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RESEARCH ARTICLE

EFFECTIVENESS OF HYDRAULIC DISTENSION OF SHOULDER IN THE MANAGEMENT OF ADHESIVE CAPSULITIS

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ABSTRACT

Adhesive capsulitis is a chronic fibrosing condition of capsule of shoulder joint. The purpose of this study was to evaluate the efficacy of hydraulic distension in the treatment of adhesive capsulitis. 50 Patients with 54 shoulders of frozen shoulder syndrome were treated with hydraulic distension and steroid under local anesthesia from August 2011 to September 2013. Various parameters like pain, range of movements (ROM) and function of shoulder were assessed on predistension, post distension and at 6 weeks follow up. Results were graded as excellent, good, fair, and poor based on above parameters. During post distension period, 4% of the patients had excellent results, 44% good results, 46% fair results and 14% had poor results. At follow up, 38% had excellent results, 52% had good results, 16% had fair results and 2% had poor results. Hydraulic distension is a safe, reliable, cost effective procedure without requiring specialized equipments in the management of frozen shoulder.

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INTRODUCTION

“Adhesive capsulitis” is a chronic condition of unknown etiology characterized by gradually progressive, painful restriction of all shoulder joint motion, with slow spontaneous restoration of either partial or complete motion over months to year. [Turek SL 2002]

Adhesive capsulitis has synonymously been termed as “peri arthritis” and “frozen shoulder”. [Murnaghan JP 1990]. The pathologic anatomy was described in 1945 by Neviaser. The synovium and capsule of the shoulder develop adhesions in response to a primary inflammatory response to a yet unknown etiology. The adhesions characteristically are found in the axillary fold and in the attachment of the capsule at the anatomic neck of the humerus [Shearer JR, Nejad AH 1996].

Frozen shoulder has been encountered among adults of all age groups but is far more common during 5th and 6th decade of life [Lippmann RK 1957]. In general population the incidence of frozen shoulder is about 2- 5%, where as among diabetics it is 10-20% [Robert H. Miller III, Azar FM. 2013]. Further among diabetics, insulin dependent diabetics have a higher incidence of frozen shoulder (36%). Incidence of bilateral involvement is

still higher (46%) among these patients [Robert H. Miller III, Azar FM. 2013]. The condition is also more common in persons with sedentary occupations and in females where the non dominant arm is more commonly involved [Neviaser RJ 1987]

Frozen shoulder has been divided by Lundberg into two groups: Primary frozen shoulder and Secondary frozen shoulder. Primary frozen shoulder is diagnosed in the absence of a specific cause for the condition while secondary frozen shoulder develops as a result of trauma. [Esch JC.1993]

Classically there are three stages to the clinical course of the primary frozen shoulder. The freezing stage also known as the painful stage, lasts for 2-9 months. This is followed by the frozen stage also called as stiffening stage, which may last for 4-12 months. The thawing stage or recovery phase is the third stage during which the patient may partially or completely recover the ROM. Time taken by the patients to regain functional ROM may be 6-9 months but may extend upto 2 years. Shoulder movement is regained gradually without specific treatment. [Fareed DO, Gallivan WR Jr. 1989, Robert H. Miller III 2013]

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Frozen shoulder is usually diagnosed on the basis of the classical history and clinical grounds. However, it often should be differentiated from other clinical conditions such as, patients with shoulder arthritis, fractures, dislocations, cervical spondylosis, and referred pain. Specific exclusion includes conditions like calcific tendinitis, supraspinatus tendinitis, bicipital tenosynovitis, and subacromial impingement. [Murnaghan JP 1990]

A variety of different treatments have been recommended and numerous studies have demonstrated successful results. The types of treatment have included benign neglect, chiropractic manipulation, oral corticosteroids, injection of corticosteroids, physiotherapy exercises, hydraulic distension with saline, manipulation under anesthesia and arthroscopic and open release of the contracture. [Griggs SM, Anthony AHN, 2010]

This study was conducted to evaluate the results of treatment of adhesive capsulitis or frozen shoulder by hydraulic distension under local anesthesia with steroid. A rapid, immediate result and cost effectiveness of hydraulic distension technique was also evaluated in this study.

