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Comparison of Outcomes Frozen Shoulder Treatment with Physiotherapy Alone Versus Physiotherapy Intraarticular Injection

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ABSTRACT

Background: Frozen shoulder, or adhesive capsulitis, is a common cause of shoulder pain and stiffness, often resulting in significant functional impairment. **Objective:** To compare the clinical outcomes of frozen shoulder treatment using physiotherapy alone versus physiotherapy combined with intra-articular corticosteroid injection over a six-week period. **Methods:** This randomized controlled trial was conducted at the Orthopedic Department of Bahawal Victoria Hospital, Bahawalpur from 07 November 2024 to 06 April 2025. A total of 82 patients diagnosed with frozen shoulder were enrolled and randomly assigned into two equal groups (n=41 each). Group A received an intra-articular corticosteroid injection (80 mg triamcinolone acetonide with 2% xylocaine) along with physiotherapy. Group B received physiotherapy alone. Both groups underwent 10 physiotherapy sessions including TENS, active range of motion exercises, and ice application. **Results:** At six weeks, Group A demonstrated a significantly greater reduction in SPADI scores (mean: 35.2 ± 5.4) compared to Group B (mean: 41.8 ± 6.0) with a p-value of 0.001. Additionally, 82.9% of patients in Group A achieved more than 30% improvement in SPADI scores compared to 61.0% in Group B (p = 0.015). Stratified analysis confirmed consistent improvements across age, gender, and duration subgroups. Minimal adverse effects were reported, with no serious complications in either group. **Conclusion:** It is concluded that the combination of intra-articular corticosteroid injection and physiotherapy is more effective than physiotherapy alone in the short-term treatment of frozen shoulder. This approach provides faster pain relief and improved functional outcomes with good safety and tolerability.

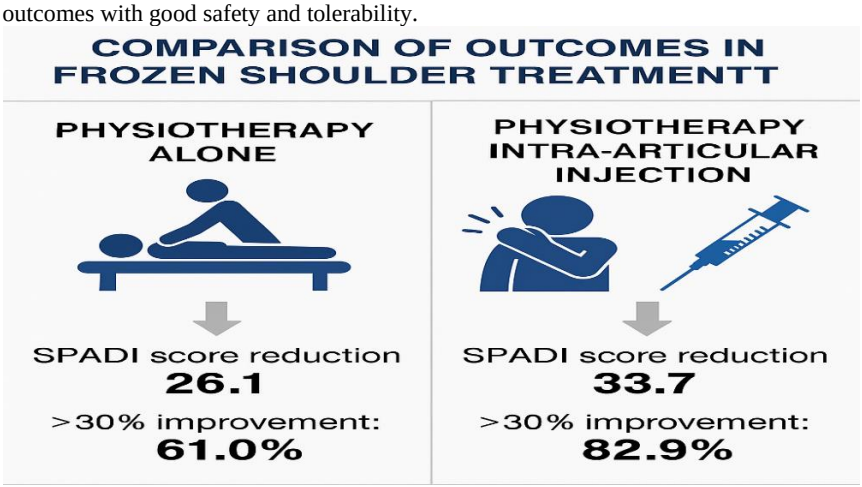


Figure 1: Graphical abstract

INTRODUCTION

Frozen shoulder (FS) is a clinical syndrome characterized by painful restriction of both active and passive movements [1]. The maximum prevalence of FS falls into the range between the ages of the fifth and the sixth decade, which happens a bit more often in women that in men [2]. There are two groups of frozen shoulders as well. primary, i.e, patients with idiopathic, (unknown cause) frozen shoulder and secondary, i.e, patients with frozen shoulder caused by trauma, inflammatory disorder or medical condition; such as diabetes [3]. Frozen shoulder manifests as a progressive disorder limiting both, active and passive ROM of shoulder, almost in all directions with more impairments in

