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The Diabetic Frozen Shoulder: Arthroscopic Release

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— **Abstract** —

In diabetics, the frozen shoulder has been difficult to treat. They tend to respond poorly to manipulation. In this report we present the rationale and results of arthroscopic selective capsular release for those patients. Nine patients, who were diabetics, developed frozen shoulders which failed to respond to conservative management. They had persistent pain, stiffness, and limited function. An arthroscopic release was performed by progressively releasing the anterior structures from superior to inferior. Postoperatively physiotherapy was carried out daily to maintain the range of movement. At a follow up of 12 to 37 months the patients were assessed using the American Shoulder Society scheme. In addition, the patients were assessed preoperatively and postoperatively on four criteria: pain, external rotation, abduction and function. We found that the patients were statistically significantly improved in all four categories. Three of the nine patients had no pain, full range of motion compared with the opposite side and full function. There was one poor result of no improvement. The remaining five patients had improved but still had residual abnormalities. We consider arthroscopic release to be an effective treatment for the resistant diabetic frozen shoulder.

Key Words : Frozen shoulder, Diabetes, Arthroscopy

INTRODUCTION

The term "frozen shoulder" refers to a condition in which the shoulder loses range of motion in external rotation and abduction. The precise cause is unknown, but recent studies have suggested that a pathological process similar to Dupytren's contracture is involved[2,17]. To establish this diagnosis it is necessary to rule out significant intra-articular pathology, such as a large rotator cuff tear with a secondary capsular contracture. A thorough history taking and physical examination is probably the best way.

The initial management of frozen shoulder consists of encouragement and gentle physical therapy, performed either independently or in a supervised setting. The majority of patients will respond to nonoperative management and require no further treatment. The treatment of resistant frozen shoulder

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(that is, a frozen shoulder which has not responded to a gentle stretching and pain control program) varies markedly in the literature. Suggested treatment regimens have included continued encouragement and gentle physical therapy, steroid injections, sustained traction[22], hydraulic distention[1,6,10], arthroscopic release, manipulation under anesthesia alone[11,18,22] or in combination with coracohumeral ligament release[16], and open release of contracted structures[11].

The role of arthroscopy in the treatment of frozen shoulder is likewise poorly defined, with few large studies in the literature, leaving experts in decided disagreement as to its usefulness[5,15]. In clinical trials arthroscopy has proven important in delineating the pathology present in frozen shoulder, as well as documenting the results of closed manipulation[12,22], but recommendations for its widespread use are conflicting. Some believe strongly that it has no use in the treatment of adhesive capsulitis[11], whereas others use this technique to assist with distention of the joint[9] or to visualize and treat associated lesions in the shoulder joint after manipulation.

In diabetics, the frozen shoulder has been difficult to treat. They tend to respond poorly to manipulation[7]. In many cases the patients are left with persistent loss of motion and function. With this group of patients we carried out an arthroscopic release to restore mobility and function.

MATERIALS AND METHODS

The study group consisted of diabetic patients with a frozen shoulder who had failed to respond to conservative treatment. All patients had had nonsteroidal anti-inflammatory medication and physiotherapy. Intra-articular injections of cortisone (40 mgs of dexamethasone) were administered as part of the conservative treatment. Approximately half of the patients responded to this treatment regimen. When symptoms persisted more than six months, surgery was recommended. Nine patients over a period of 12 months were available for follow up. Five were male. The average age was 43 years with a range of 32 to 64 years. Follow up varied from 12 months to 37 months with an average of 18 months. The average duration of symptoms prior to surgery was 16 months with a minimum of six months.

The results were assessed independently by the American Shoulder Society score system. This assesses separately five criteria. The first is pain scored as zero (complete disability) to five (none). The second is motion, assessed in the sitting position, by measuring total active elevation, passive internal rotation, active external rotation with the arm at the side, and active external rotation at 90°. Also, with the patient supine, passive total elevation and passive external rotation with the arm at the side are evaluated. The third criteria is strength measured on a scale of zero (paralysis) to five (normal) in the anterior deltoid, middle deltoid, external rotation, and internal rotation. The fourth criteria are stability graded zero (fixed dislocation) to five (normal) and assessed in the anterior, posterior and inferior planes. The fifth and final criteria is function which evaluates fifteen activities of daily living. Each is scored from zero (unable) to four (normal).

