



EFFECTIVENESS OF HYDODILATATION IN TREATMENT OF FROZEN SHOULDER : A SYSTEMATIC REVIEW.

¹ RADHIKA PK, ² TEJAL RAJANDEKAR, ³ JUBY SAJU PAPPACHAN

¹ LECTURER OF PHYSIOTHERAPY, ² LECTURER OF PHYSIOTHERAPY, ³ STUDENT

¹ NARAYANA HRUDAYALAYA INSTITUTE OF PHYSIOTHERAPY, BANGALORE,

ABSTRACT-

- Frozen shoulder is defined as an idiopathic disease that will present itself with symptoms like pain and reduced range of motion at the shoulder joint. Frozen shoulder has an incidence of 3%-5% in the general population and up to 20% in those with diabetes. Usually its peak incidence is between the ages of 40 and 60 years.
- The aim of this review was to evaluate the effectiveness of Hydro dilatation treatment of frozen shoulder followed by physiotherapy. Hydro dilatation is a rapid, non-surgical and cost-effective treatment that has proved to reduce pain and restore function as an attractive option plus intra-articular steroid injection supervised by physiotherapist followed by home exercise program in management of idiopathic frozen shoulder. The aim of this review was to document the effectiveness of hydro dilatation along with physiotherapy in treatment of idiopathic frozen shoulder.

Introduction

Frozen shoulder usually has an onset in the fourth to sixth decade of life and can be classified according to its aetiology into primary idiopathic or secondary. Secondary frozen shoulder can be further categorized into that from intrinsic causes and, extrinsic causes. [1]

Frozen shoulder usually affects the rotator interval and begins with thickening of the coracohumeral ligament.[2] This leads to early loss of external rotation, which is a classical sign. As the disease advances, there is contraction of the glenohumeral capsule and thickening of the glenohumeral ligaments, with result in a decreased soft-tissue compliance.[3]. As the disease progresses, the pain typically resolves but disabling restriction of movement persists. The diagnosis is made clinically but radiographs must be obtained to differentiate frozen shoulder from alternative causes which can lead to a restriction in external rotation, like osteoarthritis or posterior dislocation. Present with a painful restriction of shoulder motion due to pain inhibition or due to weakness from rotator cuff tears or neurological deficits which appear to form a separate clinical entity from patients with no underlying cause for their symptoms.

Many techniques have been developed for frozen shoulder treatment. Distension arthrography (also known as hydro dilatation) is one of these techniques. It is in principle an injection into the glenohumeral joint under pressure. The hydro dilatation procedure was first described by Andr en and Lundberg. Since then, a number of investigators have studied the effects of hydro dilatation treatment, and several report beneficial results [5]. Hydro dilatation has gradually emerged as a potential non-surgical option in the management of frozen shoulder. However, its role has yet to be fully clarified. The role of hydro dilatation compared with more established treatments for frozen shoulder remains undefined. Some interventions included a physiotherapy program or manipulation procedures.

