Original Article

Functional Outcome of Frozen Shoulder after manipulation under anaesthesia

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Abstract

Objective: To analyze and compare the functional outcome in adhesive capsulitis after manipulation under anaesthesia and keeping the extremity in abduction and external rotation combined with local steroid injection v/s manipulation under anaesthesia combined with local steroid alone, in terms of range of motion.

Methods: A comparative prospective study was done at the department of Orthopedics Surgery, Liaquat National Hospital, Karachi. A total of 33 patients with adhesive capsulitis of shoulder joint were included and divided into 2 groups. Group 1 (n-16) underwent manipulation under anaesthesia and manipulated extremity was kept in abduction and external rotation combined with local steroid injection. In Group 2 (n-17) patients also underwent manipulations under general anaesthesia with local steroid injection alone. After manipulation both groups had daily physiotherapy session for half an hour.

Results: After manipulation, in both groups there was a significant increase in global range of motions of the shoulder joint. However, the group 1 patients demonstrated more increase in all range of motion as compared to group 2. The result showed significant improvement in all range of movements except external rotation and forward flexion.

Conclusion: After manipulation, simply tying the manipulated extremity to the back of bed greatly influences regaining the range of motions with no additional cost. These patients need counseling and motivation for their active participation in physical therapy program even after manipulation for optimal long term result (JPMA 57:181;2007).

Introduction

The shoulder is a very complex joint that is crucial to many activities of daily living. Decreased shoulder mobility is a serious clinical finding. Adhesive capsulitis is a syndrome "defined in its purest sense as idiopathic painful restriction of shoulder movement resulting in global restriction of the glenohumeral joint".[1,2] Factors associated with adhesive capsulitis include female gender[3], age older than 40 years[4], trivial trauma[4], diabetes,[5,6] prolong immobilization[2], thyroid disease,[7] stroke or myocardial infarction, and the presence of autoimmune disease.[8] The clinical course of this condition is considered self limiting and is divided into three clinical phases: painful, adhesive and recovery phase. Several treatment methods for adhesive capsulitis have been reported in literature, none of which has proven superior to the other.[9]

In patients with adhesive capsulitis, the goal of treatment is pain reduction and preservation of shoulder mobility.

Treatment options documented in the literature included: benign neglect, supervised physical rehabilitation,[10] non steroids anti-inflammatory medication, oral corticosteroid, intra-articular injection,[4] distension arthrography, closed manipulation,[11] open surgical release, and more recently, arthroscopic capsular release.

Severe adhesive capsulitis diagnosed in the later stages is more difficult to manage. Manipulation under anaesthesia (MUA) to break up the adhesions is reserved for use in the adhesive stage. During this procedure, the synovium, the joint capsule especially the inferior axillary pouch of capsule are ruptured, but tears have also been observed to involve the intra articular long head of biceps and the sub scapularis tendon.[12] During manipulation, audible and palpable release of adhesions is a good prognostic sign.[13] An aggressive rehabilitation is employed to restore and maintain the range of motion of shoulder joint after MUA. Patients undergoing manipulation are routinely given an intra-articular corticosteroid injection combined with a local anesthetic agent 2% plain xylocain. The rationale for using intra-articular steroid is to decrease the inflammation secondary to breakage of adhesions and local anaesthetic agent is used to decrease the pain after manipulation. This has been the standard practice for patients undergoing MUA at our institution. Robert et al[14] described a new technique of keeping the extremity in 160-degree abduction and 90-degree of external rotation after manipulation for frozen shoulder.[14] In this method, before the patient recoveres from the effect of general anaesthesia he is placed with his head at the top of the mattress and wrist tied to the head of bed with a sling fixed to a spring thus keeping the extremity in a position of 160-degree abduction and 90-degree external rotation. This position is maintained for 24 hours. During this period patient is encouraged to use his tied extremity to maximum tolerance. The presence of springs maintains the desired position.

The purpose of this study was to evaluate the efficacy of this newer method of keeping the extremity in abduction and external rotation after closed manipulation for frozen shoulder.