MATERIALS AND METHODS

This study was a prospective study involving 50 Patients with 54 shoulders of adhesive capsulitis, (of which 4 cases presented with bilateral shoulder involvement) attending the outpatient department of Orthopaedics of Bapuji Hospital and Chigateri District General Hospital attached to J.J.M. Medical College, Davangere. All the patients were treated with hydraulic distension under local anesthesia along with intra articular steroid, on an outpatient basis. All these cases were treated from August 2011 to September 2013.

Different authors have indicated different range of restricted shoulder motion for a patient to be diagnosed as having frozen shoulder. In our study, we have used the diagnostic criteria used by Patrik. J. Mumaghan. According to this criteria, we included patients with progressive shoulder pain and stiffness with reduced movement, for which no specific cause was identifiable, and the patients with less than 30 degree of external rotation, less than 130 degree of forward elevation and less than 120 degree of abduction. There was variable limitation of internal rotation [Murnaghan JP 1990]

Technique of Hydraulic Distension

The distension of the affected shoulder was performed in the sitting posture after taking universal aseptic precautions. The shoulder was palpated and good understanding of the anatomical configuration was made. The arm was held in as much external rotation as possible to facilitate the needle placement into the anterior aspect of the joint. This position was maintained while palpating anatomical landmarks and also during procedure. The joint space was entered at a point 2 cm below and medial to posterolateral corner of acromion. 2 ml of 2% injection xylocaine was injected into the skin and soft tissues overlying the joint capsule. This was followed by

injection of 40 mg of medium potent steroid triamcinolone mixed with 1ml of 2% xylocaine into the joint.

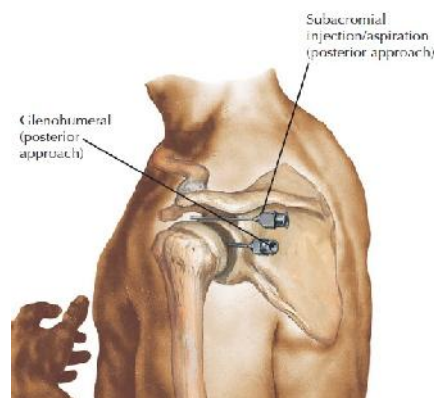


Figure 1 Showing the point of entry to the glenohumeral joint

Distension of the capsule was then performed with normal saline using a 10ml disposable syringe with a 22gauge needle. The quantity of normal saline used for distension depended on the distensibility of the joint capsule. Distension was continued till the resistance was felt. Post-procedure the patients were taught active assisted ROM exercises.

The patients were advised to continue regular home exercises. These consisted of pendulum exercises, resisted flexion, extension, internal and external rotation and abduction exercises performed four times daily. The patients were sent home with an advice to take a course of antibiotics, (Ampicillin and Cloxacillin 500mg thrice a day for 5 days) with diclofenac tablets 50 mg twice a day for 5 days. They were followed up at 2 weeks interval, and at each visit ROM and functions were examined. A second distension procedure was repeated if necessary. At 6 weeks follow up examination, function and ROM were documented again along with pain scoring.

The pain was assessed based on a scoring system prior to distension, immediately after distension and at 6 week follow up. The scoring system for pain was as given in table 1.

Table 1 Scoring System for pain

Score 0	Complete disability
Score 1	Marked pain
Score 2	Moderate pain
Score 3	After usual activity
Score 4	Slight
Score 5	None

Function of the shoulder joint was assessed at pre-distension, post distension and at 6 weeks follow up using simple activities like tucking the saree of back in females or touching back pocket in males as well as touching the opposite axilla, eating, combing hair and use of hand overhead. The functional scores were given as given in Table 2. This scoring pattern was based on the recommendation of "The society of American shoulder and elbow surgeons".

Table 2 Scoring System for Function

Score 0	Patient unable to do function
Score 1	Impaired function
Score 2	Function done with difficulty
Score 3	Mild compromise in doing function
Score 4	Normal range of function

RESULTS

The average age of the patients in this study was as 54.16 years. Out of 50 patients, who completed the study, 32 were females and 18 males. The female: male ratio was 1.77:1. In this series, 4 patients had bilateral involvement while in 17 patients (34%) had involvement of the dominant side that is right shoulder, while 29 patients (56%) were found to have left shoulder involvement.