In addition we used a scoring system to assess specifically the frozen shoulder[14]. This was carried out preoperatively and postoperatively. We used four outcomes:

pain, external rotation, abduction, and function. Pain was assessed on an ordinal scale from one to four: one - no pain, two - mild or occasional, three - moderate, four - persistent including night.

The loss of range of movement was measured in external rotation with the arm at the side and glenohumeral abduction in the scapular plane. An ordinal scale was used to grade the loss compared to the opposite side. Grade 1 was a normal range of movement. Grade 2 was a loss of up to one third and grade 3 more than one third loss of the normal range. We chose this ordinal scale in recognition of the fact that small losses in the range of movement were not of functional significance.

Functional outcome was assessed on an ordinal scale from one to four. Grade 1 was full function. Grade 2 was a mild loss of function with minimal interference of daily activities. Grade 3 was moderate symptoms necessitating changes in the pattern of activity. Grade 4 was severe, with difficulty in carrying out daily tasks and transfer of activities to the unaffected extremity. The difference was analyzed statistically using the Wilcoxon ranked sign test. The null hypothesis that there was no change postoperatively was rejected at $P>0.05$.

SURGICAL TECHNIQUE

The patients were generally admitted the day before surgery and discharged four or five days after surgery. This was to allow the diabetes to be stabilized. Some patients required a hospital stay over seven days following surgery in order to stabilize blood sugars adequately. None of these patients had had previous manipulations.

In all cases the arthroscopy was performed under general anaesthesia. The patients were positioned lying on their side on the unaffected shoulder. No traction was used and the shoulder was free draped. Gentle longitudinal manual traction was sometimes employed when entry was difficult (Fig. 1).

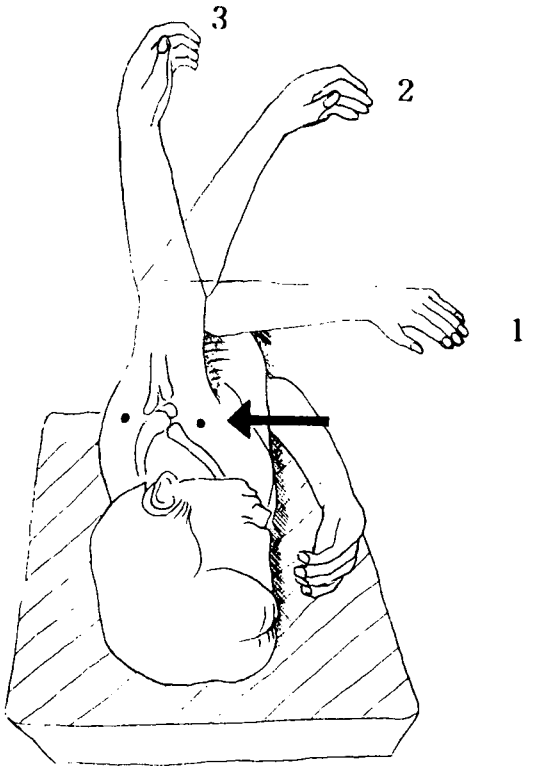

Fig. 1. The patient is positioned on the unaffected side. The head of the table is elevated 45°. The patient's arm is started off in the neutral position(1) and then, gradually progressively externally rotated as the anterior soft tissues are divided(Position 2 and 3). At the end of the procedure, the arm is able to be rotated to 90° of external rotation(Position 3).