Patients and Methods

Between November 2000 and March 2002 all patients presenting to the Orthopaedic Outpatients Departments with shoulder complaints were studied prospectively. Inclusion criteria were history of pain and stiffness of the shoulder joint for which no other cause could be identified, restriction of glenohumeral motion of less than 50% of abduction and less than 50% of external rotation as compared with the motion of contralateral shoulder joint and normal x-ray finding in shoulder joint. All symptoms should have been of 3 weeks duration. Patients were excluded from the study if they had intrinsic problems with the shoulder, such as recent surgical repair of soft tissue about the shoulder, history of fracture around shoulder joint, instability and recurrence following previous manipulation, significant osteopenia, tear of the rotator cuff, arthritis involving the glenohumeral or acromioclavicular joint, sympathetic dystrophy and abnormality of plain x-ray of shoulder joint. Extrinsic problems, such as a neuromuscular disorder (Parkinsonism) or referred pain from an associated condition such as extrusion of cervical disc with radiculopathy, were also reasons for exclusion.

A standardized physical examination was performed with the patient seated upright; the active and passive range of motion of both shoulders was measured to the nearest degree with a standard goniometer, according to modified recommendations of the Society of Shoulder and Elbow Surgeons.[15] The measurements of forward flexion, abduction, and external rotation were obtained. Internal rotation was measured on the basis of the spinal level that the patient could reach with the tip of the thumb behind the back. Intra-examiner measurement error was 5 ± 1 degrees. Standard anterior posterior and lateral radiograph was obtained for all the patients in both the groups.

After taking consent patients enrolled for this study were randomly divided into two groups. Group I patients underwent manipulation under general anaesthesia, along with 80mg of local kenacort injection combined with 2% xylocain in shoulder joint using a 10cc disposable syringe. Injection site was 1cm distal and 1cm lateral to coracoid process. This was followed by keeping the manipulated extremity in 160^{o} of abduction, with 90^{o} of external rotation, using cotton bandage secured to the wrist and tied to the back of the bed for 24 hours.

During this period, patients were allowed to untie their extremity for toileting only. All the patients were discharged after 24 hours of manipulation with daily physiotherapy session of half an hour for 3 weeks in the department of physiotherapy and follow-up visit at orthopaedic OPD after 3 weeks of manipulation.

Group 2 patients underwent manipulation under general anaesthesia along with 80mg local kenacort injection with 2% plain xylocain in shoulder joint. Injection site was the same as in the group 1. This group also had daily physiotherapy session of half an hour as group I. All the patients in this group were also discharged after 24 hours of manipulation with physiotherapy sessions of half an hour as group 1 patients with follow-up visit at orthopaedic OPD after 3 weeks of manipulation.

The pre designed questionnaire was completed by all patients in the study for data gathering and analysis. Continuous variables were analyzed using the student t-test and discrete variables were analyzed using Chi-Square test. P-value <0.05 was be considered significant, where appropriate 95% confidence intervals were calculated. Statistical analysis was carried out using standardize statistical programs SPSS 8.0 for windows.

The part A of predesigned questionnaire was filled in by both groups at the time of admission and all patients in both groups were followed for 12 weeks and after 12 weeks the part B questionnaire was filled.

Results

Of the 56 patients with a diagnosis of adhesive capsulitis or frozen shoulder recorded at OPD of Liaquat National Hospital, from November 2000 to March 2002, 48 patients satisfied the criteria for selection. However, 5 patients did not give consent to be included in this study and therefore 43 patients could be finally enrolled for this study. One patient in group 1 had fracture of humerus during manipulation and 9 patients (6 patients from group 1 and 3 patients in group 2) were lost to follow up. The remaining 33 patients could be finally enrolled in this study. These patients were divided into two groups. There were 20 (61%) females and 13 (39%) males. The age ranged from 38 years to 65 years (mean 54 years). All patients were right-hand dominant. However the right dominant upper extremity was involved in 9 (27%) patients and left non-dominant upper extremity in 24 (73%) patients. History of trivial trauma was present in 12 (36%) patients. Twenty two (67%) patients had both pain and stiffness as their predominant symptom of the involved extremity, 4 (12%) had pain only and 7 (21%) had stiffness only as their main complaint. The symptoms were present from a range of 3 weeks to 10 months at the time of the initial evaluation with mean duration of symptoms of 10 weeks.

