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Comparison of Early Results of Corticosteroid, Hyaluronic Acid, and Collagen Injection in the Treatment of Patients with Subacromial Impingement Syndrome Accompanied by Acromioclavicular Arthrosis

Akromiyoklavikuler Artrozun Eşlik Ettiği Subakromiyal Sıkışma Sendromlu Hastaların Tedavisinde Kortikosteroid, Hiyalüronik Asit ve Kolajen Enjeksiyonu Uygulamalarının Erken Dönem Sonuçlarının Karşılaştırılması

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Abstract

Objective: Subacromial impingement syndrome (SAIS) is the most common and well-known form of shoulder pain. The aim of this study is to determine the effects of different injection techniques used in the treatment of shoulder SAIS patients on early period of pain, disability, upper extremity performance and kinesiophobia and to compare the advantages of these techniques.

Materials and Methods: Data from 45 patients diagnosed with SAIS and treated with hyaluronic acid, collagen, or corticosteroid injections between January 2024 and June 2025 were analyzed. Patients' shoulder pain, disability, upper extremity performance, and kinesiophobia were assessed right before and one month after injections.

Results: There were no significant differences between the groups in terms of mean age, body mass index, pain time of origin. Based on baseline data, there were no significant differences between the groups for the shoulder pain and disability index (SPADI), SPADI pain, SPADI disability, timed functional arm and shoulder test (TFAST), TFAST hand to head and back, TFAST wall wash, TFAST gallon jug, and Tampa variables. There was a significant difference between the baseline and week 4 scores of the SPADI Total, SPADI pain, and SPADI disability variables ($p<0.05$); however, no statistically significant difference was found between the pre- and post-treatment delta values of these variables. Additionally, there was a significant difference between the pre- and post-treatment delta values of the TFAST total, TFAST wall wash, and TFAST gallon jug variables, except for TFAST hand to head and back ($p<0.05$). However, there was no significant difference between the pre- and post-treatment delta values of the TAMPA variable.

Conclusion: Our study demonstrated that corticosteroid, hyaluronic acid, and collagen applications combined with extremity rest and simple exercises were significantly effective in reducing pain and disability in the early period. It also shows that corticosteroid applications provide more effective results in the recovery of upper extremity functions in the early period compared to hyaluronic acid and collagen.

Keywords: Subacromial impingement syndrome, corticosteroid, hyaluronic acid, collagen

Öz

Amaç: Subakromiyal sıkışma sendromu (SASS), omuz ağrısının birçok farklı nedeni arasında en yaygın ve iyi bilinenidir. Bu çalışmanın amacı, SASS hastalarının tedavisinde kullanılan farklı enjeksiyon tekniklerinin erken dönem ağrı, sakatlık, üst ekstremite performansı ve kinezyofobi üzerindeki etkilerini belirlemek ve bu tekniklerin avantajlarını karşılaştırmaktır.

Gereç ve Yöntem: Ocak 2024 ile Haziran 2025 tarihleri arasında SASS tanısı alan ve tedavide hiyalüronik asit, kolajen veya kortikosteroid enjeksiyonları uygulanan 45 hastanın verileri analiz edildi. Hastaların omuz ağrısı, sakatlığı, üst ekstremite performansı ve kinezyofobisi enjeksiyonlardan hemen önce ve bir ay sonra değerlendirildi.

Bulgular: Gruplar arasında yaş ortalaması, vücut kitle indeksi ve ağrının başlangıç zamanına göre anlamlı fark saptanmadı. Başlangıç verilerine göre omuz ağrısı ve sakatlık endeksi (SPADI), SPADI ağrı, SPADI engellilik, zamanlı fonksiyonel kol ve omuz testi (TFAST), TFAST elden başa

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ve geri, TFAST duvar yıkama TFAST gallon jug ve tampa değişkenleri için gruplar arasında anlamlı bir fark yoktu. SPADI toplam, SPADI ağrı ve SPADI engellilik değişkenlerinin başlangıç ve 4. hafta skorları arasında anlamlı fark vardı ($p<0,05$); ancak bu değişkenlerin tedavi öncesi ve sonrası delta değerleri arasında istatistiksel olarak anlamlı bir fark bulunamadı. Ayrıca, TFAST toplam, TFAST duvar yıkama ve TFAST gallon jug değişkenlerinin tedavi öncesi ve sonrası delta değerleri arasında, TFAST-elden başa ve geri hariç, anlamlı fark vardı ($p<0,05$). Ancak, TAMPA değişkeninin tedavi öncesi ve sonrası delta değerleri arasında anlamlı bir fark yoktu.

