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Research Article

EFFICACY OF INTRA-ARTICULAR CORTICOSTEROID INJECTION IN SHOULDER JOINT FOR MANAGEMENT OF ADHESIVE CAPSULITIS: CASE SERIES

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ABSTRACT

Background: Fifty percent of people diagnosed with Adhesive capsulitis (AC) experience shoulder pain and/or stiffness for years after onset. Intra-articular steroid injection is an important treatment in this disease. Beneficial impacts of ultrasound-guided glucocorticoid injections over landmark-guided injections in the treatment of AC are in ambiguity. **Case Presentation:** This case series study is based on 12 patients attended our tertiary care centre with complaints of shoulder pain and limited range of motion; later diagnosed with stage 1 or stage 2 idiopathic AC. The mean age of patients was 64.42 ± 7.33 years with male predominance (66.67%) as compared to females (33.33%). Majority of the patients i.e., 66.67% were affected with stage 2 AC followed by stage 1 AC which accounts for 33.33%. All patients were given intra-articular glenohumeral joint corticosteroid injection in posterior-lateral approach under ultrasound (USG) guidance. **Clinical outcomes:** The functional outcomes were assessed using shoulder pain on Numerical Rating Scale and Shoulder Pain and Disability Index (SPADI) along with measures of active and passive range of motion (ROM) at baseline, and at 3-weeks, 6-weeks, 12-weeks and 6 months after intervention. **Clinical results:** There was a statistically significant ($p<0.001$) improvement in active and passive ROM was observed as early as 3-weeks following intervention with restoration of normal active and passive ROM post 6 months intervention. Also, statistically significant ($p<0.001$) improvement in functional outcome parameters *viz.* shoulder pain and SPADI score was observed as early as 3-weeks following intervention along with amelioration to normalcy of shoulder pain and disability post 6 months of intervention. **Conclusion:** Our case series study evidenced that intra-articular glenohumeral joint corticosteroid injection under ultrasound guidance could be the preferred choice for the management of shoulder pain in patients with idiopathic AC.

Keywords: Adhesive capsulitis, Idiopathic, Shoulder pain, Disability, Corticosteroid, Ultrasound.

INTRODUCTION

Adhesive capsulitis (AC), commonly known as frozen shoulder, is a frequent cause of shoulder pain and restricted movement, affecting approximately 2–5% of the general population and up to 20% of individuals with diabetes mellitus.[1] According to the American Shoulder and Elbow Surgeons (ASES), AC is defined as a condition involving a limitation in both active and passive shoulder motion, with radiographic findings of the glenohumeral joint typically appearing normal except for possible signs of osteopenia or calcific tendonitis.[2] As per ASES, the exact cause of AC remains uncertain, and it is not attributed to intrinsic shoulder pathology. The condition is characterized by progressive fibrosis and tightening of the glenohumeral joint capsule, resulting in pain and stiffness.[3]

AC can be classified into two main types *viz.* primary (idiopathic) AC and secondary AC. The secondary AC may arise following trauma, rotator cuff pathology, cardiovascular disease, hemiparesis, or metabolic conditions such as diabetes.[3] While AC is generally regarded as a self-limiting condition that may resolve spontaneously within one to three years; whereas up to 20–50% of affected individuals experience persistent limitations in range of motion (ROM) even after a decade.[4]

Management of idiopathic AC remains debated. Some researchers advocate for a conservative "wait-and-see" approach, citing its natural tendency to improve over time. In contrast, other studies report that symptoms and functional limitations may persist despite long-term follow-up.[5] The condition typically progresses through three overlapping stages: freezing, frozen, and thawing.[6] Patients are often categorized based on whether pain or stiffness is the predominant feature. Treatment strategies vary accordingly, with stiffness-predominant cases managed primarily through physical therapy, while pain-predominant cases may require additional interventions. Available treatment options for pain predominant cases include analgesics, physical therapy, corticosteroid or hyaluronic acid injections, manipulation under anesthesia, hydrodilatation, and arthroscopic release, though no single approach is universally accepted as the gold standard.[7-9]

Despite ongoing debate regarding the best treatment, intra-articular injections remain one of the most frequently employed interventions.[4] These injections aim to reduce pain early, facilitate ROM exercises, and promote quicker functional recovery.[6] Among different injectable agents, corticosteroids are widely recognized for their effectiveness in managing AC.[10]

Literature reports evidenced that it is unable to establish whether ultrasound-guided glucocorticoid injections are more beneficial than landmark-guided injections.[11-13] We hypothesize that an intra-articular ultrasound-guided glenohumeral injection (USGI) of corticosteroid in patients diagnosed with stage 1 or stage 2 idiopathic AC will result in timely functional recovery and resolution of pain and stiffness. Hence, in the current case series study we aimed to evaluate the safety, efficacy, and clinical results of intra-articular USGI of corticosteroid in shoulder joint for the management AC.

