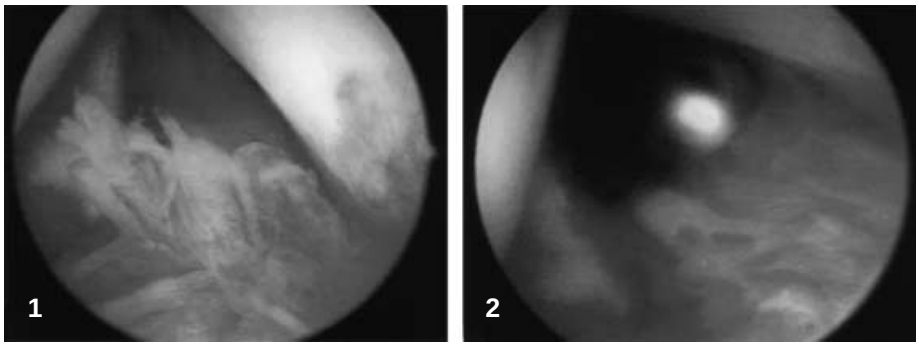

Fig. 1 Proliferative synovitis around and in front of the long head of biceps

Fig. 2 Debridement with a soft-tissue resector, which has been introduced anteriorly into the interval area

decreasing surgical morbidity. Recently, several reports have shown good results with arthroscopic treatment of the frozen shoulder [1, 2, 8, 11, 12, 14, 15, 16, 21, 22, 24]. The purpose of this study was to assess the outcome of a consecutive group of patients with refractory shoulder stiffness treated by arthroscopic release followed by early physiotherapy under sufficient analgesia.

Patients and methods

From November 1997 through October 1999, 36 consecutive patients were treated in our practice because of refractory frozen shoulder by arthroscopic release. There were 22 women and 14 men with a mean age of 49 years (range 32–63 years). The mean duration of the symptoms before the operation was 13 months with a minimum of 6 months. The patients had undergone an average of 8 months of supervised physical therapy (range 3–19 months) and had taken nonsteroidal anti-inflammatory medication. When symptoms persisted for more than 6 months, surgery was recommended. No surgical procedure had been performed before our intervention. Five patients were diabetic. The right arm was affected in 19 patients, and the left in 17 patients. Five patients had a history of involvement of the other shoulder. None of the patients had a bilateral presentation at the same time. Patients were diagnosed by clinical examination and history. Routine radiography was performed. The Constant-Murley score [5] was calculated right before the operation and at the follow-up examination. All of the patients were evaluated with regard to functional outcome after an average follow-up of 18 months (range 10–26 months). For statistical evaluation of the results, the unpaired Student's *t*-test was applied. The level of significance was $p<0.05$.

Surgical technique

All patients underwent arthroscopy under general anesthesia. Before starting arthroscopy, the patient was placed supine on the surgical table, and the passive range of motion was compared with the opposite side. Then the patients were positioned lying on their side on the unaffected shoulder. The surgical anatomy was marked on the skin and the posterior soft spot identified by palpation. A standard posterior portal was used for entry of the arthroscope. A systematic inspection was then undertaken to determine the sites and severity of any synovitis [16]. The biceps tendon and synovitic rotator interval were visualized initially (Fig. 1). An anterior portal was established by first introducing a needle into the interval area from outside. Through the anterior portal, a soft-tissue resector was introduced, and then interval synovitis and rotator cuff interval contracture were debrided (Fig. 2). To restore external rotation, an anterior arthroscopic capsular release is performed beginning just inferior to the biceps tendon and continuing to the inferior edge of the glenoid, extending down to the five o'clock position for the right glenoid and down to the seven o'clock position for the left glenoid [20]. To minimize the risk of injury to the axillary nerve, it is important not to release down through the axillary pouch. If there is continued loss of internal rotation and flexion after an anterior release, arthroscopic release of the posterior capsule is also necessary [20]. Division of the posterior capsule was performed along the glenoid rim because the muscle of the cuff tendons are superficial to the capsule at this level. On completion, subacromial arthroscopy was performed in all patients, and subacromial bursal adhesions were observed and debrided. At the end of the arthroscopy, postoperative motion was measured, and a gentle manipulation of the shoulder was performed.

Physiotherapy regimen

A physiotherapy program was started immediately after surgery. Physiotherapy emphasized the functional planes of motion, namely, forward elevation, external rotation, and internal rotation. Narcotic supplementation was used as needed. The mean hospital stay was 7 days (range 6–13 days). After discharge, physical therapy was continued on an outpatient basis for 3–7 weeks.