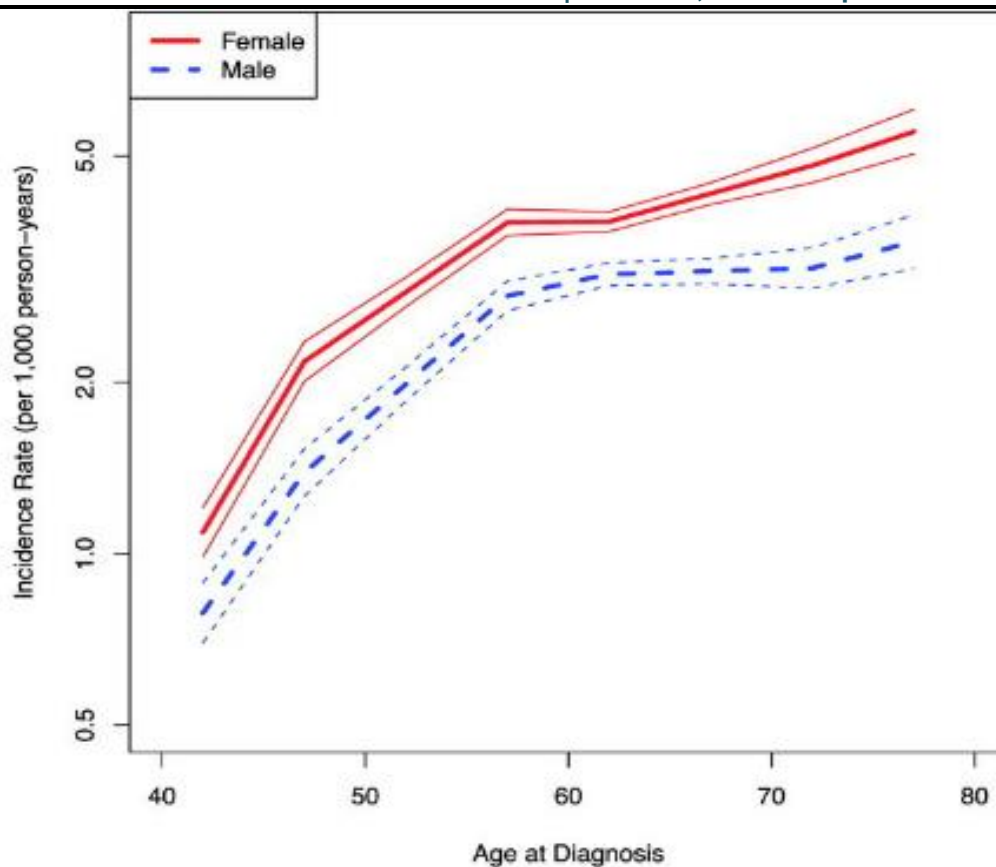


Fig:1-showing the incident rate of Frozen shoulder.

There are three main phases of frozen shoulder:

- Painful phase
- Stiff phase
- Recovery phase

FACTORS THAT AFFECTS TO THE FROZEN SHOULDER

- Diabetes mellitus
- Stroke
- Accidents
- Lung disease
- Open heart surgery
- Parkinson Disease
- Tonic seizures
- Connective tissue disease

ANATOMY

Frozen shoulder or adhesive capsulitis is a common condition characterized by spontaneous onset of pain and stiffness of the shoulder joint that restricts activities of daily living work. Pain is usually constant and worse at night.

The loose bag(capsule) around the shoulder joint becomes inflamed. The bag then appears to tighten or shrink. This tightening combined with the pain restricts the movement

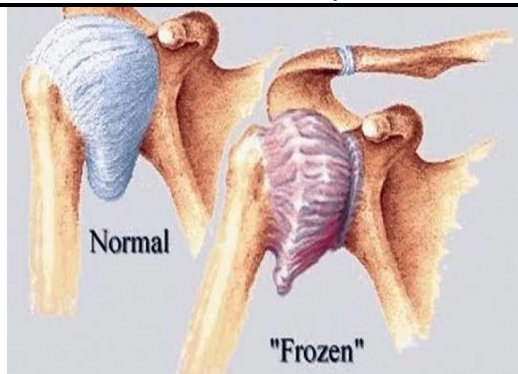


Fig:-2- showing the normal and the frozen shoulder.

CURRENT TREATMENT OPTIONS

Injections and physiotherapy

Initially frozen shoulder was predominantly thought to be an inflammatory condition, hence initial management has been with intra-articular injection of steroids and local anaesthetic into the glenohumeral joint and physiotherapy as first-line treatment. A randomised trial demonstrated superior outcomes of isolated treatment with injections over physiotherapy in primary frozen shoulder, with faster relief of symptoms in the injection group. However, it has also been demonstrated that there is a statistically significant benefit with the addition of physiotherapy after a glenohumeral joint injection. There is evidence of short-term benefits of oral steroids in the management of frozen shoulder but the benefits lasted less than six weeks.