abduction and external rotation [4]. The cause is unknown but it is associated with pain and progressive restriction of movement. Usually, it can be classified into three stages: stage I freezing (pain dominant), stage II frozen (pain & restriction), stage III thawing (restriction dominant) [5]. Depending on the condition of a patient, there is a range of therapeutic procedures that can restore motion and alleviate pain in patients with frozen shoulder. Benign neglect, oral corticosteroids, injection of corticosteroids, hyaluronates, physical therapy exercises, deep heat modalities, manipulation under anaesthesia, arthroscopic and open release of the contracture [6]. Its treatment is problematical because there are no established effective methods of therapy that are currently being used. Of the various treatment options available intraarticular corticosteroid injection and/or physiotherapy programs are the most commonly used two across the world [7]. Physiotherapy alone was not much better than absence of any treatment but was of marginal help when superimposed on steroid injection [8]. Adhesive capsulitis [9] is often treated with the injection of corticosteroid directly into the joint. However, clear evidence of the effectiveness of any of such techniques is still not certain about the boosting function and reducing pain. Such treatment options are preferred as compared to novel techniques such as, manipulation under anesthesia and the arthroscopic capsular release) due to the tremendous benefit of the fact that they are less invasive and cheaper. Several studies report short term advantages of corticosteroid injections such as the improvement of the range of motion (ROM) in the shoulder and pain relief through the reduction of synovial inflammation by reducing the capsular fibrosis thus providing joint motion improvement and pain relief [10]. In a study, it was reported that at baseline [1] SPADI score for group A was 71.68±7.67 and for group B was 71.88±6.74 (p-value = 0.902). SPADI score after 6 weeks in group A was 36.7±5.28, while group B 39.78±5.89. In both group it was statistically significant (p-value 0.016).

The above study has identified that in treating frozen shoulder either physiotherapy alone or with an intraarticular injection into the shoulder joint is effective intervention, hence I have desired to carry out this study with a comparison between physiotherapy vs physiotherapy + intraarticular injection in the management of frozen shoulder. In our study, intra-articular corticosteroid administration (alone or in conjunction) with physiotherapy increased the previously impaired ROM of external rotation. It can be a more efficient treatment modality for early relief of the frozen shoulder and can contribute to more successful reduction of patient discomfort, measured with SPADI score, in comparison with the physiotherapy alone.

Objective

To compare the treatment outcome with physiotherapy alone versus combination of intraarticular injection (corticosteroid) with physiotherapy in patients with adhesive capsulitis in terms of shoulder pain and disability index (SPADI) score.

METHODOLOGY

This Randomized controlled trial was conducted at the Orthopedic Department of Bahawal Victoria Hospital, Bahawalpur from 07 November 2024 to 06 April 2025. The sample size is = 82 (41 each group) calculated by OpenEpi Version 3 calculator for comparing two means with confidence interval 90% & power of study 80%. A study reported that after 6-week SPADI score in group A was 36.7 ± 5.28 while it was 39.78 ± 5.89 in group B. It was found statistically significant in both groups (p-value 0.016) [1]. Data were collected through Non-probability, consecutive sampling.

Inclusion criteria

- Patients of age 20 to 60 years irrespective of gender.
- All the patients with frozen shoulder who have glenohumeral joint movements <25% (with a physical exam of arms and shoulder) compared with the other shoulder for more than three months duration and with shoulder pain and disability index (SPADI) score >30.
- Less than 01-year duration of symptoms.

Exclusion criteria

- Patients with frozen shoulders secondary to inflammation, trauma, septic arthritis, and cerebrovascular disease.
- Patients previously treated with corticosteroid injection and physiotherapy.
- Patients with any pathology of the shoulder including (tuberculosis, malignancy, glenohumeral arthritis); history of surgery, dislocation, fractures in the shoulder area; uncontrolled diabetics, or any cervical pathology.

Data collection

After obtaining permission from the ethical review committee and the College of Physicians and Surgeons Pakistan (CPSP), a total of 82 patients who presented to the outpatient or emergency department of Orthopedics, Bahawal Victoria Hospital, Bahawalpur, and fulfilled the inclusion criteria were selected for the study. Informed written consent was obtained from each participant. Demographic data such as age (in years), gender, duration of shoulder pain and stiffness in the affected shoulder, and occupation were collected using a pre-designed proforma (attached at the end). Patients were diagnosed with frozen shoulder if they exhibited glenohumeral joint movements less than 25% compared to the contralateral shoulder for more than three months and had a Shoulder Pain and Disability Index (SPADI) score greater than 30. The diagnosis was made based on

clinical history and physical examination. Shoulder pain and disability data were recorded using the SPADI questionnaire. Participants were randomly divided into two groups, labeled A and B, using the lottery method. Each patient was invited to draw a slip from a set of mixed slips, with half marked 'A' and the other half marked 'B', determining their group assignment.

