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Original Article

Intra-articular Steroid Injection for the Treatment of Idiopathic Adhesive Capsulitis of the Shoulder

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Almahmud Mallik[1*], Nazmus Sakeb Chowdhury[2], Mehedi Hasan[3], Taniful Hoque[4], Nayeem Ullah[5]

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*Corresponding Author

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ABSTRACT

Introduction: *Adhesive capsulitis, commonly known as frozen shoulder, is a painful and debilitating condition characterized by inflammation and stiffening of the shoulder joint, leading to a restricted range of motion. Treatment options for adhesive capsulitis vary, but intra-articular corticosteroid injections have been widely used. This study aimed to assess intra-articular steroid injection for the treatment of idiopathic adhesive capsulitis of the shoulder.* ***Methods & Materials:*** *This retrospective study, conducted between January and August 2024 at Monno Medical College Hospital, included 566 patients with idiopathic adhesive capsulitis treated with intra-articular corticosteroid injections. All analyses were conducted using SPSS version 26.0.* ***Result:*** *This study evaluated the effectiveness of intra-articular corticosteroid injections for treating idiopathic adhesive capsulitis in 566 patients. In this study 69.3% of patients achieved complete pain relief, while 26.1% experienced maximal pain reduction. The majority of patients (50.2%) experienced pain relief within 7-10 days, with 45.2% reporting relief within 11-15 days. The follow-up compliance rate was high, with 95.4% of patients attending all follow-up visits. A small subset of patients (1.2%) required surgical referral due to persistent symptoms, and complications such as post-injection pain flare (1.9%) and transient hyperglycemia (1.6%) were rare but noted.* ***Conclusion:*** *In conclusion, intra-articular corticosteroid injections are an effective and safe treatment option for patients with idiopathic adhesive capsulitis, providing significant pain relief and improving range of motion in the majority of patients. The low complication rate and rapid onset of action make it a favorable non-surgical treatment.*

Keywords: *Intra-articular Steroid Injections, Adhesive capsulitis, Frozen shoulder, Physical activeity*

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1. *Assistant Professor, Department of Orthopedic, Monno Medical College Hospital, Manikganj, Bangladesh*
2. *Consultant, Department of Anesthesiology, Monno Medical College Hospital, Manikganj, Bangladesh*
3. *Assistant Professor, Department of Anesthesiology, Monno Medical College Hospital, Manikganj, Bangladesh*
4. *Registrar, Department of Anesthesiology, Monno Medical College Hospital, Manikganj, Bangladesh*
5. *Associate Professor, Department of Radiology and Imaging, Monno Medical College Hospital, Manikganj, Bangladesh*

INTRODUCTION

Idiopathic adhesive capsulitis (IAC) of the shoulder, commonly referred to as "frozen shoulder," is a debilitating condition characterized by progressive pain and restricted shoulder movements. It primarily involves the glenohumeral joint and is marked by chronic inflammation and fibrosis of the joint capsule, leading to adhesions and loss of mobility. IAC affects approximately 2-5% of the general population, with a higher incidence in middle-aged adults between 40 and 60 years of age, and is more common in women than men [1]. Despite being widely studied, the precise etiology remains unclear, although it is thought to involve a multifactorial process of inflammation, synovitis, and subsequent fibrosis within the joint capsule [2]. Clinically, adhesive capsulitis progresses through three overlapping stages: the painful or "freezing" stage, the stiffening or "frozen" stage, and the recovery or "thawing" stage. The painful stage is marked by significant shoulder pain, particularly at night, and progressive limitation of movement. The frozen stage is associated with decreased pain but pronounced stiffness that limits daily activities. In the thawing stage, patients experience a gradual improvement in shoulder mobility, which may take up to 2-3 years [3]. Although adhesive capsulitis is self-limiting in some cases, it can result in long-term disability and diminished quality of life if left untreated [4]. The management of idiopathic adhesive capsulitis aims to reduce pain, improve joint mobility, and restore functional movement. A range of conservative and interventional treatment strategies exist, including physiotherapy, non-steroidal anti-inflammatory drugs (NSAIDs), oral corticosteroids, intra-articular injections, hydrodilatation, and surgical options like manipulation under anesthesia (MUA) or arthroscopic capsular release [5]. Among these, intra-articular corticosteroid injections have gained widespread acceptance as an effective modality for pain relief and functional improvement [6]. Intra-articular corticosteroid injections act by delivering anti-inflammatory agents directly into the synovial cavity, reducing local inflammation, synovitis, and pain. Corticosteroids inhibit pro-inflammatory cytokines such as interleukin-1 (IL-1) and tumor necrosis factor-alpha (TNF-α), thereby interrupting the inflammatory cascade that contributes to fibrosis and capsular contracture [7]. Several randomized controlled trials (RCTs) and systematic reviews have demonstrated that corticosteroid injections significantly reduce pain and improve the range of motion in patients with adhesive capsulitis, especially in the freezing stage [8].