Few patients were found to have certain associated conditions viz eight patients had diabetes mellitus, four patients had hypertension, six patients had osteoarthritis of knee, two patients diagnosed with peptic ulcer, and patient of bronchial asthma were seen. 35 patients out of 50 patients (70%) were previously treated with oral NSAIDs but without much relief. Five (10%) patients also had been treated with steroidal intraarticular injection.

All the patients were managed with hydraulic distension under local anaesthesia and steroid without using any sedatives. The procedure was well tolerated by the patients and no complications were noticed during or post procedure.

Pain: Almost all the patients had severe pain and disturbed sleep before treatment. Diffuse shoulder pain particularly during rotational movements was noticed. Tenderness over the glenohumeral joint was present in majority of the patients. The relief was all most spontaneous with improvement after 2 weeks follow up. It was common feedback that they had the first sound sleep on the day of distension since the onset of symptoms

Pain score

Score	Pain Score		
	Pre-Distension	After Hydraulic Distension	At Follow Up (6 Weeks Post Distension)
0	1	0	0
1	17	6	0
2	16	15	4
3	20	24	10
4	0	9	34
5	0	0	6

Range of Movement (ROM)

For the purpose of analysis, the sum of the external rotation, forward elevation, abduction was calculated and average was taken

ROM	Pre-Distension	After Hydraulic Distension	At Follow Up (6 Weeks Post Distension)
0-60 deg	25	14	2
61-100 deg	29	24	20
101-140 deg	0	16	32

Functional Score

All the functional scores were added up and average was calculated. Any decimal in the result was rounded off to the nearest whole number for the purpose of analysis. In this study the shoulders had the following functional scores

Functional Score	Pre-Distension	After Hydraulic Distension	At Follow Up (6 Weeks Post Distension)
0	6	1	0
1	12	5	0
2	19	22	9
3	16	23	23
4	1	3	22

The results were graded as follows

Results	Pain	Range Of Movement	Function
Excellent	4 & above	111 — 130°	4
Good	3	81 - 110°	3
Fair	2	61- 80°	2
Poor	1	Below 40-60°	1

The results were as follows

Results	No. Of Shoulders		Percentage	
	Post Distension	Follow Up	Post Distension	Follow Up
Excellent	2	19	4	38
Good	22	26	44	52
Fair	23	8	46	16
Poor	7	1	14	2

There were 7 shoulders with poor result after distension of which one shoulder did not improve even at follow up.

23 shoulders had fair results after distension, and only 8 shoulders had fair results at follow up.

There were 22 shoulders with good results after distension and 26 good results at follow up. In total there were 19 shoulders with excellent results at follow up, as compare to 2 shoulders with excellent results after distension. Patients who had deteriorated revealed that they had failed to do regular prescribed home exercises. In contrast patients who had gained excellent results had their regular home exercises as prescribed to them.

Two cases were given 2nd trial of hydraulic distension but there was no improvement.

Frozen shoulder with severe restriction of motion in range of movements less than 60 degrees very minimal improvement was seen. In shoulder who had initial range of movements of 60 to 100 degrees showed better results. The best results were seen in shoulder who had range of movements more than 100 degrees.

PRE DISTENSION



POST DISTENSION



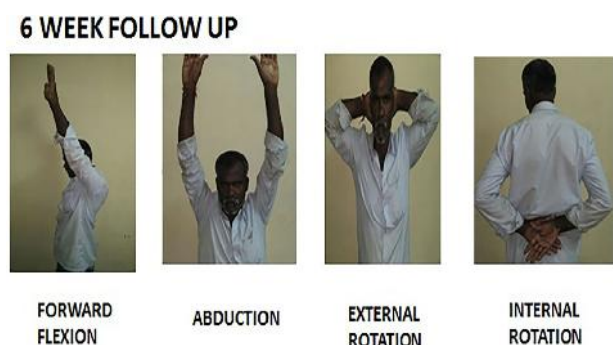


Figure 2 Case showing range of movements pre and post distension and during follow up

DISCUSSION

Frozen shoulder, though common, is least understood condition, causing pain in the shoulder. One of the earliest descriptions of the pathology of a frozen shoulder was by Neviasser, in 1945, who found thickened, contracted capsule around the humeral head. Histology of the capsule showed fibrosis and inflammatory cells. [Shearer JR, Nejad AH 1996]

Adhesive capsulitis is believed to be a primarily inflammatory reaction in the capsule and synovium that subsequently leads to the formation of adhesions, characteristically in the axillary fold and in the attachment of the capsule at the anatomical neck of the humerus. [Neviaser RJ 1987]

Review of the previous literature on treatment options of the condition revealed a lack of consensus on a universally accepted modality for the patient. [Griggs SM, Anthony AHN, 2010].