A standard posterior portal was used for the entry of the arthroscope. Intraarticular pathology was assessed. The subacromial space was entered and any pathology recorded. An anterior portal was established by first introducing a needle into the interval area from the outside. Then a 5.5㎜ soft tissue resector was introduced into the

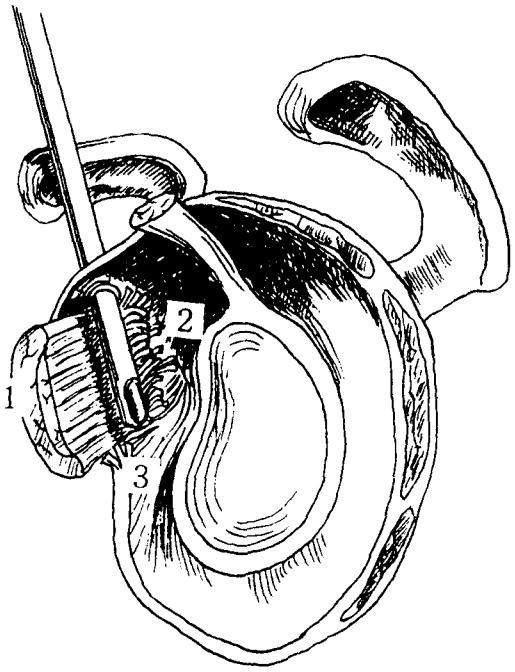

Fig. 2. The posterior portal has been used for the arthroscope. The soft tissue resector has been introduced anteriorly into the interval area. The first step of the procedure is to resect the abnormal synovium and tissue in the interval area and open up the interval area.
1= intraarticuiar portion of the subscapularis tendon; 2 = inflamed tissue in the interval area ; 3 = soft tissue resector.

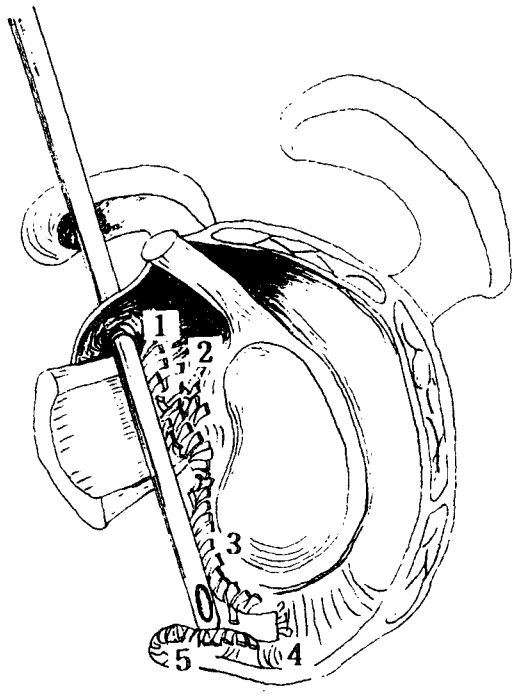

Fig. 3. With progressive external rotation of the shoulder, as in Fig. 1, the inferior glenohumeral ligament is completely divided(3). The inferior capsule is divided(5).
1 = intraarticular portion of the subscapularis tendon; 2 = the anterior superior glenohumeral ligament and middle glenohumeral ligament; 4 = the infraglenoid recess; 5 = the inferior capsule; 3 = the anterior inferior glenohumeral ligament.

joint. Initially, the shoulder was held in position of rotation to visualize the tight lures. The synovitis present in the interval area between the subscapularis and supraspinatus was first of all resected(Fig. 2). The anterior structures were then divided progressively using the motorized shaver. We started with the anterior superior glenohumeral ligament and then the anterior capsule that was deep in the subscapularis tendon. The intra-articular portion of the subscapularis was divided in such a way that we could see muscle beneath it. The inferior capsule was divided, taking care to visualize the tip of the shaver at all times so as not to damage underlying structures(Fig. 3). We found it essential to use pressure irrigation throughout the procedure to ensure adequate visualization. Throughout the division of the anterior structures, the arm was progressively externally rotated. At the end of the procedure we found that there was full external rotation. Local anaesthetic was placed into the shoulder joint at the end of the procedure.

We were concerned about the extravasation of fluid. Certainly when the anterior capsule was released, fluid would leak out into the anterior tissues. Therefore we

took care to minimize the duration of the procedure. Following the procedure the axilla was examined to determine if there was significant swelling. We noted that the patients had a thin, red skin crease in the axilla which represented the release of the previous contracture. Careful neurovascular assessment was performed postoperatively to make sure that there was no impairment. If there was a concern that the swelling in the axilla would compromise the neurovascular structures, the patient was observed hourly until the swelling decreased. This happened in one patient, and the swelling resorbed in approximately four hours.