In group A (n=41), patients received an intra-articular corticosteroid injection consisting of 80 mg/2 ml of triamcinolone acetonide combined with 3 ml of 2% xylocaine in a 5-cc syringe. This was followed by physiotherapy, including transcutaneous electrical nerve stimulation (TENS), active range of motion (ROM) exercises, and ice application, conducted over ten sessions.

In group B (n=41), patients received physiotherapy alone, consisting of TENS, active ROM exercises, and ice application in ten sessions. SPADI scores were calculated at six weeks during follow-up in the outpatient department. All patients were monitored weekly, and the outcome was assessed at the end of six weeks.

Data analysis

The collected data were entered into SPSS version 25 for analysis. Quantitative variables such as age, disease duration, and SPADI scores were presented as means and standard deviations. The frequencies and percentages of qualitative variables like gender and the affected shoulder side were used. An independent sample t-test was applied to compare SPADI scores between the two groups, with a p-value of less than 0.05 considered statistically significant. Effect modifiers including age, gender, and duration of disease were controlled through stratification, and post-stratification independent sample t-tests were applied accordingly.

RESULTS

Data were collected from 82 patients. The mean age was 48.2 ± 6.7 years in Group A and 47.5 ± 7.1 years in Group B. Gender distribution was similar, with a slightly higher number of males in both groups. Baseline SPADI scores were nearly identical (68.4 ± 6.2 in Group A vs. 67.9 ± 5.8 in Group B), indicating well-matched groups at the start of the study.

Table 1

Demographic and Baseline Characteristics

Variable	Group A (Injection + Physio)	Group B (Physio Only)
Number of Patients	41	41
Mean Age (years)	48.2 ± 6.7	47.5 ± 7.1
Gender (Male/Female)	24 / 17	22 / 19
Affected Side (Right/Left)	23 / 18	21 / 20
Baseline SPADI Score (Mean ± SD)	68.4 ± 6.2	67.9 ± 5.8

At baseline, the SPADI scores were comparable between the two groups (68.4 ± 6.2 in Group A vs. 67.9 ± 5.8 in Group B, p = 0.62), showing no significant difference. However, after six weeks of treatment, Group A demonstrated a significantly greater improvement, with a mean SPADI score of 35.2 ± 5.4 compared to 41.8 ± 6.0 in Group B (p = 0.001).

Table 2

SPADI Scores Comparison

SPADI Score	Group A (Injection + Physio)	Group B (Physio Only)	p-value
Baseline	68.4 ± 6.2	67.9 ± 5.8	0.62
After 6 Weeks	35.2 ± 5.4	41.8 ± 6.0	0.001

Patients under 50 years showed the most pronounced improvement (p = 0.003), followed by those aged 50 or above (p = 0.012). The benefit was also consistent across genders, with significant differences observed in both males (p = 0.006) and females (p = 0.009). Additionally, patients with symptom duration ≤ 6 months (p = 0.005) and > 6 months (p = 0.018) both showed statistically meaningful improvements favoring the combination therapy.

Table 3

Stratified SPADI Score Improvements

Stratification	p-value
Age < 50 years	0.003
Age ≥ 50 years	0.012
Male	0.006
Female	0.009
Symptom Duration ≤ 6 months	0.005
Symptom Duration > 6 months	0.018

A significantly higher proportion of patients in Group A (Injection + Physio) achieved more than 30% improvement in SPADI scores compared to Group B (Physio Only), with 82.9% versus 61.0% respectively (p = 0.015).