Manipulation under anesthesia (MUA)

The intention of manipulation of the frozen shoulder under anaesthesia is to forcibly rupture the contracted capsule. MUA is often combined with intra-articular steroid injection to minimise the secondary inflammatory response in order to permit subsequent rehabilitation. However, the literature has called into question the benefit of intra-articular steroid injection after the procedure. MUA may be performed in isolation or as an adjunct to arthroscopic arthrolysis. Short-term results within one year have been reported to be superior with combined MUA and arthroscopic arthrolysis compared with MUA alone, although after one year there was no difference. The literature supports MUA as a treatment to accelerate recovery in frozen shoulder, but historically the literature has failed to support MUA as a treatment in diabetic patients, with poor short-term outcomes reported.

Arthroscopic arthrolysis (capsular release)

Although various surgical techniques are available, a release of the anterior capsule and clearance of the rotator interval to include the superior and middle glenohumeral ligaments and the coracohumeral ligament is invariably performed in all reported studies. Variations on the technique include a spectrum of further releases, with some surgeons performing a full 360° release. Despite this, arthroscopic arthrolysis remains the preferred surgical option when managing frozen shoulder. It is anticipated that the currently recruiting multi-centre randomised United Kingdom Frozen Shoulder Trial (UK FROST), which is comparing structured physiotherapy *versus* manipulation under anaesthesia *versus* arthroscopic capsular release, will serve to further contribute to the literature base and answer some of the uncertainties regarding optimal management of the frozen shoulder.

Hydro dilatation (distension arthrography)

Hydro dilatation is a non-surgical radiological intervention used in the management of frozen shoulder. Although therapeutic regimens will differ between units, common to most is the instillation of a large volume of saline containing steroid, local anaesthetic and contrast material into the glenohumeral joint under imaging guidance, typically around 30 ml. The stated benefits of the procedure are achieved through hydraulic distension of the capsule and the main purpose of initial work was to achieve capsular rupture. However, there is little in the way of evidence to determine whether capsule rupture must be achieved in order for the procedure to be successful, or whether it is the capsular distension which is most important. Most studies comment on their intention to achieve capsular rupture but have not investigated this.

Physiotherapy

Most patients are initially prescribed a course of physiotherapy prior to referral to a surgeon. The aim behind most regimens is to prevent further reduction in range of motion and eventually to increase the range of motion in the affected shoulder. Passive mobilization and capsular stretching are two of the most commonly used techniques. Despite the near universal use of physiotherapy as a first line treatment for frozen shoulder there is very little high-quality evidence to support its use. Cochrane reviews have demonstrated that the current literature base shows that physiotherapy alone has little to no benefit as compared to control groups. There are a number of adjuncts that are often used with physiotherapy including extracorporeal shockwave therapy, electromagnetic stimulation, acupuncture and the use of lasers, none of which have been subjected to investigation with randomized controlled studies.

CONTRAINDICATIONS FOR HYDRODILATATIONS

- Systemic inflammatory disease including osteoarthritis and rheumatoid arthritis.
- Diabetes
- Tumour
- Pregnancy
- Contraindicated to arthrogram such as warfarin therapy, allergy to local anaesthesia or iodinated contrast



Fig- procedure of Hydro dilation on Frozen shoulder.

ASSESSMENT**SUBJECTIVE ASSESSMENT****DEMOGRAPHIC DATA:**

Name:
Age:
Sex:
MRN:
Address:
Marital status:
Language:

Chief complaint:**History:**

Present history: mode of onset
: duration
: associated history

Present medical history: trauma or dislocation
: position of the shoulder at the time of incident is noted.
: fall on the point of shoulder – AC joint injury.

Surgical history of present or past:**Occupational history:**

Family history: similar problems in relatives or hereditary disease.

