Short Communication

Intra-Articular along with Subacromial Corticosteroid Injection in Diabetic Patients with Adhesive Capsulitis

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Abstract

Background: To compare intra-articular plus subacromial corticosteroid injection with a single intra-articular injection in diabetics with adhesive capsulitis.

Materials and Methods: A total of fifty-four diabetic patients were randomized into corticosteroid injection in both intra-articular and subacromial sites (group A) and one intra-articular injection (group B). Pain by a visual analog scale (VAS), shoulder range of motion, and functional state by the American Shoulder and Elbow Score was assessed before injection, and at follow-up months.

Results: The pain VAS scores of group A were considerably lower than group B at the first-month follow-up visit (P=0.01). The range of motion in forward-elevation and internal rotation at three-month follow-up visits was significantly higher in group A than in group B (P=0.035, P=0.04, respectively). No notable differences in the range of motion in forward-elevation, internal rotation, and external rotation between groups at the final follow-up visit were seen. Though a significant difference in the ASES between groups at the third-month follow-up visit (P=0.03), the ASES score at the final sixth-month follow-up was similar in both groups (P=0.7).

Conclusion: In diabetic adhesive capsulitis of the shoulder, subacromial combined with intra-articular steroid injections has superior subjective outcomes compared to single intra-articular corticosteroid injection.

Keywords: Adhesive capsulitis, Diabetes mellitus, Corticosteroid, Intra-articular injection

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Introduction

Adhesive capsulitis of the shoulder as a common affliction has a prevalence of 2–5% in the general adult population and up to 20% in diabetic patients (1-3). This disease was first described by Codman in 1934 (4). Adhesive capsulitis is a clinical diagnosis based on a history of the gradual progression of severe shoulder pain with the gradual limitation of active and passive glenohumeral joint range of motions. The main pathogenesis of this disease remains unknown, although features associated with it include older than forty years old, trauma, female sex, diabetes, autoimmune disease, prolonged immobilization,

stroke, thyroid disease, and myocardial infarction (5). Even though typically considered as a self-limiting condition, the natural history of adhesive capsulitis is not completely understood, and the latest trials have reported that it can cause longer-term disability over several years (6, 7). The general non-operative approaches used for the management of frozen shoulder consist of non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroid local injections, physiotherapy, manipulation, and hydrodilation (8). Up to now, there is no consensus as to which is most helpful (9). Intra-articular corticosteroid injections can result in unsatisfactory outcomes in the management of adhesive capsulitis, with improved shoulder movements and quick pain relief (10). The management of adhesive capsulitis in diabetic patients is more difficult, and they have more resistance to conservative treatment. An intra-articular or subacromial corticosteroid injection can be a useful treatment approach for diabetic patients with the benefits of locally delivering and potentially less systemic side effects (11). However, the efficacy of intra-articular or subacromial corticosteroid injections in adhesive capsulitis patients with diabetes has not been well assessed. The aim of this study is to evaluate the clinical efficacy of intra-articular and subacromial corticosteroid injection compared with single intra-articular injection in diabetic patients with adhesive capsulitis.