A number of different treatments have been described, including general measures such as rest and neglect to analgesics, NSAIDS, local or oral steroids, physiotherapy, distension of the joint capsule, manipulation. Recently arthroscopic treatment and surgical release has also been recommended for this condition [Fareed DO, Gallivan WR Jr 1989]. More than often, a combination of these modalities has been advocated. No standard treatment regime is universally accepted.

Some studies have found that local steroid injection provided pain relief to the patients but often failed to restore adequate ROM and also had no superior effect on the duration of symptoms compared with other treatments including heat, physiotherapy, ice, local analgesic injections, manipulation or no treatment. Other studies have reported that local steroids were without advantage when compared to physiotherapy or oral nonsteroidal anti-inflammatory drugs. Manipulation of the shoulder under general anesthesia with an intra-articular steroid and local anesthesia injection has been recommended for frozen shoulder. However, this requires a more costly inpatient stay with general anesthesia and immediate post operative physiotherapy. There are also risks of fracture of the humeral neck and rupture of the rotator cuff when the procedure is performed by an inexperienced surgeon. [Gam AN, Schydowsky et al 1998]

Hydraulic distension of the shoulder joint capsule initially described by Halverson L, Maas R., has potential to provide rapid relief of pain and immediate improvement of shoulder function for patients with adhesive capsulitis. They have reported that 94% of the patients had improved mobility immediately after the procedure. 53% of the patients had immediate, short term, and sustained improvement in comfort and function. [Halverson L, Maas R. 2002]

In our study, we found that during post distension period, 8% of the patients had excellent results, 48% good results, 40% fair results and 12% had poor results. At follow up 44% had excellent results, 50% had good results, 12% had fair results and 2% had poor results.

A similar study conducted by Khan AA, et al., compared distension arthrography with intra-articular steroid plus physical therapy versus physical therapy alone and concluded that distension arthrography with intra-articular steroid plus physical therapy was superior over physical therapy alone in the functional improvement of the frozen shoulder. [Khan AA et al 2005]

Quraishi et al in their prospective study have recommended hydrodistension for patients with adhesive capsulitis resistant to conservative treatment. Manipulation under anaesthesia is a more costly inpatient procedure, whereas hydrodilatation can be carried out as an outpatient without general anaesthetic. There is also the risk of humeral neck fracture and rupture of the rotator cuff during manipulation under anaesthesia [N. A. Quraishi et al 2007]. Our study had absolutely no complication or side effect except for mild pain during hydraulic distension.

The study conducted by Donald O Fareed, and William R, Gallivan, Jr., for the treatment of frozen shoulder under the local anaesthesia and hydraulic distension noted immediate resolution of previous pain and resumption of normal sleep pattern in all patients. They noticed 90% return of function and ROM immediately after the first treatment, while some loss of motion was usually noted (10-15 degree) at the two week follow up exam. At a four week follow up examination, all patients had resumed their normal function. [Fareed DO, Gallivan WR Jr 1989]

Our study had similar results with 64% patients having immediate pain relief and 90% of patients with complete resolution of pain at follow up at 2 weeks. 80% of the patients had improved range of motion (more than 80 degrees) at 2 week follow up and almost everyone returned to their normal functional activity 6 week follow up.

On the basis of the findings in our study we recommend that patients with frozen shoulder should be treated with hydraulic distension under local anesthesia with steroid because this technique is safe and cost effective.

CONCLUSION

Hydraulic distension is a safe, reliable, cost effective modality in treating the chronically distressing painful condition of

adhesive capsulitis. This therapy can be practiced as an outpatient without any specialized equipments, and when performed with a right technique under aseptic precautions, it has absolutely no side effects. Hence, we conclude that hydraulic distension under local anesthesia with steroid can be considered as a first line management option in patients with adhesive capsulitis.

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