

Frozen Shoulder: Role of Single Intra-Articular Corticosteroid Injection and Home Exercise Programme

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ABSTRACT

OBJECTIVE: To observe the affects of intra-articular steroid injection followed by simple home exercise programme in patients with primary frozen shoulder phase I and phase II.

MATERIAL AND METHODS: Eighty five patients with idiopathic (primary) frozen shoulder, clinical phase I and II with unilateral involvement with minimum duration of six months were selected for the study. The solution injected contained 5cc of 1% lidocaine HCl (xylocain) and 2cc (80 mg) methyl prednisolone acetate (depomedrol). All patients were injected once. The glenohumeral joint was injected via posterior approach. The site of entry was same as used for traditional posterior portal for arthroscopy of shoulder. After the intra-articular injection, patients were advised to perform range of movements exercise within the limits of pain daily for ten minutes. Systemic documentation of shoulder function was made before the treatment and six months after the intra-articular injection by obtaining simple shoulder test (SST)

RESULTS: All the 15 patients in clinical phase I recovered in the mean time of seven weeks. (Range 3 weeks to 3 months). Fifty out of seventy patients in clinical phase II recovered in the mean time of 4 months. (Range 3 weeks to 6 months) Twenty patients did not meet the recovery criteria within six months after injection.

CONCLUSION: In patients with frozen shoulder, single intra-articular injection of corticosteroid combined with simple home exercise program is effective in improving shoulder pain and disability.

KEY WORDS: Frozen shoulder, idiopathic, unilateral, gnenohumeral, simple shoulder test.

INTRODUCTION

Codmen in 1934, coined the term frozen shoulder for a clinical condition which is slow in onset and characterized by pain and discomfort in the region of deltoid, inability to sleep on the affected site, restricted movements at shoulder joint with normal radiographs.¹

The frozen shoulder was initially considered as "periartthritis". Nevasier was first to identify the pathology by histological and surgical examination of patients with frozen shoulder. He reported that frozen shoulder was not periartthritis but a "thickening and contraction of the capsule which becomes adherent to the humeral head". He named it "adhesive capsulitis". Later various studies supported this finding and conclude that it is result of contracted collagenous tissue³. Histological findings of tissue taken from frozen shoulder indicates the chronic inflammatory response and fibroblastic proliferation.⁴

Frozen shoulder affects 2% to 5% of population, commonly between 4th to 6th decade of life. mostly female. Patients having diabetes mellitus, hyper or hypothyroidism, Parkinson's disease, cardiovascular illness and those whose shoulder is immobilized for prolonged period due to trauma are at high risk.^{5, 6}

The non dominant side is commonly affected, 6% to

17% of cases have bilateral involvement, with a female-to-male ratio of about 1:4.⁷

Primary or idiopathic frozen shoulder develops without a specific precipitating factor. It results from a chronic inflammatory response with fibroblastic proliferation, which may be an abnormal immune response.⁸

Secondary frozen shoulder develops after a shoulder injury or surgery. It may be associated with other conditions such as diabetes, cerebrovascular accident, rotator cuff injury or cardiovascular disease which may prolong recovery and limit outcomes.⁹

Primary frozen shoulder has three clinical phases:

(1) Painful phase: In this phase there is gradual start of shoulder pain which becomes worst at night and lying by on affected side. This phase continues from two to nine months.

(2) Stiffening or frozen phase: In this phase there is progressive loss of motion (especially external rotation of shoulder joint) the intensity of pain is mostly not changed and the patient feels difficulty in simple activities of daily life. There is progressive stiffness which may lead to disuse atrophy of muscles around shoulder. This phase lasts for four to twelve months.

(3) Thawing phase: In this phase the patient notices gradual improvement in the range of movement and decrease in pain. This phase lasts for 5–12 months.⁴

Many methods have been used for treatment of frozen shoulder. The goal of treatment is to relieve pain, improve functions, and achieve permanent recovery.

Presently many peripheral regional anaesthesia techniques are practiced for pain relief.

One of these techniques is interscalenebrachial plexus block which is used in shoulder surgery for anaesthesia and postoperative analgesia, with successful results.¹⁰

Limitation in the range of movement of shoulder may not fully recover even 3-5 years after the onset of frozen shoulder.¹¹ According to some authors, frozen shoulder is a self limiting condition which resolves in 1-3 years¹² while others report that between 20% and 50% of patients with frozen shoulder suffer long-term range of movement deficits that may last up to 10 years.¹³

Other treatment options for this condition includes, manipulation under anaesthesia, surgical intervention, intra-articular corticosteroid injections in combination with stretching protocols,^{11,14} and the use of continuous passive motion devices.¹⁵

Distension arthrography is one of the techniques used for the management. It is in principle an injection into the glenohumeral joint under pressure. This procedure was first described by Andr en and Lundberg.¹⁶

The justification for shoulder joint corticosteroid injection is that it decreases inflammation which leads to reduction in capsular fibrosis. This allows enhancement of joint motion and reduces the functional recovery time.¹⁷

Our hypothesis about the role of intra-articular corticosteroid injection in frozen shoulder is that it prevents the adhesion formation between capsule and bone by fibrinolysis and its anti inflammatory effect.