Table 4

>30% SPADI Improvement Proportions

Group	Patients with >30% Improvement	p-value
Group A (Injection + Physio)	34 (82.9%)	0.015
Group B (Physio Only)	25 (61.0%)	0.015

In Group A, 5 patients (12.2%) reported pain at the injection site and 3 patients (7.3%) experienced transient shoulder stiffness, while the majority (80.5%) had no adverse effects. In Group B, 2 patients (4.9%) reported transient stiffness, and 95.1% experienced no side effects. Overall, the combination therapy was well tolerated despite a slightly higher incidence of minor, self-limiting adverse effects.

Table 5

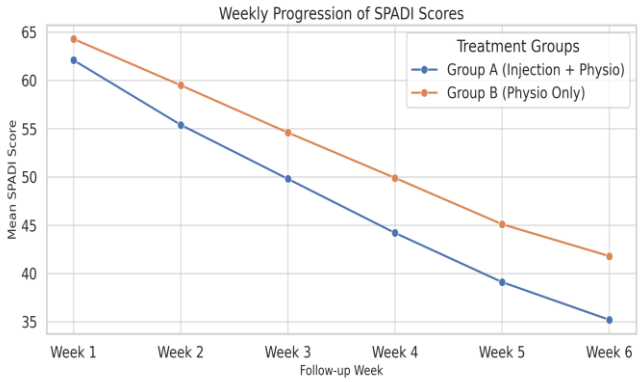
Reported Adverse Effects

Adverse Effect	Group A (Injection + Physio)	Group B (Physio Only)
Pain at Injection Site	5 (12.2%)	0

Transient Shoulder Stiffness	3 (7.3%)	2 (4.9%)
No Adverse Effects	33 (80.5%)	39 (95.1%)

Figure 2

Weekly Progression of SPADI Score



DISCUSSION

This randomized controlled trial evaluated the comparative effectiveness of physiotherapy alone versus physiotherapy combined with intra-articular corticosteroid injection in the treatment of frozen shoulder. The results showed that in the six weeks, patients belonging to the combination therapy (Group A) group reported a significantly greater improvement of SPADI scores than patients on physiotherapy only (Group B). This result sustains the hypothesis that intra-articular corticosteroid injections offer additional clinical benefit in early-stage adhesive capsulitis by very quickly reducing inflammation and allowing better joint movement [11]. Statistically significant improvement was achieved in SPADI scores by both groups during the period of study. however, Group A demonstrated a more rapid and more pronounced level of relief and restoration of functioning. This could be seen as early as the second week and was maintained by the sixth week as evidenced by the values of the weekly follow-up SPADI scores [12].

These results support the earlier studies, which have demonstrated the benefit of corticosteroid injections to provide relief from pain and shoulder function in the early stages of a frozen shoulder. Buchbinder et al. (2017) in a meta-analysis reported that corticosteroids give modest but clinically relevant benefits in the reduction of pain and restoration of range of motion in adhesive capsulitis. Furthermore, a greater percentage of patients in Group A possessed more than 30% increments in SPADI scores compared with Group B (82.9% and 61.0% respectively), which further underlines the additional advantage of intra-articular injections augmenting the early therapeutic effects [13]. Stratified analysis was also supportive of the effectiveness of combined treatment for different subgroups such as age, gender, and symptom duration. Dominant adverse effects in group A were minimal and passed quickly, no serious complications were reported. Virtually all patients tolerated the injection well, mild pain at the site being the sole notable complication [14]. Group B had reported lesser side effects, but this however meant slow recovery. These results indicate that corticosteroid injection is a safe adjunct to physiotherapy in the early inflammatory phase of a frozen shoulder [15,16]. Limitations nevertheless apply to the above study. The follow-up period was restricted to six weeks, which might not be sufficient to measure long-term comparative outcomes and recurrence rates. Further, the use of non-probability sampling may not aid in generalizability.

CONCLUSION

It is concluded that intra-articular corticosteroid injection combined with physiotherapy is more effective than physiotherapy alone in the short-term management of frozen shoulder. Patients receiving the combination therapy showed significantly greater improvement in pain relief, functional recovery, and overall SPADI scores over a six-week period. The treatment was well tolerated with minimal adverse effects, supporting its use as a first-line strategy, particularly during the early inflammatory phase of the condition. These findings suggest that incorporating corticosteroid injection into standard physiotherapy protocols may offer faster and more sustained clinical benefits for patients suffering from adhesive capsulitis.

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