CASE PRESENTATION

Patients

Patients visited OPD of Department of Orthopaedic at Kodagu Institute of Medical Sciences (KoIMS), Madikeri, Karnataka with complaints of shoulder pain and limited ROM. A written informed consent was taken from all the patients recruited in the study.

Inclusion criteria

1. Any gender
2. Diagnosed with stage 1 or stage 2 idiopathic AC
3. Diagnosis negative for osteoarthritis

Exclusion criteria

Patients with:

1. History of shoulder fractures or dislocations, shoulder trauma or surgical operation to either shoulder in the last 10-years
2. History of neck pain identified by means of the "repeated movements test" and of Wainner's cluster
3. Contraindications to corticosteroid injection

Patient characteristics

The mean age of patients was 64.42 ± 7.33 years with male predominance (66.67%; 8/12) as compared to females (33.33%; 4/12). Majority of the patients i.e., 66.67% were affected with stage 2 AC followed by stage 1 AC which accounts 33.33%. AC was affected on Right shoulder in 58.33% of patients followed by left shoulder in 41.67% patients (Table 1).

Table 1: Patient characteristics

Variables	**Values**
Age, years (mean ± SD)	64.42 ± 7.33
Gender	
Male	8 (66.67)
Female	4 (33.33)
Stage 1 AC	4 (33.33)
Stage 2 AC	8 (66.67)
Site of AC	
Right shoulder	7 (58.33)
Left shoulder	5 (41.67)

Values were expressed as n (%) unless otherwise stated
AC, Adhesive capsulitis; SD, Standard deviation

DIAGNOSIS OF AC

At the initial physical therapy session, patients were asked about their medical history, including the onset of symptoms, pain characteristics such as location and frequency, the presence of stiffness during movement, and any related functional limitations. Following this, a physical examination was carried out to assess passive ROM, along with imaging studies to rule out the possibility of a full-thickness rotator cuff tear. External rotations, abduction and forward flexion were measured using a Tracker Freedom wireless inclinometer, with the unaffected shoulder serving as a reference point.

Subsequently, an ultrasound evaluation was conducted using a M-Turbo Ultrasound System Q54GL1 Model with linear probe (FUJIFILM SonoSite, Inc., Bothell, USA). The supraspinatus, infraspinatus, and subscapularis tendons were examined in both longitudinal and transverse planes. A full-thickness rotator cuff tear was identified by the presence of a hypoechoic area or an anechoic defect along the tendon thickness. Following the ultrasound assessment, patients were referred to an orthopaedist to confirm a diagnosis of stage 1 or stage 2 idiopathic AC. In all 12 cases, the pain intervention specialist and the orthopaedic specialist independently agreed on the diagnosis based on established AC diagnostic criteria from the literature,[14] and the study's inclusion criteria.

Prior intervention all patient underwent routine blood investigations, X ray of shoulder joint, MRI of affected joint.

TREATMENT

All patients were given intra-articular glenohumeral joint corticosteroid injection in posterior-later approach under ultrasound guidance with 1ml Triamcinolone (40mg), and 9ml of normal saline. Posterior Glenohumeral joint injection was given with 21G 1.5″ needle using linear probe, and patient lying prone or sitting and facing the operator (Figure 1). Patients were given two injections with three-week intervals, and all injections were given under USG guidance.

Figure 1: Illustration of intra-articular ultrasound-guided glenohumeral injection of corticosteroid

CLINICAL MEASURES

The functional outcomes *viz.* shoulder pain on Numerical Rating Scale (NRS) score and Shoulder Pain and Disability Index (SPADI) score along with measures of active and passive ROM were measured at baseline, and at 3-weeks, 6-weeks, 12-weeks and 6 months after intervention. The movements tested were abduction, forward flexion, and internal and external rotation at 0° of shoulder abduction, and measurements were made with a goniometer. Recovery criteria were defined as forward flexion, abduction, and external rotation within 15° of the contralateral side and internal rotation within 3 spinous process levels of the contralateral side.

STATISTICAL ANALYSIS

Data were entered in Microsoft Excel 2021 and statistical analysis was done using IBM Statistical Software for Social Sciences (SPSS) version 20. Categorical variables were represented in the form of percentages, and frequencies. Continuous variables were presented as descriptive statistics (Mean and Standard deviation). Repeated measured analysis of variance (ANOVA) was done for comparison of time series data between baseline and at 3-weeks, 6-weeks, 12-weeks and 6 months post intervention. $p \leq 0.05$ was considered statistically significant.

CLINICAL RESULTS

There was a statistically significant ($p<0.001$) improvement in active and passive ROM was observed as early as 3-weeks following USGI of corticosteroid intervention. Furthermore, post six months intervention a normal active and passive ROM was achieved (Table 2).