Sonuç: Çalışmamız ekstremitenin dinlendirilmesi ve basit egzersizlerle kombine edilen kortikosteroid, hiyalüronik asit ve kolajen uygulamalarının erken dönemde ağrı ve dizabilite üzerine anlamlı düzeyde etkili olduğunu ortaya koymuştur. Ayrıca kortikosteroid uygulamalarının erken dönemde üst ekstremite fonksiyonlarının geri kazanımında hiyalüronik asit ve kolajene kıyasla daha etkili sonuçlar verdiğini göstermektedir.

Anahtar kelimeler: Subakromiyal sıkışma sendromu, kortikosteroid, hiyalüronik asit, kolajen

Introduction

The shoulder joint has the widest range of motion in the body and is therefore one of the most vulnerable joints to trauma. The prevalence of shoulder pain in the general population ranges from 7% to 34%, with a lifetime prevalence exceeding 70% (1). This condition can lead to chronic pain and reduced shoulder mobility, leading to reduced performance in daily and occupational activities (2).

Among the various causes of shoulder pain, the most common is subacromial impingement syndrome (SAIS) (3). Neer first described it in 1972 as resulting from compression of the rotator cuff tendons and the long head of the biceps tendon beneath the inferior surfaces of the anterior third of the acromion and of the acromioclavicular joint (4). Medical history and physical examinations are crucial for diagnosing SAIS. Specific tests play a significant role in the diagnosis of this syndrome. Evaluations of the Hawkins, Neer, Jobe, and painful arc tests are highly valuable in the diagnosis of shoulder impingement syndrome (5). Studies indicate that, to support physical examination findings during diagnosis, conventional radiography and ultrasound are appropriate and yield good results in the initial diagnostic evaluation (6). However, shoulder magnetic resonance imaging (MRI) is considered the primary imaging modality for the evaluation of rotator cuff lesions and glenohumeral instability, and is strongly recommended, especially in patients with long-standing findings (7,8).

Pain, disability, and impaired upper extremity function are the primary clinical symptoms of SAIS (9). Recent studies suggest that shoulder pain primarily originates from the shoulder joint and surrounding structures, but other factors also play a role in the development and chronicity of pain and limitations (10,11). Deficiencies in strength, stability, function, and coordination of the shoulder girdle muscles are the primary physical factors contributing to shoulder pain (4,11,12). Identifying the physical and psychological factors contributing to pain is important for early intervention in the rehabilitation process. Kinesiophobia due to pain can emerge early and limit the individual more than the pain itself (11). Kinesiophobia, which is common in musculoskeletal disorders, can cause functional limitations and disability, and delay recovery by reducing participation in rehabilitation and adherence to exercise (12,13).

Conservative treatment is the preferred initial approach for SAIS. Treatment approaches include rest, activity modification, non-steroidal anti-inflammatory drugs, physical therapy modalities, therapeutic exercises, corticosteroid injections into the subacromial space, and suprascapular nerve blocks (14). Surgery may be considered in patients with severe, persistent subacromial shoulder pain and functional impairments that do not improve despite conservative treatment or in the presence of a concomitant full-thickness rotator cuff tear (15).

Purpose of Study

The aim of this study was to determine the effects of different injection techniques used in the treatment of patients with shoulder SAIS on early pain, disability, upper extremity performance, and kinesiophobia, and to compare the advantages of these techniques.

Materials and Methods

Ethical approval for the study was obtained from the Bakircay University Ethics Committee (08.10.2025/decision no: 2516/study no: 2504). Patients admitted to the Orthopedics and Traumatology Outpatient Clinic of Bakircay University Faculty of Medicine Hospital between January 2024, and June 2025 were included in this study.

Patients and their demographic data [age, gender, body mass index (kg/m^2), and pain onset time] were identified through the hospital information management system and recorded in patient files. Data was collected from patients who underwent examinations and tests, who were diagnosed with SAIS, and who received treatment with hyaluronic acid, collagen, or corticosteroid injections. These injections were administered to patients with similar complaints, examination findings, and radiological imaging results, without considering other criteria. A total of 96 patients were evaluated. Of these, 51 did not meet the inclusion and exclusion criteria, and the remaining 45 were included in the study. Patients receiving hyaluronic acid were designated Group 1, those receiving corticosteroids were Group 2, and those receiving collagen were Group 3, with 15 patients in each group.

Patients aged between 40 and 70 years who had complaints of shoulder pain and loss of function lasting more than 3 months, who underwent MRI as a diagnostic method, in whom MRI evaluation detected degeneration-arthrosis in the acromioclavicular joint, who were diagnosed with SASS supported by examination findings, and who had not been treated in the last 6 months were included in the study.