Results

The mean duration of follow-up for the 36 patients who had undergone an arthroscopic capsular release was 18 months (range 10–26 months). During arthroscopy, proliferative synovitis was present in all shoulders. The majority of significant synovitis was noted in the interval area. Significant intra-articular adhesions were found in 4 shoulders. There were no complications related to the arthroscopic procedure, no wound infections or neurovascular compromise. The score of Constant and Murley [5] improved a mean of 37 points, from a mean of 29 (range

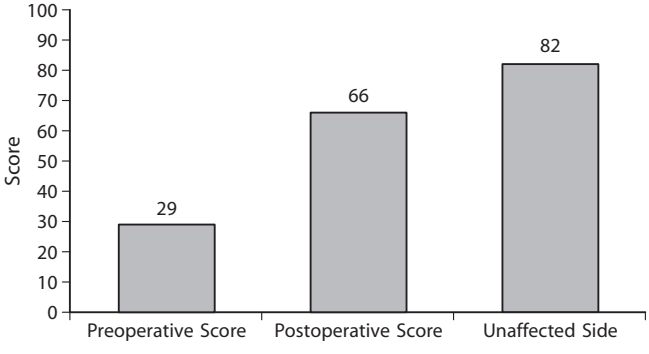

Fig. 3 Graphs showing the Constant and Murley scores

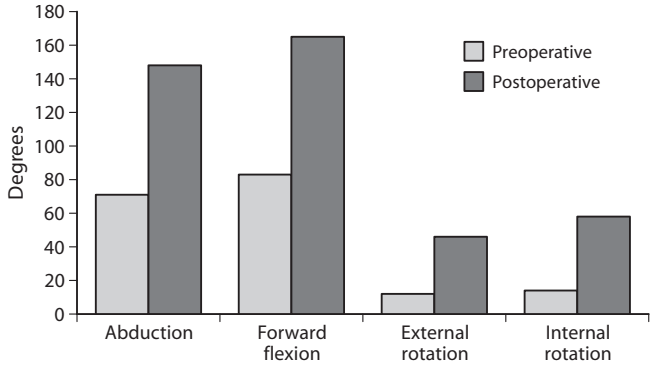

Fig. 4 Graphs showing the preoperative and postoperative range of motion

14–51) preoperatively to a mean of 66 (range 35–91) at the time of follow-up (Fig. 3). In particular, there was no secondary instability noted postoperatively, and there was no relationship between the end result and the initial pathologic findings. All patients noted substantial relief of pain. Before surgery, the mean range of movement (ROM) was 71º of abduction, 83º of forward flexion, 12º of external rotation, and 14º of internal rotation. At the time of the follow-up examination, the range of movement had improved to a median of 148º abduction, 165º of forward flexion, 46º of external rotation, and 58º of internal rotation (Fig. 4). All improvements in range of motion were significant ($p<0.05$). Only one patient developed recurrent refractory stiffness. By a mean of 8 weeks after treatment, 75% of the patients returned to work.

Discussion

Frozen shoulder remains an enigma and is a difficult problem to manage. Primary (idiopathic) frozen shoulder is a condition of unknown etiology characterized by a spontaneous onset of shoulder pain accompanied by increasingly severe limitation of glenohumeral passive and active movements in all directions [10]. The painful stiff shoulder has been the subject of numerous investigations to determine an effective treatment for this disabling condition. Although frozen shoulder is believed to be a self-limiting condition that frequently can be treated with physical therapy, some patients may be unwilling to wait the time required for the resolution of symptoms [17]. Studies that determined the natural history of this condition have shown that resolution of the disease often takes up to 2–3 years [7, 8]. It is estimated that 3% of general population will develop frozen shoulder, whereas the occurence may be as high as 36% in insulin-dependent diabetic patients [3, 12]. Recently, arthroscopic surgical techniques have been reported for the release of glenohumeral capsular contractures in selected patients [1, 2, 8, 12, 13, 14, 15, 16, 18, 22, 23]. The high degree of success obtained in using the arthroscopic techniques in patients with primary frozen shoulder contrasts greatly with the results obtained in diabetic patients with frozen shoulder [16]. The high failure rate in this latter group parallels the findings of previous authors [12]. We, however, did not find poorer results in patients with diabetes. It is important to emphasize that treatment of primary adhesive capsulitis should not be considered while the patient is experiencing severe pain in addition to motion loss because this may represent the inflammatory phase of the disease [20]. Neviaser and Neviaser [11] have pointed out that any surgical treatment in this stage will likely exacerbate the patient's loss by increasing capsular injury. This is supported by the observation that the frozen shoulder syndrome and Sudeck syndrome are clinically similar in many aspects. There are several indications in the literature that suggest that the frozen shoulder is an algoneurodystrophic process [10], and normally surgery is contraindicated during the acute phase of a reflex sympathetic dystrophy [19]. If after a suitable waiting time (at least 6 months) and adequate conservative treatment the patient continues to report a loss of range of movement and functional impairment, an arthroscopic procedure offers the patient a better change of improvement. The duration of conservative treatment for adhesive capsulitis has been debated [11, 18, 21]. We arbitrarily chose a 6-month limit. Although closed manipulation under anesthesia has proven successful in some patients, it has also been associated with complications such as humeral fracture, nerve injury, and dislocation of the shoulder. The risks seem lower in patients treated with arthroscopic release [14]. In a prospective cohort study of Ogilvie-Harris et al. [14], manipulation vs arthroscopic release was compared. Patients treated with manipulation did as well as the patients treated with arthroscopic division for restoration of their range of movement. However, the patients in the arthroscopic division group had significantly better pain relief and restoration of function. Based upon the reports of Ogilvie-Harris et al. [14] and Warner et al. [21], who have demonstrated the efficacy of arthroscopic capsular release for the refractory frozen shoulder, it is possible with this arthroscopic technique to improve the shoulder's range of motion, reduce pain, and return shoulder function with diminished postoperative morbidity.