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However, the optimal timing, dose, and frequency of injections remain subjects of ongoing research. In diabetic patients, intra-articular injections are a safer alternative due to their limited systemic absorption, although transient hyperglycemia can still occur [9]. Recent studies have compared intra-articular corticosteroid injections to other interventions, such as physiotherapy and hydrodilatation. A study concluded that corticosteroid injections offer superior short-term pain relief and functional improvement compared to physiotherapy alone [10]. However, combining intra-articular injections with structured physiotherapy protocols has shown synergistic benefits, resulting in better outcomes in terms of pain reduction and shoulder mobility [11]. This combination therapy underscores the importance of a multimodal approach to managing adhesive capsulitis. Despite their proven efficacy, the duration of pain relief and functional improvement following intra-articular steroid injections remains a concern. The effects are typically short-lived, lasting approximately 6-8 weeks, after which symptoms may gradually return [12]. This has led to debates about the need for repeat injections, particularly in patients with persistent pain and limited shoulder function. While some clinicians advocate for multiple injections, others caution against potential adverse effects, such as joint infection, cartilage damage, and steroid-induced osteoporosis. This study aimed to assess intra-articular steroid injection for the treatment of idiopathic adhesive capsulitis of the shoulder.

METHODS & MATERIALS

A retrospective review was conducted at Monno Medical College Hospital between January 2024 and August 2024. Patients diagnosed with idiopathic adhesive capsulitis who were treated with intra-articular steroid injections were included in this study. A total of 566 patient records were reviewed to assess pain relief, improvement in restricted shoulder movement, functional outcomes, and any associated complications following the treatment.

Inclusion Criteria

- Patients diagnosed with idiopathic adhesive capsulitis (frozen shoulder) based on clinical and radiological assessment.
- Patients aged 18–70 years.
- Patients treated with intra-articular corticosteroid injections during the study period.
- Records with complete data on pain scores, range of motion (ROM), and functional outcomes before and after treatment.
- Patients with a minimum of 6 weeks follow-up.

Exclusion Criteria

- Patients with a history of trauma or fracture involving the affected shoulder.
- Secondary adhesive capsulitis due to underlying conditions such as rotator cuff tear, glenohumeral arthritis, or post-surgical stiffness.
- Patients with systemic inflammatory conditions (e.g., rheumatoid arthritis).
- Patients with diabetes mellitus uncontrolled during the study period (HbA1c >8%).
- Patients receive alternative therapies such as hydrodilatation or surgical intervention during the same period.
- Incomplete or missing medical records.

The intra-articular corticosteroid injections were administered under aseptic conditions. The standard dose of 40 mg triamcinolone acetonide mixed with 2–3 mL of 1% lidocaine was injected into the glenohumeral joint under palpation guidance by trained orthopedic specialists. The primary outcome of the study was the reduction in pain scores, assessed using the Visual Analog Scale (VAS) at baseline and during follow-up. Secondary outcomes included improvement in shoulder range of motion, specifically in abduction, external rotation, and forward flexion, as recorded in patient records. Additionally, functional recovery was evaluated based on clinical notes documenting improvements in activities of daily living (ADL). The incidence of treatment-related complications, such as infection, post-injection pain flare, or steroid-induced hyperglycemia, was also reviewed. Descriptive statistics (mean, standard deviation, and percentage) were used to summarize baseline demographics and clinical characteristics. Paired t-tests were applied to compare pre-and post-intervention VAS scores. A p-value of <0.05 was considered statistically significant. All analyses were conducted using SPSS version 26.0.