Exclusion criteria included serious pathologies, such as a non-partial tendon tear or a dislocation of the shoulder joint; receipt of shoulder injection therapy within the last year; a history of shoulder surgery; serious health problems, such as bleeding disorders or systemic connective tissue disease; severe visual or vestibular disorders; uncontrolled hypertension; pregnancy or breastfeeding; disabilities that could interfere with communication; professional athletes; other shoulder pathologies accompanying SAIS; and limited range of motion. Patients who met these criteria were excluded from the study.

No criteria were used to select the agent for patients receiving injections; each patient made the choice after being informed in detail about the available agents. All injections were administered by a single orthopedic surgeon under aseptic conditions, using the standard subacromial injection technique, without local anesthesia. Review of the applied treatment protocol showed that the materials administered to the patients as injections included 20 mg hyaluronic acid in 2 mL solution, 5 cc/2 mg type 2 collagen, or 20 mg triamcinolone hexacetonide. Additionally, patients were allowed to perform simple pendulum exercises twice a day after the injection, with the affected extremity protected from particularly strenuous activities (such as lifting, overhead activities, pushing, and pulling) for approximately 3 weeks.

The collected data was used to review the patients' pre- and post-treatment assessment results for shoulder pain, disability, upper extremity function, and kinesiophobia. The assessment results were recorded before injections and at 4 weeks post-treatment.

Shoulder pain and disability were assessed using the shoulder pain and disability index (SPADI). The SPADI comprises two subscales: The first assesses pain intensity and comprises five items, and the second assesses functional limitations in activities of daily living and comprises eight items. Higher scores indicate increased pain intensity and functional disability (17). The Turkish validation, reliability assessment, and cultural adaptation of the index were conducted by Bumin et al. (18). Patients were asked to score each item on a 10-cm visual analog scale. The total score for each subscale was divided by the highest possible score and multiplied by 100. The overall score was obtained by dividing the sum of all item scores by 130 and multiplying by 100 (17).

Upper extremity performance was assessed with the timed functional arm and shoulder test (TFAST). This test consists of three parts: (1) the hand to head and back test, (2) the wall wash test, and (3) the gallon jug test. In the hand to head and back test, patients were asked to touch their head with any part of their hand and then touch their back with the back of their hand; the number of repetitions completed in 30 seconds was recorded. In the wall wash test, patients were asked to follow four dots marked in a circular pattern on the wall while maintaining constant contact with the wall. The test was performed in both clockwise and counterclockwise directions, and the number of circles completed in each direction within 60 seconds was recorded. In the gallon jug test, participants were asked to lift and lower a 3.78 kg weight to a height of 50.8 cm. The number of repetitions completed in 30 seconds was recorded. All scores for the patients' affected extremities were calculated using the formula "hand to head and back test + (wall wash/4) + gallon jug lift" (19).

Kinesiophobia was assessed using the Tampa kinesiophobia scale. The scale consists of 17 items; each scored on a 4-point Likert-type scale. The total score ranges from 17 to 68, with higher scores indicating greater kinesiophobia (fear of movement) (20). The scale's validity and reliability in Turkish were assessed by Tunca Yılmaz et al. (21).

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics 20 (IBM Corp., Armonk, NY, USA). Normality of data distribution was assessed using the Shapiro-Wilk test, histograms, and Q-Q plots. Parametric tests were used for data analysis because all variables were normally distributed. Differences in values and in pre- and post-treatment change scores among the three treatment groups were analyzed using a One-Way ANOVA. When a significant overall group effect was detected, the Bonferroni post-hoc test was applied to determine the source of the difference. Within-group comparisons before and after treatment were made using the paired t-test. Statistical significance was accepted at $p<0.05$. Results are presented as mean ± standard deviation.

Results

There were no significant differences in mean age, body mass index, or pain onset time between the groups (Table 1). The gender distributions were as follows: Group I (13 females/2 males), Group II (8 females/7 males), and Group III (11 females/4 males).

At baseline, there were no significant differences between the groups in the following variables: SPADI, SPADI pain, SPADI

Table 1. Demographic data of patients

Groups	Age (year)	Body mass index (kg/m²)	Pain onset time (month)
Group I	54.9±10.4	30.6±11.6	19.7±13.1
Group II	57.3±10.5	28.9±3.8	14.6±15.3
Group III	59.5±9.2	27.2±4.0	18.0±29.8
p-values	0.473	0.472	0.806

Group I: Hyaluronic acid injection, Group II: Corticosteroid injection, Group III: Collagen injection, One-Way ANOVA

disability, TFAST, TFAST hand to head and back, TFAST wall wash, TFAST gallon jug, and TAMPA (Table 2). There were significant differences between the baseline and week 4 scores for SPADI total, SPADI pain, and SPADI disability ($p<0.05$); however, no statistically significant differences were found between the pre- and post-treatment delta values of these variables. Additionally, there was a significant difference between the pre- and post-treatment delta values of the variables TFAST total, TFAST wall wash, and TFAST gallon jug, except for TFAST hand to head and TFAST back ($p<0.05$). However, there was no significant difference between the pre- and post-treatment delta values for the variable TAMPA (Table 2).