Our own experiences support these findings. In conclusion, we believe that early arthroscopic release may be an effective form of treatment with minimum morbidity in selected compliant patients who have refractory shoulder stiffness and is an effective way of shortening the course of an apparently self-limiting disease. Outcomes may vary following capsular release depending on the etiology of the frozen shoulder.

References

1. Andersen NH, Sojbjerg JO, Johannsen HV, Sneppen O (1998) Frozen shoulder: arthroscopy and manipulation under general and early passive motion. J Shoulder Elbow Surg 7: 218–222
2. Beaufils P, Prevot N, Boyer T, et al (1999) Arthroscopic release of the glenohumeral joint in shoulder stiffness: a review of 26 cases. French Society for Arthroscopy. Arthroscopy 15: 49–55

3. Bunker TD, Anthony PP (1995) The pathology of frozen shoulder: A Dupuytren-like disease. J Bone Joint Surg Br 77: 677–683
4. Codman EA (1934) The shoulder. Todd, Boston
5. Constant CR, Murley AH (1987) A clinical method of functional assessment of the shoulder. Clin Orthop 214: 160–164
6. Duplay ES (1872) De la periarthrite scapulohumerale et des raideuers de l´epaule qui en son la consequence. Arch Gen Med 20: 513–542
7. Grey RG (1978) The natural history of idiopathic frozen shoulder. J Bone Joint Surg Am 60: 564
8. Harrymann DT, Matsen FA, Sidles JA (1997) Arthroscopic management of refractory shoulder stiffness. Arthroscopy 13: 133–147
9. Melzer C, Wallny T, Wirth CJ, Hoffmann S (1995) Frozen shoulder – treatment and results. Arch Orthop Trauma Surg 114: 87–91
10. Muller LP, Rittmeister M, John J, Happ J, Kerschbaumer F (1998) Frozen shoulder – an algoneurodystrophic process? Acta Orthop Belg 64: 434–440
11. Neviaser RJ, Neviaser TJ (1987) The frozen shoulder: diagnosis and management. Clin Orthop 223: 59–64
12. Ogilvie-Harris DJ, Myerthall S (1997) The diabetic frozen shoulder: arthroscopic release. Arthroscopy 13: 1–8
13. Ogilvie-Harris DJ, Wiley AM (1986) Arthroscopic surgery of the shoulder. A general appraisal. J Bone Joint Surg Br 68: 201–207
14. Ogilvie-Harris DJ, Biggs DJ, Fitsialos DP, MacKay M (1995) The resistant frozen shoulder. Manipulation versus arthroscopic release. Clin Orthop 319: 238–248
15. Pearsall AW, Osbahr DC, Speer KP (1999) An arthroscopic technique for treating patients with frozen shoulder. Arthroscopy 15: 2–11
16. Pollock RG, Duralde XA, Flatow EL, Bigliani LU (1994) The use of arthroscopy in the treatment of resistant frozen shoulder. Clin Orthop 304: 30–36
17. Shaffer B, Tibone JE, Kerlan RK (1992) Frozen shoulder. A long-term follow-up. J Bone Joint Surg Am 74: 738–746
18. Uitvlugt G, Detrisac DA, Johnson LL, Austin MD, Johnson C (1993) Arthroscopic observation before and after manipulation of frozen shoulder. Arthroscopy 9: 181–185
19. Walker SM, Cousins MJ (1997) Complex regional pain syndromes: including ‘reflex sympathetic dystrophy’ and ‘causalgia’. Anaesth Intensive Care 25: 113–125
20. Warner JJP (1997) Frozen shoulder. Diagnosis and management. J Am Acad Orthop Surg 5: 130–140
21. Warner JJP, Allen A, Marks PH, Wong P (1996) Arthroscopic release for chronic refractory adhesive capsulitis of the shoulder. J Bone Joint Surg Am 79: 1808–1816
22. Watson L, Dalziel R, Story I (2000) Frozen shoulder: a 12-month clinical outcome trial. J Shoulder Elbow Surg 9: 16–22
23. Wiley AM (1991) Arthroscopic appearance of frozen shoulder. Arthroscopy 7: 138–143
24. Zanotti RM, Kuhn JE (1997) Arthroscopic capsular release for the stiff shoulder. Description of technique and anatomic considerations. Am J Sports Med 25: 294–298
25. Zuckermann JD, Cuomo F, Rokito S (1994) Definition and classification of frozen shoulder: a consensus approach. J Shoulder Elbow Surg 3: S72 (part 2)