RESULTS

1. American Shoulder Society Scoring

On the pain score, three patients were graded as 5, having no pain. Four patients were graded as four, having slight pain. One patient had pain after unusual activity (Grade 3). One patient had marked pain (Grade 1).

Active total elevation of the arm averaged 160°. Four of the patients achieved full active total elevation. The worse results were one patient who scored 45° and one patient who scored 80°. In six of the nine patients strength was noted to be normal in the anterior deltoid, middle deltoid, external rotation, and internal rotation positions. In one of the patients, external rotation was noted to be slightly weaker, scoring Grade 4. The remaining two patients showed Grade 4 muscle strength in all motion directions. Stability was noted to be normal in seven patients. Two patients had mild anterior instability with apprehension on full abduction and external rotation. No patient had any episode of subluxation or dislocation. Function was assessed using 15 criteria as outlined in Table 1. Only three patients had nearly normal function in all

Table 1. Summary of Functional Assessment by Activity

Activity	Normal	Mild Compromise	Difficulty	With Aid	Unable
Back Pocket	4	3	1	1	
Perineal Care	7	2			
Wash Opposite Axilla	5	2	1	1	
Eat With Utensil	7	1	1		
Comb Hair	5	2	2		
Use Hand With Arm at Shoulder Level	5	3	1		
Carry 10 to 15 lbs With Arm at Side	4	3	2		
Dress	5	2	1		
Sleep on Affected Side	3	4	1	1	
Pulling	5	2	1	1	
Use Hand Overhead	4	3	1	1	
Throwing	4	3	2		
Lifting	7	1	1		
Work	5	3	1		
Sport	4	3	2		

NOTE. Summary of functional assessment by activity using the American Society for the Shoulder System. The values in Table 1 are the number of patients in each category.

these criteria. The areas that caused particular difficulty were use of the hand with the arm at shoulder level, sleeping on the affected side, use of the hand overhead and throwing.

2. Outcome Scores

Pain scores preoperatively showed that six patients had severe pain, two moderate pain, and one mild pain(Table 2). Postoperatively three patients were pain free, four had mild, one moderate and one severe pain. This was significant. External rotation was limited by more than one-third -compared to the opposite side in 7 patients preoperatively(Table 3). Postoperatively 4 patients had normal external rotation, 4 had limitation of less than one-third and 1 still had persistent limitation of more than one-third. This was statistically significant.

Abduction was improved substantially from a preoperative value in which 7 patients had loss of more than one-third to a postoperative value of which 4 patients were normal. This was statistically significant(Table 4).

Preoperatively the function was severely restricted in 6 patients with a moderate loss in 2 patients(Table 5). Postoperatively function was normal in 3 patients with a mild loss in 4, a moderate loss in 1 and severe loss persisted in 1 patient. There was a statistically significant change. Overall 1 patient did poorly, with pain, loss of movement and function.

3. Complications

There were no complications in this series. There were no wound infections or neurovascular compromise. The patients had not been given prophylactic antibiotics. Although some patients had to stay in the hospital for several days after the procedure to stabilize the blood sugars,

Table 2. Preoperative and Postoperative Pain Scores

Score	1	2	3	4	*p* Value
Pain Preop		1	2	6	
Pain Postop	3	4	1	1	0.009

NOTE. Values in Table 2 are the number of patients in each category.
1 = None; 2 = Mild; 3 = Moderate; 4 = Severe

Table 3. External Rotation Scores Preoperatively and Postoperatively

Score	1	2	3	*p* Value
External Rotation Preop	0	2	7	
External Rotation Postop	4	4	1	0.003

NOTE. Values in Table 3 are the number of patients in each category.
1 = Normal; 2 = Loss of One Third;
3 = Loss of More Than One Third Compared With the Opposite Side.