In this study, the effects of intra-articular steroid injection followed by simple home exercise programme, were studied in patients with primary frozen shoulder phase I and phase II.

MATERIAL AND METHODS

The study was conducted between July 2006 and December 2010 in a private practice setup.

Eighty five patients, sixty five female and twenty male, were included in the study. The age range was 45 to 70 years. Fifteen patients were in phase 1 and seventy were in phase II. The inclusion criteria were idiopathic (primary) frozen shoulder, clinical phase I and II with unilateral involvement with minimum duration of 6 months. Patients presenting with frozen shoulder secondary to some other disease or having co morbidity, e.g. Diabetes mellitus, Parkinson's disease, hyper or

hypothyroidism were not included in the study.

The frozen shoulder was diagnosed on history and clinical examination. All the patients had tender shoulder joint capsule both anteriorly and posteriorly. Pain increased on shoulder movements. Range of movements at shoulder joint was recorded; especially active and passive forward flexion, abduction, internal and external rotation in neutral abduction. The shoulder movements were checked while patients were standing. The diagnosis of frozen shoulder was made when patient presented with pain and limitation of movement at shoulder joint especially external rotation, and other causes of shoulder pain and limitation of movement were excluded. Absence of impingement signs and normal strength of muscles around shoulder excluded rotator cuff tendinopathy. Lack of tenderness on palpation of acromioclavicular joint excluded the pain originating from this joint. Radiographs were taken to exclude osteoarthritis of glenohumeral joint and tumour of the region

Radiographs were normal in all the patients included in this study, with the exception of evidence of disuse osteopenia. All patients were treated with an intra-articular injection containing mixture of localaesthetic and corticosteroid.

The solution injected contained 5cc of 1% lidocaine HCl (xylocain) and 2cc (80 mg) methylprednisolone acetate (depomedrol). All patients were injected once. The posterior approach was used to inject glenohumeral joint. The site of entry was same as used for traditional posterior portal for arthroscopy of shoulder. This portal is located 2 to 3 cm inferior and 1 cm medial to the posterolateral tip of the acromion. At this site the attempt was made to pass through the posterior soft spot between the infraspinatus and teres minor muscles. An 18 gauge spinal needle was inserted in this site with tip pointing towards coracoids process anteriorly. The index and middle finger was placed on the coracoids process to direct the tip of needle anteromedially towards the coracoids. When in right direction, the needle faces little resistance on entering the joint.¹⁸

The treating surgeon performed both active and passive range of movement (AROM and PROM) assessment before and after injection and at all subsequent visits. Range of motion (ROM) was measured in, forward flexion, backward extension, abduction, external rotation in 45° abduction and internal rotation in 45° of abduction.

After the intra-articular injection, patients were advised to perform range of movements exercise within the limits of pain daily for ten minutes. The exercises included active and passive forward flexion, backward

extension, abduction, external rotation in abduction, internal rotation in abduction and reaching the inferior angle of opposite scapula. Patients were called for follow up examination every three weeks for six months.

Patients who have regained range of movement within 15 degrees of the contra lateral normal side especially in forward flexion external and internal rotation were considered recovered.¹⁷

Systemic documentation of shoulder function was made before the treatment and six months after the intra-articular injection by obtaining simple shoulder test (SST). The SST, developed by university of Washington, shoulder service, department of orthopaedic surgery, is a series of 12 “yes” or “no” questions answered by patient about the function of involved shoulder. This test provides a standardized way of recording the functions of shoulder before and after the treatment (Table 1).¹⁹ SPSS v.16 was used to analyze the data. Chi square test was applied to calculate the recovery before and after administration of intra-articular injection. P-value up to 0.05 was considered significant.

RESULTS

A total of eighty five patients were included in the study. Out of eighty five, fifteen were in clinical phase I and seventy were in clinical phase II. Patients who have regained range of movement within 15 degrees of the contralateral normal side, especially in forward flexion external and internal rotation, were considered recovered. Sixty five patients recovered at a mean time of three months.