Personal history: lifestyle

: sleep pattern
: workload

Environmental history: environment of work and home place**Social history: social and educational status**

Pain history: onset of pain- gradual/ insidious
: duration of pain- continues/ intermittent
: type of pain- burning, pricking, sharp
: aggravating factors
: relieving factors
: site of pain
: side of pain

OBJECTIVE ASSESSMENT**On observation-** (sitting/ standing) b

- : body built
- : observation from front, behind and lateral
- : attitude of limb
- : deformity
- : presence of edema
- : pattern of movements- synergic/ Asynergic
- : external appliances

On palpation: palpation should be done on

- : glenohumeral joint
- : acromioclavicular joint
- : bicipital groove
- : parascapular muscles

Edema: if present pitting/ non-pitting**Tenderness:****Warmth:****Crepitus:****On examination:****Range of motion examination:**

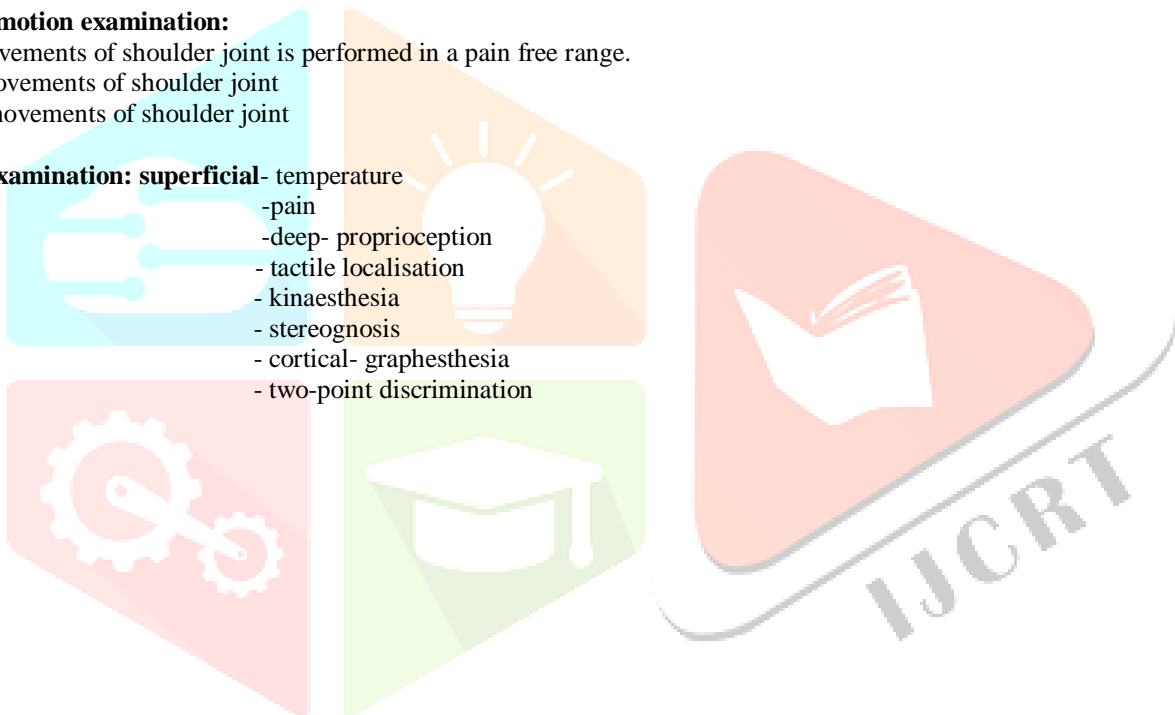
Active movements of shoulder joint is performed in a pain free range.

Passive movements of shoulder joint

Resisted movements of shoulder joint

Sensory examination: superficial- temperature

- pain
- deep- proprioception
- tactile localisation
- kinaesthesia
- stereognosis
- cortical- graphesthesia
- two-point discrimination



Reflex examination: biceps and triceps

Manual muscle testing:

UPPER LIMB	RIGHT	LEFT
Biceps		
Triceps		
Brachioradialis		

SPECIAL TESTS:

1.Instability tests	Load and shift test Sulcus sign Feagin test Posterior apprehension test
2.Impingement tests	Neer test Hawkins-Kennedy test Posterior internal impingement test
3.Labral tear tests	Clunk test (bankarts) Anterior slide test Anterior compression test (SLAP) Biceps tension test
4.Scapular stability tests	Lateral scapular slide test Wall push up
5.Muscle/ tendon pathology tests	Speeds test (biceps) Yeragasons test (biceps) Empty can test (supraspinatus) Lift-sign (subscapularis) Medial rotation test/ lag test (supraspinatus) Lateral rotation (infraspinatus)
6.Thoracic outlet tests	Roos test Military brace test

Scales used –

OXFORD SHOULDER SCORE

The oxford shoulder score (OSS) is a 12-item patient-reported outcome measures specifically designed and developed for assessing outcomes for shoulder surgery and the impact on patient quality of life of degenerative conditions such as arthritis and rotator cuff problems. It has undergone rigorous testing for validity and reliability to change and has been shown to be robust tool for assessing outcomes following intervention. It returns a single score between 0 and 48, with a higher score representing a better functioning shoulder.

VISUAL ANALOGE SCALE

Patient marks a continuum of severity from “no pain” and “very severe pain.” Simple and quick to use and can track the pain experience as it changes, this could reveal the patterns such as situations or times of the day when the pain is better or worse.

ARM SHOULDER HAND SCORE

The quick DASH is also a patient-reported outcome measures using items to measure physical function and symptoms in people with musculoskeletal disorders of the upper limb. It returns a single score between 0 and 100, with a lower score representing a better functioning shoulder.

SPADI

The Shoulder Pain and Disability Index (SPADI) is a patient completed questionnaire with 13 items assessing pain level and extent of difficulty with ADLs requiring the use of the upper extremities. The pain subscale has 5-items and the Disability subscale has 8-items.

AIMS AND OBJECTIVES OF THE STUDY

- To find out the effectiveness of hydro dilatation on frozen shoulder.

REVIEW OF LITERATURE

Dr. Shambhu Sah, Sigdel D (2019): This study was to evaluate the effectiveness of intra-articular steroid injection in treatment of idiopathic frozen shoulder followed by physiotherapy and home exercise program. The mean age of patient was ranged 45-55 years. All the patients underwent treatment protocol that comprised of intra-articular steroid injection followed by five days of oral NSAIDs along with five days regime of physiotherapy and home exercise program. All patients enrolled for the study had satisfactory response. They concluded that the combination of intra-articular methylprednisolone injection, physiotherapy and home exercise program is effective in frozen shoulder for rapid improvement in pain and range of motion.

M.Saltychev, K.Laimi (2018): A systemic review and meta-analysis on effectiveness of hydro dilatation in adhesive capsulitis of shoulder joint and to assess the correlation between the effects of this procedure and the amount of fluid injected. It results of the 270 records identified through search, 12 studies were included in qualitative and quantitative analysis and seven were included in a meta-analysis. The lower 95% confidence interval for the effect of hydro dilatation on pain severity was 0.12 indicating small effect size and mean number needed to treat 12. They have concluded that according to current evidence, hydro dilatation has only a small, clinically insignificant effect when treating adhesive capsulitis.

S. Rymaruk, C. Peach (2017): Conducted a review on indications for hydro dilatation for frozen shoulder. Hydro dilatation is a potential first-line treatment of frozen shoulder in secondary care. A rapid, non-surgical and cost-effective treatment that reduces pain and restores function is an attractive option. They concluded that the patient who are not improving or in whom watchful waiting is not practical, hydro dilatation can be supported for short term management. Diabetic patient must be counselled about the anticipated inferior outcomes when compared with non-diabetic population.

Ragendranath Sinha, Priyeshpatel, Nicky Rose (2016): Conducted an analysis of hydro dilatation as part of a combined service for stiff shoulder. Patients referred from the shoulder clinic, underwent hydrodilatation under ultrasound guidance. 163 patients underwent the procedure and attended follow-up physiotherapy. Outcome measures were available for 118 patients. There was a statistically significant improvement in function scores (Oxford shoulder score and disability arm shoulder hand score). They concluded that the hydro dilatation results in a significant improvement of symptoms in patient with adhesive capsulitis.