Before the manipulation in both the groups, abduction and external rotation were the most effected movements with a relative preservation of forward flexion. Internal rotation however was more restricted in-group 1 as compared to group 2 (Table 1). After the manipulation, in both the groups there was a significant increase in global range of motion of shoulder. However, the group 1 patients demonstrated more increase in all range of motion as compared to group 2 (Table 2).

The result showed significant p value <0.05 in all range of movement except external rotation (active and passive) and forward flexion (passive) (Table 2).

This questionnaire also revealed the functional limitation of the patients. Almost 90% of patient's population were dependent and required assistance in performing some basic activity of daily living as shown in Table 3.

Discussion

Frozen shoulder was first described as periarthritis involving the periarticular soft tissues of the shoulder by Duplay in 1872.[16] Codman coined the term "frozen shoulder" in 1934.[17] He described the frozen shoulder as "difficult to define, difficult to treat and difficult to explain." Frozen shoulder usually affects women in the sixth decade of life, frequently involves the non-dominant extremity, and occurs bilaterally in as many as 34 per cent of patients. These epidemiological conclusions are well supported in the literature.[10,18]

Although frozen shoulder is believed to be a benign self limited disorder, which tends to be resolve over 1- 2 years, the authors suggested that the patients with significant stiffness are good candidate for manipulation under anaesthesia rather than conventional treatment because conventional treatment of supervised physiotherapy programme must be carried out for months to years in order to regain the range of motion.[19,20]

In contrast, only a few weeks of supervised physiotherapy programme helps to achieve a functional range of motion in patients who have undergone manipulation under anaesthesia. It must be emphasized that even after manipulation of shoulder, a regular supervised physiotherapy session is critical to ensure a mobile painless shoulder otherwise significant stiffness quickly return.

The results of this small series demonstrated that there is a significant improvement in all ranges of motion after manipulation and keeping the extremity in abduction and external rotation as compared to manipulation only. This increase in range of motion is probably due to extreme stretching of the joint capsule and surrounding soft tissue when the shoulder is placed in 160° of abduction and 90° of external rotation for 24 hours after manipulation. This allows the immediate intra-articular inflammation and reaction to occur in maximal stretched position of joint capsule and the subsequent inflammatory reaction due to rupture of capsule and synovium does not hinder the range of motion.

Adhesive capsulitis is clearly associated with a global dysfunction of the involved extremity with functional limitations according to its severity. Stiff shoulder of adhesive capsulitis does not allow the optimal positioning of elbow, forearm and hand for usual function. Dependency on basic activities of daily living changing clothes, brushing hair, reaching shelves that was above the head and scratching or washing lower back were clear indications of functional limitation and have social implications apart from pain and stiffness these patients experience.

Table 1. Pre manipulation range of shoulder movement.

Range of Motion	Group 1 (n 16) (mean ± SD)	Group 2 (n 17) (mean ±SD)	P value
Pre manipulation ROM abduction (active).	33.75 (± 11.03)	29.71 (± 13.05)	0.345
Pre manipulation ROM abduction (passively).	45.88 (± 14.91)	40.18 (± 17.01)	0.315
Pre manipulation ROM forward flexion (active).	65.94 (± 16.15)	65.59 (± 21.42)	0.958
Pre manipulation ROM forward flexion (passively).	81.88 (± 20.56)	81.18 (± 22.26)	0.926
Pre manipulation ROM external rotation (active).	28.56 (± 24.45)	33.53 (± 22.96)	0.552
Pre manipulation ROM external rotation (passively).	37.00 (± 23.22)	41.47 (± 23.77)	0.589
Pre manipulation ROM internal rotation (active)*	1.00 (± 0.00)	1.12 (± 0.33)	0.167
Pre manipulation ROM internal rotation (passively)*	1.00 (± 0.00)	1.18 (± 0.39)	0.082

* All motions were measured in degrees except internal rotation, which was measured by spinal level.
ROM. Range of motion.
SD. Standard deviation.
P < 0.05 - Significant

Table 2. Post manipulation range of shoulder movement.