Table 2: Active and passive range of motion

Variables	Baseline	3-weeks	6-weeks	12-weeks	6-months	All

						p-value
Forward Flexion (180°)	60.83 ± 18.01	94.58 ± 13.46	116.67 ± 15.99	135.00 ± 11.90	159.17 ± 8.62	<0.001
Abduction (170°)	69.17 ± 16.18	101.67 ± 18.63	120.00 ± 18.71	144.17 ± 18.47	155.83 ± 17.54	<0.001
External Rotation (75°)	26.25 ± 10.43	39.58 ± 12.66	56.67 ± 9.65	64.17 ± 4.49	69.58 ± 1.38	<0.001

Values are expressed as mean ± SD; n=12; p<0.001 as compared to baseline at each time point

The results of functional outcome parameters following USGI of corticosteroid intervention were represented in Table 3. Results depicted that there was a statistically significant improvement in functional outcome parameters *viz.* NRS score and SPADI score was observed as early as 3-weeks following USGI of corticosteroid intervention. Furthermore, in six months' time period the shoulder pain was reduced from severe pain (8.83 ± 1.34) to mid pain (1.08 ± 0.76). The SPADI score also improved from very severe shoulder pain and disability (95.83 ± 4.93) to mild shoulder pain and disability (12.50 ± 4.33).

Table 3: Functional outcome parameters

Variables	Baseline	3-weeks	6-weeks	12-weeks	6-months	All p-value
Shoulder Pain (NRS)	8.83 ± 1.34	5.83 ± 1.40	4.17 ± 1.34	2.25 ± 1.23	1.08 ± 0.76	<0.001
Disability Index (SPADI)	95.83 ± 4.93	62.50 ± 7.22	35.00 ± 9.57	22.50 ± 7.22	12.50 ± 4.33	<0.001

Values are expressed as mean ± SD; n=12; p<0.001 as compared to baseline at each time point

DISCUSSION

Shoulder AC is a condition mainly characterized by a decreased ROM. Intra-articular steroid injection is an important treatment to this disease.[13] Owing to uncertainty about the beneficial impacts of ultrasound-guided glucocorticoid injections than landmark-guided injections in the treatment of AC,[11-13] we hypothesized to evaluated if USGI of corticosteroid in patients diagnosed with stage 1 or stage 2 idiopathic AC will result in timely functional recovery and resolution of pain and stiffness. In this case series study comprised of 12 stage 1 or stage 2 idiopathic AC it was learnt that USGI of corticosteroid intervention significantly improved active and passive ROM and functional outcomes such as shoulder pain and SPADI as early as 3-weeks and restored normal active and passive ROM and functional outcomes post 6 months of USGI of corticosteroid intervention.

Concurrently, Naredo et al. conducted a study involving 41 patients with painful shoulders to compare the effectiveness of blind versus USG-guided subacromial injections. Their findings demonstrated that patients who received USG-guided injections experienced greater improvements in pain and function than those treated using anatomical landmarks.[15] Similarly, Ucuncu et al. reported comparable outcomes, confirming the superiority of USG-guided injections for enhancing joint pain relief and functional recovery.[16]

In another study, Lee et al., evaluated 43 patients with AC and observed that, by the second week post-injection, those who underwent USG-guided procedures had significantly greater improvements in pain levels, ROM, and shoulder function scores compared to the blind injection group.[17] Moreover, a systematic review by Soh et al., further supported these findings,

showing that six weeks after injection, patients who received USG-guided treatments had significantly better outcomes in terms of pain reduction and joint function.[18]

Literature reports evidenced that corticosteroid has a greater short-term effect for AC, but only a small long-term effect.[19,20] Moreover, in previous studies, corticosteroid was reported to show improvement in pain early after injection.[21-23] These findings were inconsistent with our study wherein we observed USGI of corticosteroid intervention significantly improved active and passive ROM and functional outcomes such as shoulder pain and SPADI as early as 3-weeks post intervention. Furthermore, Oh and colleagues reported that intraarticular injection of corticosteroid had an excellent effect in improving the quality of sleep, ROM, and function by rapidly alleviating pain in patients with AC.[4]

The mechanism of action behind pain amelioration could be understood from the fact that corticosteroid increases the transcription of genes coding for anti-inflammatory proteins such as liporcortin-1, interleukin-10, and interleukin-1 receptor antagonist and inhibits the expression of multiple inflammatory genes.[24]

CONCLUSION

The findings of our case series study demonstrated that ultrasound guided intra-articular glenohumeral joint corticosteroid injection treatment significantly ameliorated shoulder pain and disability, and improved active and passive range of motion of shoulder through significant improvements in flexion, abduction and external rotations . Hence, intra-articular glenohumeral joint corticosteroid injection under ultrasound guidance could be the preferred choice for the management of shoulder pain in patients with idiopathic AC.

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