Methods

Between February 2016 and October 2019, 67 diabetic patients suffering from shoulder adhesive capsulitis were referred to us. Shoulder adhesive capsulitis was defined as the presence of shoulder pain with a limitation of the passive movements of the glenohumeral joint (more than 25% or 30º in at least two directions including forward-elevation, external rotation, and internal rotation) compared to the contralateral normal shoulder (12). In the case of bilateral involvement, the more limited joint was selected for study analysis. Patients were investigated with conventional radiographs (true anteroposterior, axial, and 30º caudal tilt views) and Magnetic resonance imaging (MRI). To rule out other causes of the limitation of shoulder range of motion including calcific tendinitis, rotator cuff tear, or osteoarthritis. We excluded all patients with symptomatic calcific tendinitis, shoulder osteoarthritis, glenohumeral arthritis, cerebrovascular accident, a history of shoulder trauma, previous intra-articular therapy, a known blood coagulation disorder; partial rotator cuff tear with more than 50% tear and full-thickness rotator cuff tear, the written informed consent was obtained from all participants from all patients of this study. The patients were diagnosed with diabetes based on a confirmed history of diabetes or as the result of an oral glucose tolerance test and HbA1c value (13). Randomization was conducted via an automatically generated randomization list. Patients were divided into two groups: one group of patients underwent injection in both intra-articular and subacromial sites (group A) and another group received only one intra-articular injection (group B). The severity of adhesive capsulitis was classified (7, 14-16): painful stage with a subtle onset of pain and gradual loss of movement (phase 1), frozen stage with subsidence of pain and global stiffness (phase 2), and resolution stage (phase 3). All of the patients received the same protocol for home stretching physical therapy at the first visit, which highlights a four-quadrant stretching protocol in internal rotation, external rotation, forward elevation, and cross-body adduction (17). The patients were recommended to do their exercises at home at least three times a day and were prescribed oral non-steroidal anti-inflammatory drugs if needed. The study protocol was approved by our university ethics committee. A corticosteroid injection solution contained 40 mg triamcinolone acetonide (1 cc) with 4 mL of 2% lidocaine and 5 mL distilled water in 10 cc syringe (for intra-articular injection just 5cc of this cocktail used and for two side injection 5 mL for intra-articular and 5 mL for subacromial space). Triamcinolone was chosen because it is the minimal water-soluble corticosteroid preparation and so has the least systemic spill-over with the longest efficacy duration (14). While local corticosteroid injection can lead to the increment of the blood glucose levels, there is no evidence regarding intra-articular injection induce adverse side effects (11). The injected dose of 40 mg was believed to be sufficient to get satisfactory outcomes in the treatment of shoulder adhesive

capsulitis (10). The intra-articular steroid injections were carried out by the same orthopedic surgeon. After placing the patient in the sitting position, the index finger of the surgeon's free hand was put on the coracoid process tip while the thumb is placed at the back of the shoulder 1.5 cm below and 1.5 cm medial to the posterolateral angle of the acromial in the soft spot area. The needle was inserted near the surgeons' thumb and toward the tip of the index finger. The needle was inserted into the posterior a capsul of the glenohumeral joint. For injection into the SA space; after palpation of the distal, lateral, and posterior edges of the acromion the needle is inserted exactly inferior to the posterolateral edge of the acromion. Then the corticosteroid solution flow freely into the space without any resistance or significant discomfort to the patient. All patients in both groups were prescribed NSAIDs and analgesics for pain relief if needed. The home stretching exercise protocol was started one day later. A complete physical examination was conducted by the same surgeon. The shoulder range of motion was assessed using a goniometer with passive internal rotation to the back while the patient was seated, external rotation at 0^{0} abduction, and forward elevation and recorded as whole numbers without decimal. The internal rotation to the back was measured as the highest bony landmark reached with the extended thumb, which was consequently transformed to a value between 0 and 10 without decimal based on the constant score to ease statistical analysis (18). The pain severity was analyzed via a 10-cm visual analog scale (VAS, 0 representing 'no pain' and 10 representing 'the most severe pain') ruler to one decimal place, and the functional assessment was performed by use of American Shoulder and Elbow Score (ASES) determined before the injection and at the end of first, the third, and sixth month of follow-up.We considered two-scale differences of the VAS as the significant between-groups difference since the reported minimal clinically notable difference of the numeric pain rating scale in broad patient populations with different musculoskeletal characteristics has been reported to be two points (19). Statistical analysis was carried out using SPSS 22 software. Demographic comparisons were conducted via the student t-test for age and symptom duration and X^2 tests for sex distribution. Improvement in each follow-up between the groups and the differences between pre-injection and each follow-up period were evaluated between the groups via the student t-tests. Additional Bonferroni corrections were applied to adjust for various comparisons.