All the 15 patients in clinical phase I recovered in the mean time of seven weeks. (Range 3 weeks to 3 months). Fifty out of seventy patients in clinical phase II recovered in the mean time of 4 months (range 3 weeks to 6 months). Twenty patients did not meet the recovery criteria within six months after injection. These patients did not strictly follow the home exercise routine advised after intra-articular injection. Mean Simple shoulder test (SST) score for 15 phase I patients before injection was 66.65% and six months after injection the mean SST score was 90.66% (P<0.001).

Mean simple shoulder test score for 50 recovered phase II patients before injection was 33.33% and six months after injection the mean SST score was 82.32% (P<0.001).

Mean SST score for 20 phase II patients not showing recovery within six months after injection was 33.33% before injection and 41.66% six months after the injection.

TABLE I: SIMPLE SHOULDER TEST UNIVERSITY OF WASHINGTON, SHOULDER SERVICE, DEPARTMENT OF ORTHOPAEDIC SURGERY (LIPPITT SB, MATSEN FA)

Dominant hand	Right	Left	Ambi-dextrous
Shoulder evaluated			
Questions	Yes	No	
1- Is your shoulder comfortable with your arm at rest by your side?			
2- Does your shoulder allow you to sleep comfortably?			
3- Can you reach the small of your back to tuck in your shirt with your hand?			
4- Can you place your hand behind your head with the elbow straight out to the side?			
5- Can you place a coin on a shelf at the level of your shoulder without bending your elbow?			
6- Can you lift one pound (a full pint container) to the level of your shoulder without bending your elbow?			
7- Can you lift eight pounds (a full gallon container) to the level of your shoulder without bending your elbow?			
8- Can you carry twenty pounds at your side with the affected extremity?			
9- Do you think you can toss a soft-ball under-hand twenty yards with the affected extremity?			
10- Do you think you can toss a soft-ball over-hand twenty yards with the affected extremity?			
11- Can you wash the back of your opposite shoulder with the affected extremity?			
12- Would your shoulder allow you to work full-time at your regular job?			
Total			
Scoring Responses. Scale. Twelve functional task questions answered yes or no (yes 1, no, 0). Score range. Range is 0–12, (transformed to percentage). Interpretation of scores. Best score is 12/12, representing no disability. Method of scoring. (Number of yes responses/ number of items answered) X100.			

DISCUSSION

There are many methods of treating frozen shoulder and variable success has been claimed.

Symptoms of frozen shoulder show much improvement when treated with deep heating and stretching exercise combined. Superficial heating alone was less effective.²⁰

Traditionally stretching exercises have been used to stretch the shoulder capsule. Continuous passive motion has shown more promising results as compared to this traditional practice.¹⁵

Combining oral steroids, non steroid anti-inflammatory drugs and physiotherapy, provide good pain relief, that usually does not extend beyond six weeks.²¹

Widiastuti-Samekto and Sianturi claimed that intra-articular steroid injection gave rapid relief when compared to oral route.²²

Dudkiewicz I et. al (2004), in their study of 54 patients, with mean follow up of 9.2 years, claimed that conservative primary treatment for frozen shoulder i.e., physiotherapy and intra-articular steroid injection was an effective long term treatment method.¹¹

Majority of our patients in phase II and all in phase I had very good results.

Patients who followed the home exercise programme properly were early to recover and had good long term results.

Twenty patients who did not recover had longer history of shoulder symptoms and did not follow the home exercise programme. Stretching exercise up to the pain limit is very effective in regaining the range of movement and fast recovery. This finding is in agreement with study of Dierks & Stevens where seventy seven patients with idiopathic frozen shoulder were compared with respect to the results of exercise within limits of pain and intensive physical therapy. The results were better in patients who performed exercise within limits of pain than those who had intensive physical therapy.²³

We followed the patients for six months after injection. Any patient not showing recovery within this period was advised manipulation under anaesthesia and repeat injection.

Farrell CM et al, reported that, in patients with persistent severe stiffness, manipulation of shoulder under general anaesthesia improves range of movement at shoulder joint for a mean period of 15 years after treatment¹⁴. Some authors have claimed that this does not add to the benefit of exercise program.²⁴

We excluded from this study all patients with comorbidities because we think that patients with comorbidities are usually unable to follow the home exercise programme and may therefore adversely affect results of our study.

Simple shoulder test developed by University of

Washington shoulder service department of orthopaedic surgery is a useful and standardized tool to document the shoulder function before and after the treatment.

Our hypothesis about the role of intra articular corticosteroid injection in frozen shoulder was that it prevents the adhesion formation between capsule and bone by fibrinolysis due to its anti inflammatory effect. Our results have proved that our hypothesis was correct. Majority of our patients in phase II and all in phase I had very good recovery.

CONCLUSION

Combination of single intra-articular corticosteroid injection and home exercise program effectively improves pain and disability in patients with frozen shoulder.

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