Table 4. Abduction Scores Preoperatively and Postoperatively

Score	1	2	3	*p* Value
Abduction	0	2	7	
Abduction Postop	4	4	1	0.003

NOTE. Values in Table 4 are the number of patients in each category.
1 = Normal; 2 = Loss of One Third;
3 = Loss of More Than One Third Compared With the Opposite Side

Table 5. Function Scores Preoperatively and Postoperatively

Score	1	2	3	4	*p* Value
Function Preop	0	1	2	6	
Function Postop	3	4	1	1	0.009

NOTE. Values in Table 5 are the number of patients in each category.
1 = Full Function; 2 = Mild Loss; 3 = Moderate Loss;
4 = Severe Loss

there were no actual complications from the medical condition.

DISCUSSION

The precise cause of the frozen shoulder is unknown. Trauma does not seem to play a significant role, although it can, in some circumstances, be an initiating factor. The site of the pathological lesion seems to be the rotator interval[13,16,22]. This is the area between the tendons of the subscapularis and supraspinatus. A recent study has shown that abnormal tissue grows in this area which has a myofibrillar nature[2]. This is similar to the tissue found in Dupuytren's contracture and may account for the severity of the contracture and it's resistance to treatment in some circumstances[17].

There is a general consensus among investigators that patients with diabetes mellitus are: (1) at higher developing stiffness especially if insulin-dependent for more than 10 years; (2) have more stiffness and a poorer prognosis[3]; and (3) have a more protracted recovery after treatment than patients with idiopathic shoulder stiffness[3,7].

Lundbaek[9] in 1957, was the first to describe restricted joint mobility in patients with diabetes mellitus. In 1986, Fisher et al.[3], were the first to note an association between cheiroarthropathy and frozen shoulder. They found a 44.8% incidence of frozen shoulders in insulin-dependent diabetics with cheiroarthropathy compared with 7.1% in a control group of insulin-dependent diabetics without cheiroarthropathy. Of note, they also found an increased frequency of the microvascular complications of diabetes, including advanced retinopathy and peripheral neuropathy, in those with cheiroarthropathy. Unfortunately, the underlying etiology and pathogenesis of cheiroarthropathy is not known. Histological examination of the lesions seen in Dupuytren's contracture and frozen shoulder reveals excess connective tissue and alterations in the structure of collagen.

Hyperglycemia leads to an increase in the intermolecular cross-linkages in collagen through nonenzymatic cosylation. This makes the collagen more resistant to degeneration and more likely to accumulate. These cross links may also be responsible for the stiffening of the connective tissue. This may be the underlying mechanism seen in the fibrosis or fibroplasia of frozen shoulder as recently reported[2].

The process of fibrosis in soft tissue injury may result from increased numbers (proliferation and recruitment) of collagen synthesizing cells, increased matrix synthesis by existing cells, and/or deficient collagen degradation with continued collagen synthesis. An imbalance between synthesis and degradation leads to collagen accumulation. Reversing the fibrotic process may be possible by inhibiting the inflammatory response, or by inhibiting the angiogenesis essential for tissue repair and fibrosis[8]. As shown in diabetic retinopathy, there is a broken in anti-angiogenesis mechanism in diabetic patients, and this may be the cause of the frozen shoulder in diabetic patients.

Diabetics have a higher incidence of frozen shoulder than those without the disease. It is estimated that 3% of the general population will develop frozen shoulder, whereas the occurrence may be as high as 36% with the insulin-dependent diabetics[2]. Also, among patients with

bilateral shoulder involvement, 42% have some form of diabetes[2]. The condition tends to be more difficult to treat in the diabetic, as these patients often fail to respond to manipulation[7]. The reason for the increased incidence and severity of frozen shoulder in diabetics is not known.

The conservative treatment for the frozen shoulder remains the long-established primary method of care. Most patients will respond to this. Treatment such as intraarticular and subacromial steroid injections, distension and manipulation have been used. Recently, papers on the arthroscopic release of the frozen shoulder have shown to be effective[4,19,22]. However, diabetics were reported to have had less satisfactory results[14,19]. The use of arthroscopy in the management of the stiff shoulder is a relatively new concept.