Puniasonu, Sushma (2015): conducted a study on physiotherapy management in patient with frozen shoulder. A rehabilitation protocol was followed to treat diagnosed frozen shoulder patient. Reduction in pain, improvement in range of motion and able to do activities of daily livings after giving physiotherapy management. This study concluded that various therapeutic techniques like hot packs, ultrasound, capsular stretches and home regime have a significant effect in reducing pain and increasing range of motion and stiffness of joint in frozen shoulder.

Philip Yoong, Stephen Duffy, David Mckean (2014): This study was to evaluate on targeted ultrasound-guided hydro dilatation via the rotator interval for adhesive capsulitis. They have selected 22 patients were suitable for inclusion in the study. Nineteen were female and three were male. The mean range was 55 years. The duration of symptoms ranged from 4 weeks to 20 months. At 4 months of patients described good improvement in their symptoms and there was a statistically significant improvement in the oxford shoulder scores. They concluded that the rotator interval and anterior joint capsule are strongly implicated in the symptomatology of adhesive capsulitis. The novel use of targeted ultrasound-guided hydro dilatation via rotator interval gives good results in reducing shoulder pain and symptoms in adhesive capsulitis.

Kamath surenthra, Nahar Vivek P (2014): Comparison study of the functional outcome following hydro dilatation with manipulation and manipulation alone for idiopathic frozen shoulder. The mean duration of follow-up was 12 months. With hydro dilatation plus manipulation 77% patient had a satisfactory outcome, 20% had fair outcomes, and 3% were not satisfied with the treatment. They have concluded that hydro dilatation is a simple and effective add on to the routinely done manipulation procedures to obtain better results and also from this study it appears that male gender, bilateral disease and diabetes were associated with worse motion at the final evaluation.

DP, Lamichhane AP, Mahara DP (2012): Comparison between hydroplasty and intra-articular steroid injection in treatment of idiopathic frozen shoulder. In this study they found out significant improvement in pain scale, range of motion and disability scale in 3 months follow-up in hydroplasty group than intra-articular steroid injection in idiopathic frozen shoulder. so they concluded that the hydroplasty technique was more effective than steroid injection in frozen shoulder.

Lyn Watson, Andrea bialocerkowski (2007): To determine the long-term effectiveness of hydro dilatation and post-hydro dilatation physiotherapy in patient with primary and secondary glenohumeral contracture associated with rotator cuff pathology. They selected a total of 53 patients, at the 2 years assessment, there were no significant differences in demographic characteristics, primary outcomes, pre-hydro dilatation outcome measures and intra-hydro dilatation findings. They concluded that the hydro dilatation and physiotherapy increase shoulder motion and have a significant effect in increasing functional capacity. benefits associated with hydro dilatation and physiotherapy continue to improve, in a long-term (up to 2 years after hydro dilatation). Therefore, physiotherapy and hydro dilatation seem to be effective and relatively low risk interventions for stiff and painful shoulder.

METHODS AND METHODOLOGY SEARCH METHOD**Search method**

A search of articles for this study was done on PubMed control, Medline, online journal, google scholar the search strategy being: “effectiveness of hydrodilatation in idiopathic frozen shoulder followed by physiotherapy management and home exercise program” and keywords including frozen shoulder, aetiology, pathogenesis, conservative treatment, operative treatment, hydrodilatation.

INCLUSION CRITERIA:

