



International Journal of Orthopaedics Sciences

ISSN: 2395-1958
IJOS 2016; 2(4): 27-30
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www.orthopaper.com
Received: 06-08-2016
Accepted: 07-09-2016

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Effectiveness of hydraulic distension of shoulder in the management of frozen shoulder

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DOI: <http://dx.doi.org/10.22271/ortho.2016.v2.i4.006>

Abstract

Frozen shoulder 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 frozen shoulder. 50 Patients with 54 shoulders of frozen shoulder syndrome were treated with hydraulic distension and steroid under local anesthesia from July 2014 to August 2016. 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.

Keywords: Frozen shoulder, hydraulic distension, predistension, steroid

1. Introduction

“Frozen shoulder” 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 [1].

Frozen shoulder has synonymously been termed as “periartthritis” and “frozen shoulder” [2]. The pathologic anatomy was described in 1945 by Neviasser. 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 [3].

Frozen shoulder has been encountered among adults of all age groups but is far more common during 5th and 6th decade of life [4]. In general population the incidence of frozen shoulder is about 2-5%, whereas among diabetics it is 10-20%⁵. 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 [5]. The condition is also more common in persons with sedentary occupations and in females where the non-dominant arm is more commonly involved [6].

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 [7]. 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 [5].

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 [2]. A variety of different treatments have been recommended and numerous studies have demonstrated successful results.

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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.

This study was conducted to evaluate the results of treatment of 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

2. Methodology

This study was a prospective study involving 50 Patients with 54 shoulders of frozen shoulder, (of which 4 cases presented with bilateral shoulder involvement) attending the outpatient department of Orthopaedics of Saptagiri Institute of Medical Sciences, Bangalore. 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 July 2014 to August 2016.

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 [2].

3. 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.

3. 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.

Table 1: 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

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

Table 2: Range of Movement

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

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.

Table 3: Functional Score

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

Table 4: Grades of results

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

Table 5: Overall results

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.

4. 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 Neviaser, in 1945, who found thickened, contracted capsule around the humeral head. Histology of the capsule showed fibrosis and inflammatory cells^[3]. Frozen shoulder 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^[6].

Review of the previous literature on treatment options of the condition revealed a lack of consensus on a universally accepted modality for the patient. 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^[8]. 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 no steroidal 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^[9].

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 frozen shoulder. 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^[10].

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.

Quraishi *et al* in their prospective study have recommended hydrodistension for patients with frozen shoulder 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^[11]. Our study had absolutely no complication or side effect except for mild pain during hydraulic distension.

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.

5. Conclusion

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

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