RESULTS

Table – I: Baseline characteristics of patients (*n*=566)

Characteristic	Total (n=566)	Unilateral (n=434)	Bilateral (n=132)
Age (years), Mean ± SD	51.2 ± 8.3	50.8 ± 8.1	52.4 ± 8.6
Gender, n (%)			
Male	238 (42.0%)	183 (42.2%)	55 (41.7%)
Female	328 (58.0%)	251 (57.8%)	77 (58.3%)
Duration of Symptoms (weeks)	8.4 ± 2.5	8.2 ± 2.3	8.9 ± 2.7

In a total of 566 patients with idiopathic adhesive capsulitis, of which 434 (76.7%) had unilateral involvement and 132 (23.3%) had bilateral involvement. The mean age of the study population was 51.2 ± 8.3 years, with patients in the unilateral group averaging 50.8 ± 8.1 years and those in the bilateral group slightly older at 52.4 ± 8.6 years. Females constituted a higher proportion of cases, accounting for 58.0% (328/566) overall, with similar gender distributions in both the unilateral (57.8% female) and bilateral (58.3% female) groups. The average duration of symptoms was 8.4 ± 2.5 weeks, with patients in the bilateral group having a longer mean duration (8.9 ± 2.7 weeks) compared to those with unilateral involvement (8.2 ± 2.3 weeks). [**Table I]**

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Table – II: Distribution of pain and movement restriction (*n*=566)

Movement Restriction	Number	Percentage
Unilateral	434	76.7
Bilateral	132	23.3

Out of the 566 patients included in the study, 434 patients (76.7%) experienced unilateral movement restriction, while 132 patients (23.3%) had bilateral restriction. **[Table II]**

Table – III: Pain relief outcomes (*n*=566)

Outcome	Number	Percentage
Complete Pain Relief	392	69.3
Maximal Pain Reduction	148	26.1
Referred for Surgical Intervention	7	1.2
Lost to Follow-up	19	3.4

Among the 566 patients, 392 (69.3%) achieved complete pain relief following intra-articular steroid injections, while 148 patients (26.1%) experienced maximal pain reduction but not full relief. A small subset of patients, 7 (1.2%), were referred for surgical intervention due to persistent symptoms. Additionally, 19 patients (3.4%) were lost to follow-up during the study period. [**Table III]**

Table – IV: Time to achieve pain relief (*n*=566)

Time to Relief (Days)	Number	Percentage
7-10	284	50.2
11-15	256	45.2
>15	26	4.6

The majority of patients, 284 (50.2%), achieved pain relief within 7-10 days following intra-articular steroid injection. An additional 256 patients (45.2%) experienced relief between 11-15 days, while 26 patients (4.6%) required more than 15 days to achieve significant pain relief. [**Table IV]**

Table – V: Follow-up compliance and duration (*n*=566)

Follow-Up Outcome	Number	Percentage
Attended All Follow-Up Visits	540	95.4
Lost to Follow-Up	19	3.4
Average Follow-Up Time (weeks)	4 weeks	—

Out of the 566 patients, 540 (95.4%) attended all scheduled follow-up visits, demonstrating strong compliance. However, 19 patients (3.4%) were lost to follow-up during the study period. The average follow-up duration for the study population was 4 weeks, allowing sufficient time to assess pain relief, functional improvement, and treatment outcomes. [**Table V]**

Table – VI: Complications and surgical referrals (*n*=566)

Complication/Outcome	Number	Percentage
Post-Injection Pain Flare	11	1.9
Infection	3	0.5
Hyperglycemia (Transient)	9	1.6
Referred for Surgery	7	1.2