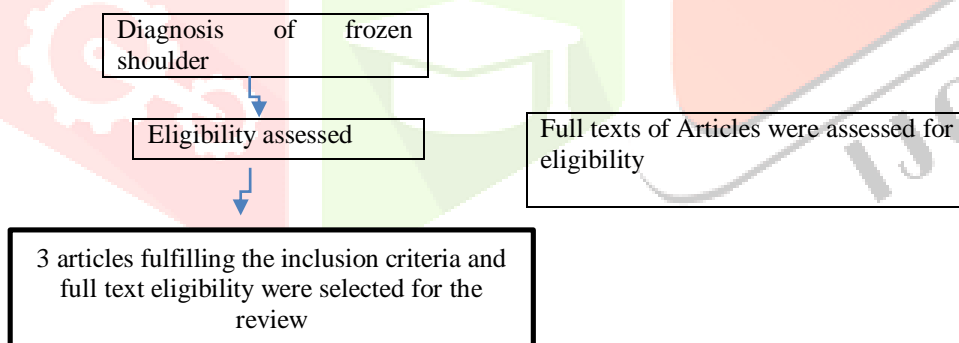
- Patients were likely to undergo hydro dilatation and physiotherapy programme
- Clinically suffering from pain and decreased ROM of shoulder for 6 weeks
- Failure to respond to conservative treatment
- Restriction of passive motion of shoulder in > 2planes of movement.

EXCLUSION CRITERIA:

- Systemic inflammatory joint diseases
- Glenohumeral joint arthritis
- Diabetes
- Tumor
- Full thickness rotator cuff tear
- Fracture or previous shoulder surgery
- Contraindications to arthrogram or hydro dilatation such as warfarin therapy; allergy to local anaesthesia
- Pregnancy

METHODOLOGY

- A total of 40 articles were taken for this study out of which articles were screened for inclusion and exclusion criteria.
- 40 studies (RCTs, systematic reviews, Cohort studies) were screened.
- After screening for full text eligibility and inclusion and exclusion criteria, only 3 studies were found to fulfill the criteria and were included in this review.

**RESULT**

Hydro dilatation, corticosteroids and adhesive capsulitis: A randomized controlled trial (2008) In this the groups showed a rather similar degree of improvement from baseline. According to a multiple regression analysis, the effect of dilatation was a mean improvement of 3 points (confidence interval: -5 to 11) on the SPADI 0–100 scale. T-tests did not demonstrate any significant between-group differences in range of motion. This study did not identify any important treatment effects resulting from three hydro dilatations that included steroid compared with three steroid injections alone.

Intra-articular injection, subacromial injection, and hydro dilatation for primary frozen shoulder: A RANDOMIZED clinical TRIAL (2015). Among the 3 injection methods for primary frozen shoulder, HD resulted in a greater range of motion in forward flexion and external rotation, a lower visual analog scale score for pain after 1 month, and better outcomes for all functional scores after 1 month and 3 months of follow-up. However, there were no significant differences in any clinical outcomes among the 3 groups in the final follow-up at 6 months.

Randomized controlled trial of supervised physiotherapy versus a home exercise program after hydro dilatation for the management of primary frozen shoulder (2017). There was no significant difference between the treatment groups at any time point as measured by the OSS or EQ-5D index. In group 1, the OSS improved significantly from 25.00 (95% confidence interval [CI], 21.92-28.08) at baseline to 38.29 (95% CI, 34.01-42.58; $P < .0001$) at 4 weeks and 43.71 (95% CI, 41.61-45.80; $P < .0001$) at 1 year. In group 2, the OSS improved significantly from 26.60 at baseline (95% CI, 22.50-30.70) to 40.07 (95% CI, 36.77-43.36; $P < .0001$) at 4 weeks and 43.00 (95%

CI, 39.69-46.31; $P < .0001$) at 1 year. All outcome measures improved significantly from baseline to 4 weeks. In this group of patients, after a hydro dilatation procedure for the treatment of primary frozen shoulder, there was no significant difference in clinical outcomes between supervised physiotherapy in addition to a home exercise program and a self-directed home exercise program in isolation.

CONCLUSION

From reviewing the studies, we conclude that there are many cases of frozen shoulder which are mild and will resolve with analgesics and physiotherapy. However, for patients who are not improving or in whom watchful waiting is not practical, hydro dilatation can be supported for short-term management. The hydro dilatation is a simple, effective add on to the routinely done manipulation procedures which shows a significant improvement of symptoms of patient. The combination of intra-articular methylprednisolone, physiotherapy and home exercise program is effective for rapid improvement of pain and range of motion for frozen shoulder patients.

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