Results

Group A included 27 patients, 10 men (37%) and 17 women (63%), who were a mean age of 52.3 years (range, 37-69 years). The mean duration of symptoms was 5.7 months (range, 1.1-19 months). Group B consisted of 27 patients, 12 men (44%) and 15 women (56%), with a mean age of 56.5 years (range, 39-74 years). The mean duration of symptoms was 2.9 months (range, 1-10 months). The two groups had no statistically significant difference regarding age, gender, affected shoulder, symptom duration, disease stage, hemoglobin A1C level, and prevalence of insulin-dependent patients. Patient baseline

Table 1: Patient baseline characteristics.

Variable	Group A[1]	Group B[2]	P-value
Patients	27	27	
Age, mean (range)	52.3 (37-69)	56.5 (39-74)	0.18
Sex,			0.78
Male (%)	10 (37%)	12 (44%)	
Female (%)	17 (63%)	15 (56%)	
Symptom's duration, month (range)	5.7 (1.1-19)	7.3 (3-16)	0.61

[1] Group A: patients underwent injection in both intra-articular and subacromial sites.
[2] Group B: patients received only one intra-articular injection.

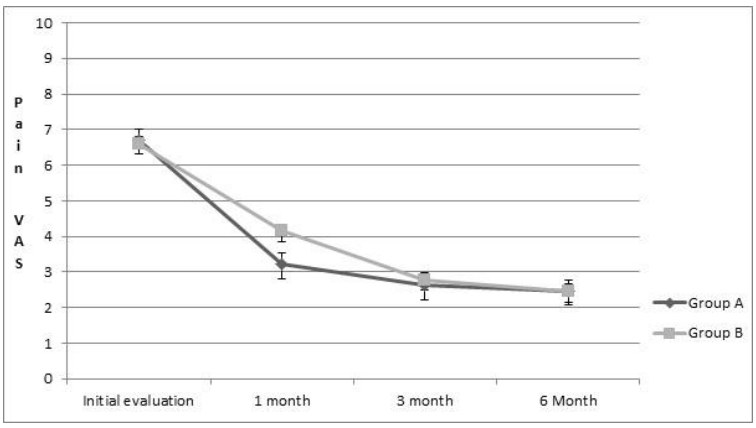

Figure 1. Pain severity using VAS (before the injection,1month,3 months, and 6 months after the injection).

characteristics are summarized in Table 1. At the initial visit, no intergroup differences were found between groups. The pain VAS scores of group A were considerably lower than group B at the first-month follow-up visit (P = 0.01) (Figure 1). The range of motion in forward-elevation and internal rotation at the three-month follow-up visit was significantly higher in group A than in group B (P = 0.035, P= 0.04 respectively) (Figure 2). There were no notable differences in the range of motion in forward-elevation, internal rotation (Figure 3), and external rotation (Figure 4) between groups at the final six-month follow-up visit. Although there was a significant difference in the ASES between groups at the three-month follow-up visit (P= 0.03) the ASES score at the final six-month follow-up was similar in both groups (p=0.7) (Figure 5).

Discussion

There are some reports that a single intra-articular steroid injection is useful to relieve shoulder pain and disability in patients with frozen shoulders (2, 5, 18). By considering synovial inflammation as the probable pathophysiology of frozen shoulder intra-articular steroid injection can be acceptable for its management. The most important outcome of our survey was that double intra-articular along with subacromial corticosteroid injection in diabetic patients demonstrated superior results in the subjective pain suffering and early functional recovery in comparison with single intra-articular corticosteroid injection. While there were no considerable between-group differences in pain, range of motion and functional score at the end of the six-month follow-up, double site corticosteroid injection leads to faster functional improvement and reduce pain perception. We found significant differences in pain perception one month after injection and functional improvement at the end of three months. Adhesive capsulitis composes of inflammatory and fibrotic changes (1). Intra-articular corticosteroid injection results in chemical ablation of the synovitis prevent the subsequent progression of fibrosis and influence the ordinary history of the disease (15). Shoulder adhesive capsulitis is the most frequent musculoskeletal pathology in diabetic patients (20). It has been reported in recent studies that diabetic patients usually have more joint motion limitations in comparison with a healthy population. The incidence of shoulder adhesive capsulitis in the general population is expected to be 2–5%, while in diabetic patients it increases to 20% (1, 2). On the other hand, in diabetic patients' shoulders, adhesive capsulitis was shown to be more persistent and unresponsive to conservative management. Even though the main pathophysiology of adhesive capsulitis in diabetic patients is unknown, a structural alteration in collagen as a consequence of glycosylation of the collagen protein and cell injury due to final product accumulation after advanced glycosylation can justify this association (21, 22). Although operative treatment