Before the present report, arthroscopy has been used to: (1) identify the appearance and local pathological changes in the glenohumeral joint and subacromial space[4,11,22]; (2) identify problems often associated with shoulder stiffness such as a tendon tear[14,19]; (3) examine the joint after manipulative capsular disruption[19]; and (4) specifically to assist treatment of the stiff shoulder by synovectomy and/or releasing tissue contractures[5,14,21].

In our series we were able to obtain good results overall, except for two patients. These two patients were not improved by the surgery. They had persistent pain, loss of motion, and functional deficits. One of these patients repeated the procedure, but without substantial improvement. Among nine patients, three had nearly normal function. Five had almost normal function with residual difficulties being in the use of the arm in the overhead position, throwing and sleeping on the shoulder. Overall, the results of the arthroscopic release were relatively satisfactory. The procedure did require hospital admission and stabilization of the blood sugar preoperatively and postoperatively. The major surgical risk factor in these patients was, in fact, the diabetes itself. Potentially, these patients could be managed on an outpatient basis if adequate medical back up based on blood glucose determination was available to monitor and intervene when necessary.

Our recommended treatment for the diabetic frozen shoulder consists of establishing a correct diagnosis by history, physical examination, and other investigations as necessary; for example, an arthrogram if a complete rotator cuff tear is suspected. The patient should be placed on a nonsteroidal anti-inflammatory and given rigorous physiotherapy with mobilizations. If response is lacking, we would inject the shoulder joint intraarticularly with a mixture of 20 ccs of local anesthetic mixed with a steroid. Further therapy will follow. After six months without significant improvement, arthroscopic release is recommended.

CONCLUSIONS

In the diabetic population, we feel that conservative treatment should initially be carried out following the development of a frozen shoulder. Physiotherapy and intraarticular cortisone with distension are valuable in the initial management. However, when the symptoms are persistent and with significant functional disability, arthroscopic release will offer improvement to most patients with relatively small risks.

REFERENCES

1) **Andren L and Lundberg BJ** : Treatment of rigid shoulders by joint distension during arthrography. *Acta Orthop Scand*, 36:45-53, 1965(cited from Ogilvie-Harris DJ and Myerthall S : The diabetic frozen shoulder: Arthrpscopic release. *The Journal of Arthroscopic and Related Surgery*, 13:1-8, 1997.
2) **Bunker TD and Anthony PP** : The pathology of frozen shoulder: a dupuytren's like disease. *J Bone Joint Surg Br*, 77-B:677-683, 1995.
3) **Fisher L, Kurtz A and Shipley M** : Association between cheiro-arthropathy and frozen shoulder in patients with insulin-dependent diabetes mellitus. *Br J Rheum*, 25:141-146, 1986.
4) **Ha'eri GB and Maitland A** : Arthroscopic findings in the frozen shoulder. *J Rheum*, 8:149-152, 1981.
5) **Harryman DT** : Shoulders: frozen and stiff. 2nd ed. *Instr Course Lect*, 42:247-57, 1993.
6) **Hsu SYC and Chan KM** : Arthroscopic distension in the management of frozen shoulder. *Int Orthop*, 15:79-83, 1991.
7) **Janda DH and Hawkins RJ** : Shoulder manipulation in patients with adhesive capsulitis and diabetes mellitus: a clinical note. *J Shoulder Elbow Surg*, 2:36-38, 1993.
8) **Leadbetter WB, Buckwalter JA and Gordon SL** : Sports-induced inflammation. 1st ed, Park Ridge, *American Academy of Orthopaedic Surgeons*:641, 1999.
9) **Lundbaek K** : Stiff hands in long term diabetics. *Acta Med Scand,* 158:447-451, 1957(cited from Ogilvie- Harris DJ and Myerthall S : The diabetic frozen shoulder: Arthrpscopic release. *The Journal of Arthroscopic and Related Surgery*, 13:1-8, 1997).
10) **Lundberg BJ** : The frozen shoulder. *Acta Orthop Scand*, 119(Suppl):1-59, 1969(cited from Pollock RG, Duralde XA, Flatow EL and Bigliani LU : The Use of Arthroscopy in the Treatment of Resistant Frozen Shoulder. *Clin Orthop*, 304:30-36, 1994).
11) **Neviaser RJ and Neviaser TJ** : The frozen shoulder. Diagnosis and management. *Clin Orthop*, 223: 59-64, 1987.
12) **Neviaser TJ** : Adhesive capsulitis. *Orthop Clin North Am*, 18:439-443, 1987.
13) **Nobuhara K, Sugiyama D, Ikeda H and Makiura M** : Contracture of the shoulder. *Clin Orthop*, 254:105-110, 1990.
14) **Ogilvie-Harris DJ, Biggs DJ, Fitsialos DP and MacKay M** : The resistant frozen shoulder. Manipulation versus arthroscopic release. *Clin orthop*, 319:238-248, 1995.
15) **Ogilvie-Harris DJ and Wiley AM** : Arthroscopy surgery of the shoulder: a general appraisal. *J Bone Joint Surg Br*, 68:201-207, 1986.
16) **Ozaki J, Nakagawa Y, Sakurai G and Tamai S** : Recalcitrant chronic adhesive capsulitis of the shoulder. Role of contracture of the coracohumeral ligament and rotator interval in pathogenesis and treatment. *J Bone Joint Surg Am*, 71:1511-1515, 1989.
17) **Pal B, Griffiths ID, Anderson J and Dick WC** : Association of limited joint mobility Dupuytren's contracture in diabetes mellitus. *J Rheum*, 143: 592-585, 1987.
18) **Parker RD, Froimson AI, Winsberg DD and Arsham NE** : Frozen shoulder Part II: Treatment by manipulation under anesthesia. *Orthopedics*, 12:989- 990, 1989.
19) **Pollock RG, Duralde XA, Flatow EL and Bigliani LU** : The use of arthroscopy in the treatment of resistant frozen shoulder. *Clin Orthop*, 304:30-36, 1994.
20) **Segmuller HE, Taylor DE, Hogan CS, Saies AD and Hayes MG** : Arthroscopic treatment of adhesive capsulitis. *J Shoulder Elbow Surg*, 4:403-408, 1995.
21) **Warner JJP, Allen A, Marks P and Wong P** : Arthroscopic release of chronic, refractory capsular contracture of the shoulder. *J Shoulder Elbow Surg*, 5:S7, 1995.
22) **Wiley AM** : Arthroscopic appearance of frozen shoulder. *Arthroscopy*, 7:138-143, 1991.