In terms of complications, 11 patients (1.9%) experienced post-injection pain flare, while 3 patients (0.5%) developed infections following the injection. 9 patients (1.6%) experienced transient hyperglycemia as a result of the corticosteroid injection. Additionally, 7 patients (1.2%) were referred for surgical intervention due to inadequate response to the treatment. [**Table VI]**

DISCUSSION

In this cohort, 69.3% of patients achieved complete pain relief, and 26.1% experienced maximal pain reduction, although not complete relief. These findings are consistent with other studies that have shown that intra-articular corticosteroid injections are effective in reducing pain in adhesive capsulitis patients. An author found that approximately 70% of patients had significant pain reduction following corticosteroid injections, which is similar to the 69.3% complete pain relief rate observed in our study [13]. Furthermore, the rapid onset of pain relief observed in our cohort, with 50.2% of patients achieving relief within 7-10 days and 45.2% within 11-15 days, aligns with findings from another study, which reported significant pain relief in the majority of their patients within the first two weeks after injection [14]. This rapid response is likely due to the anti-inflammatory effects of corticosteroids, which help reduce synovial inflammation and improve joint function. In terms of movement restriction, the study found that 76.7% of patients had unilateral involvement, while 23.3% had bilateral involvement, consistent with existing literature. Another author reported that unilateral involvement is more common in adhesive capsulitis, with bilateral cases being less frequent but still observed in approximately 10-20% of patients [15]. This distribution in our study reflects the typical clinical presentation of adhesive capsulitis. The high follow-up compliance rate (95.4%) in this study is a strength, ensuring that the results are reliable. This rate is higher than the 83.5% compliance observed in another study, which also studied the effects of corticosteroid injections on adhesive capsulitis [16]. Follow-up is crucial to assess the durability of the injection's effects, as improvements in pain and range of motion are often observed in the first few weeks after treatment. In our study, the average follow-up duration was 4 weeks, which is consistent with other studies that have shown significant improvements within this timeframe [17]. However, it is notable that 7 patients (1.2%) in our study required surgical referral due to persistent symptoms. This is in line with another study that reported that 5-10% of patients with adhesive capsulitis do not respond to conservative treatment and may require surgical intervention such as capsular release [18]. The low referral rate in this study suggests that intra-articular steroid injections are effective in the majority of cases, with only a small subset of patients failing to respond to this treatment. In terms of complications, 11 patients (1.9%) experienced post-injection pain flare, which is a known, although rare, side effect of corticosteroid injections. This side effect is often self-limiting and resolves within a few days. Additionally, 3 patients (0.5%) in our cohort developed infections, a rare but

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serious complication, and 9 patients (1.6%) experienced transient hyperglycemia, consistent with other studies. For example 1-2% of patients may experience transient hyperglycemia following corticosteroid injections, particularly in those with predisposing factors such as diabetes [19]. Despite these complications, the overall safety profile of intra-articular corticosteroid injections is favorable. The incidence of infection was low, consistent with findings which noted that low infections occur in intra-articular injections [20]. Furthermore, transient hyperglycemia typically resolves without long-term effects, supporting the idea that the benefits of corticosteroid injections outweigh the potential risks in most cases.

Limitations of The Study

The study was conducted in a single hospital for a short duration. So, the results may not represent the whole community.

CONCLUSION

In conclusion, intra-articular corticosteroid injections are an effective and safe treatment option for patients with idiopathic adhesive capsulitis, providing significant pain relief and improving range of motion in the majority of patients. The low complication rate and rapid onset of action make it a favorable non-surgical treatment. However, a small subset of patients may not respond to conservative management and may require surgical referral.

RECOMMENDATION

It is recommended that intra-articular corticosteroid injections be considered as a first-line treatment for patients with idiopathic adhesive capsulitis, given their effectiveness in reducing pain and improving range of motion. While the majority of patients experience significant relief, clinicians should remain aware of the potential for rare complications such as post-injection pain flare, infection, and transient hyperglycemia. For patients who do not respond to steroid injections, a referral for surgical intervention may be necessary. Future prospective studies with longer follow-up periods are needed to further assess the long-term outcomes and safety of this treatment.

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