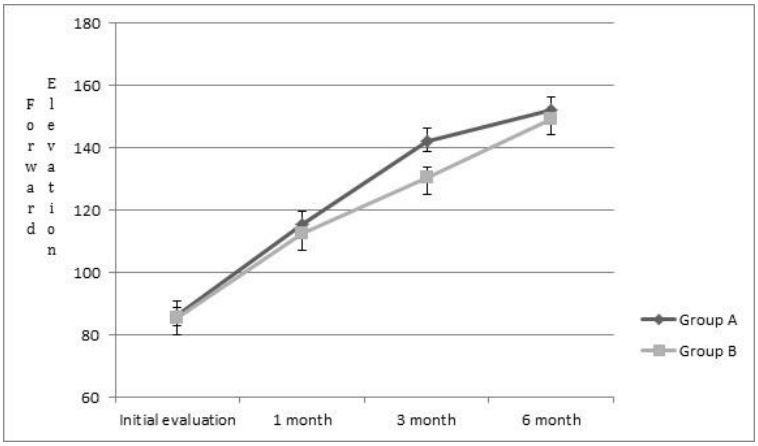

Figure 2. Forward elevation of the shoulder (before the injection,1month,3 months, and 6 months after the injection).

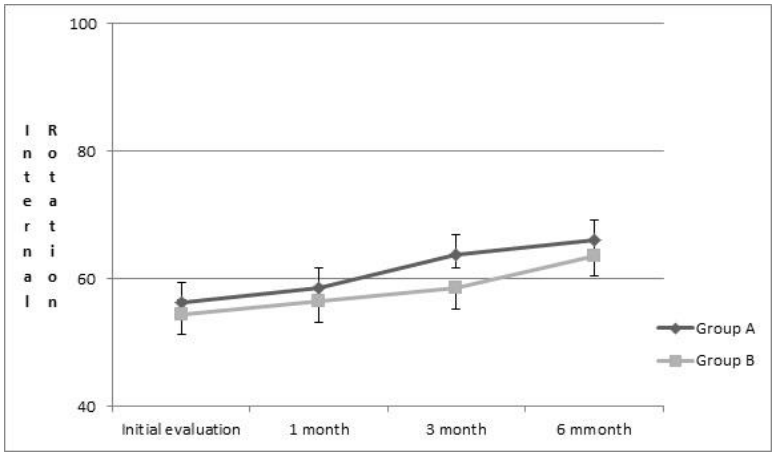

Figure 3. Internal rotation of the shoulder (before injection, 1month, 3 months, and 6 months after the injection).