— 국문초록 —

당뇨병성 동 견관절의 관절경 하 박리술

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당뇨병 환자에서 동 견관절은 치료가 어려우며 도수 조작에 잘 반응하지 않는 경향이 있다. 이에 본 저자들은 보존적인 요법에 치유되지 않은 당뇨병 환자의 동 견관절에 대해 관절경 하 선택적 관절낭 박리술을 시행하고 결과를 보고하고자 한다. 동 견관절이 발생한 당뇨병 환자 중 6개월 이상의 보존적인 치료에 반응하지 않고 지속적인 통증과 견관절의 운동 장애 및 기능 장애가 남아있는 9명을 대상으로 하였다. 관절경 하 박리술이 관절낭 전방 구조물의 상부에서 하부로 점진적으로 이루어 졌으며, 수술 후 관절 운동 범위 유지를 위해 물리 치료를 시행하였다. 추시 기간은 12개월로부터 37개월로 평균 18개월이었으며 결과는 동통, 운동 범위, 근육 강도, 안정성, 일상 생활의 5가지 요소로 견관절의 기능을 평가하는 American Shoulder Society Score를 이용하였다. 추가적으로 동통, 외 회전, 외전, 그리고 견관절 기능의 4가지 요소가 수술 전, 후로 평가되었다. 수술 후 평가 기준상 호전을 보였으며 3명의 환자는 수술 후 통증이 없었으며 건측과 비교한 운동 범위 및 기능면에서 정상을 보였으며 5명의 환자는 약간의 장애는 남았으나 수술전과 비교시 호전되었으나 나머지 1명은 지속적인 동통 및 운동 범위의 감소가 있었다. 보존적 치료에 반응하지 않는 당뇨병성 동 견관절에 있어 관절경 하 박리술이 효과적인 치료 방법 중 한 방법일 것으로 사료된다.