Range of Motion	Group 1 (n 16) (mean ± SD)	Group 2 (n 17) (mean ±SD)	P value
Post manipulation ROM abduction (active)	151.81 (± 13.19)	122.82 (± 21.08)	0.00
Post manipulation ROM abduction (passively)	160.25 (± 12.10)	137.76 (± 15.21)	0.00
Post manipulation ROM forward flexion (active)	157.19 (± 9.12)	141.18 (± 19.49)	0.005
Post manipulation ROM forward flexion (passively)	161.38 (± 10.14)	155.29 (± 16.25)	0.210
Post manipulation ROM external rotation (active)	83.38 (± 6.61)	76.76 (± 19.76)	0.213
Post manipulation ROM external rotation (passively)	91.25 (± 6.45)	86.41 (± 13.38)	0.200
Post manipulation ROM internal rotation (active)*	3.56 (± 0.51)	2.65 (± 0.70)	0.00
Post manipulation ROM internal rotation (passively)*	3.88 (± 0.34)	2.88 (± 0.49)	0.00

* All motions were measured in degrees except internal rotation, which was measured by spinal level.
* ROM. Range of motion.
P < 0.05 - Significant

The duration of symptoms in patients who have frozen shoulder remains undetermined. Some investigators have claimed that symptoms resolve in as little as six weeks in all patients.[16] Withers[21] found that pain resolved in two weeks to four months. Grey[19] whose findings supported

Table 3. The following subjective questions refer to daily activity in group 1 and group 2 (pre-operatively).

	Dependently		Independently	
	Group 1	Group 2	Group 1	Group 2
A. Putting on or removing a pull over sweater or shirt.	90%	88%	10%	12%
B. Combing or brushing your hair.	85%	68%	15%	32%
C. Reaching shelves that are above you're your head.	90%	91%	10%	09%
D. Scratching or washing your lower back with your hand.	95%	100%	05%	-

those of Codman[18], noted recovery "within a maximum of two years from the onset of symptoms." In our study the duration of pain was 6 to 12 weeks (42.4%), and duration of stiffness was mainly 6 to 12 weeks (36.4%). Conversely, Lloyd-Roberts and French reported that a third of their patients had not recovered eighteen months after the onset of symptoms. DePalma[2] reported on three patients who had remained symptomatic five, six, and eight years after the onset of symptoms "with no indication of regression or improvement." One study demonstrated continuing disability of the shoulder for as long as ten years after the onset of the symptoms.[20] The average duration of symptoms in our study was twelve weeks.

Murnaghan[22] stated that "the time course of return of shoulder motion is quite unpredictable." However, it is difficult to identify a precise end-point for the resolution of symptoms or restriction of motion and a return to a mostly normal state, particularly in a retrospective study.

Frozen shoulder remains enigmatic, defying our ability to predict its duration in individual patients. The onset of symptoms was spontaneous, with no recognizable precipitating event, in most of our patients. Similar findings have been reported in the literature.[23]

Frozen shoulder commonly occurs at a higher rate in diabetic patients.[5] In our study 45.5% of patients had diabetes mellitus and 2 reported a positive family history of frozen shoulder.

Reeves noted that the involvement of the contra lateral shoulder appeared six months to seven years after the onset of symptoms in the first shoulder.[20] Most radiographs of our patients demonstrated normal findings, as has also been reported earlier.[24]

None of our patients had recurrence of the frozen shoulder, however, due to short duration of follow up, it is difficult to comment whether any of these patients were permanently cured or continued to be symptomatic or had recurrence of stiffness.

Conclusion

Adhesive capsulitis can cause functional limitation in terms of performing basic activity of daily living. Most patients with adhesive capsulitis respond to non-surgical treatment with a supervised physical therapy programme. If conservative therapy is unsuccessful or there is significant stiffness at the time of initial presentation then manipulation under anaesthesia can be done to regain motions and facilitate rehabilitation. After manipulation, simply tying the manipulated extremity at the back of bed greatly influences regaining the range of motions with no additional cost. These patients need counseling and motivation for their active participation in physical therapy programme even after manipulation for optimal long term result.

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