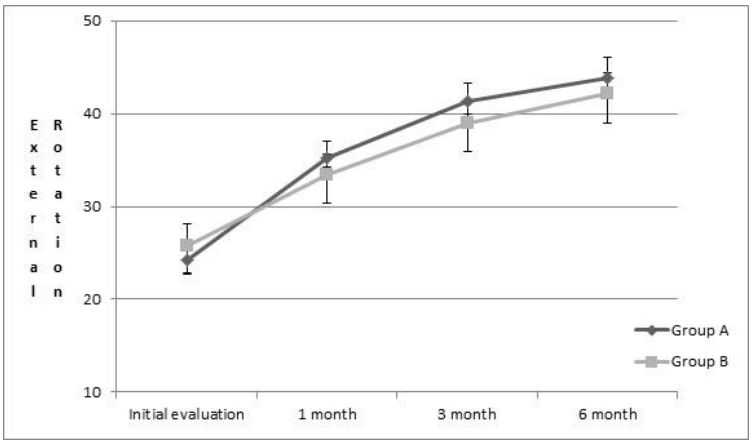

Figure 4. External rotation of the shoulder (before injection, 1month, 3 months, and 6 months after the injection).

has been displayed to decrease the natural history of this disease, surgery, and anesthesia-associated complications particularly in diabetic patients are major concerns (16). For that reason, intra-articular corticosteroid injection can be a valuable treatment approach for diabetic patients. Rizk et al in a randomized trial compared four groups: intrabursal lidocaine injection, intrabursal methylprednisolone, and lidocaine injection, intra-articular methylprednisolone and lidocaine injection, and intra-articular lidocaine injection (23). They found no significant difference between intrabursal injections

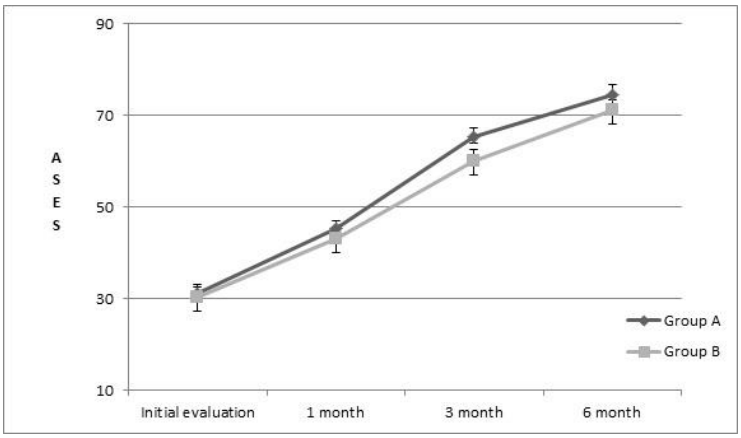

Figure 5. ASES of the patients (before injection, 1month, 3 months and 6 months after the injection).

and intra-articular injections. Finally, partial, temporary pain relief was seen in two-thirds of the steroid-injected patients. However, we experienced that single intra-articular steroid injection has not had always satisfactory outcomes. Some authors believed that the low accuracy of intra-articular injections without image guidance is the major reason for unsatisfactory outcomes (24-26). On the other hand, one of the most frequent causes of the limited range of motion of the shoulder is rotator cuff disorders such as tendinopathy, calcification, and partial-thickness tears. In this survey, we performed an MRI investigation to rule out mentioned pathologies. Because of reporting few studies about the systemic effects of intra-articular corticosteroid injection especially on the blood glucose levels (11). Additional researches will be necessary to verify the most effective dosage and potential side effects of intra-articular along with subacromial corticosteroid injection and other pain reliving modalities (25-26). Our prospective, randomized, comparative trial concluded that because of the relatively lesser accuracy of blind injections into the glenohumeral joint, subacromial steroid injections along with intra-articular injections show superior outcomes in subjective pain perception and early functional recovery compared to the single intra-articular corticosteroid injection. Given the absence of verified adverse events in these patients, Subacromial steroid injections along with intra-articular injections is recommended as a valuable treatment approach in diabetic patients with shoulder adhesive capsulitis.

Conclusion

Because subacromial steroid injections along with intra-articular injections show superior outcomes in subjective pain perception and early functional recovery compared to the single intra-articular corticosteroid injection, it is recommended as a valuable treatment approach in diabetic patients with shoulder adhesive capsulitis.

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Conflicts of Interest

The authors declare that they have no conflict of interest.

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