Our results demonstrate that all three groups of agents used in the SPADI assessment produced significant improvements in patients. However, no statistically significant superiority of any of the three agents was found over the others in this area.

A statistical analysis of the TFAST results reveals that corticosteroids (Group 2 agents) are superior to hyaluronic acid and collagen (agents in Groups 1 and 3) in the TFAST total values. The effect and superiority of corticosteroid applications were statistically evident in all "hand-to-hand and back", "wall wash", and "gallon jug" evaluations used in the TFAST evaluation. No superiority between hyaluronic acid and collagen, which are Group 1 and 3 agents, has been determined. A review of the kinesiophobia and Tampa kinesiophobia scale values revealed no significant difference between the three groups.

Table 2. Intergroup comparisons of pain, disability, upper extremity functions, and kinesiophobia

Measurements	Group	Baseline (X ± SD)	4th week (X ± SD)	Delta (Δ) (X ± SD)	p-values (within group)	p-values (post-hoc)
SPADI total	I	73.6±20.3	49.2±29.9	-24.5±24.9	**0.002***	1.000, I vs. II
	II	68.6±18.7	48.1±22.7	-20.5±24.2	**0.006***	1.000, I vs. III
	III	70.7±20.3	50.8±23.3	-19.9±20.3	**0.002***	1.000, II vs. III
p-values		0.784	0.958	0.843		
SPADI pain	I	78.8±17.7	56.7±30.5	-22.1±27.1	**0.007***	1.000, I vs. II
	II	74.3±16.0	55.3±24.7	-19.1±20.9	**0.003***	1.000, I vs. III
	III	77.3±15.8	58.7±24.3	-18.7±19.0	**0.002***	1.000, II vs. III
p-values		0.754	0.940	0.900		
SPADI disability	I	70.4±22.8	44.5±31.6	-25.9±25.8	**0.002***	1.000, I vs. II
	II	64.9±19.7	44.6±22.2	-20.3±23.6	**0.005***	1.000, I vs. III
	III	66.0±24.95	45.9±23.6	-20.7±22.6	**0.003***	1.000, II vs. III
p-values		0.788	0.986	0.774		
TFAST total	I	22.2±6.1	24.3±6.7	2.1±5.7	0.104	**0.007, I vs. II***
	II	18.8±8,1	28.2±10.0	9.4±7.4	**<0.001***	1.000, I vs. III
	III	20.0±6.2	23.5±8.3	3.6±5.1	**0.002***	**0.040, II vs. III***
p-values		0.398	0.281	**0.006***		
TFAST hand to head and back	I	15.2±3.2	15.1±4.7	1.3±3.5	0.162	0.196, I vs. II
	II	12.7±4.3	15.4±5.1	3.9±3.9	**0.002***	1.000, I vs. III
	III	15.0±6.3	15.2±4.1	1.7±3.7	0.094	0.353, II vs. III
p-values		0.268	0.632	0.139		
TFAST wall wash	I	15.5±5.9	20.9±5.0	2.4±5.5	0.116	**0.014, I vs, II***
	II	14.5±6.3	25.7±9.5	8.1±6.6	**<0.001***	1.000, I vs, III
	III	15.3±4.4	21.8±5.2	3.4±2.7	**<0.001***	0.055, II vs, III
p-values		0.928	0.125	**0.011***		
TFAST gallon jug	I	6.4±2.9	6.6±3.6	0.2±2.4	0.748	**0.007, I vs. II***
	II	5.5±3.0	8.9±3.3	3.47±3.4	**0.001***	1.000, I vs. III
	III	5.7±3.4	6.7±4.0	1.0±3.1	0.136	0.058, II vs. III
p-values		0.701	0.158	**0.007***		
TAMPA	I	44.2±6.1	46.0±7.7	1.8±5.6	0.234	1.000, I vs. II
	II	40.3±7.4	40.8±7.9	0.5±6.5	0.755	0.260, I vs. III
	III	45.1±7.0	42.5±7.0	-2.6±8.25	0.243	0.656, II vs. III
p-values		0.139	0.169	0.208		

Group I: Hyaluronic acid injection, Group II: Corticosteroid injection, Group III: Collagen injection, SPADI: Shoulder pain and disability index, TFAST, Timed functional arm and shoulder test, TAMPA: Tampa scale of kinesiophobia, One-Way ANOVA, *: $p<0.05$, SD: Standard deviation

Discussion

The results of this study indicate that hyaluronic acid, corticosteroid, and collagen treatments significantly reduced pain and disability in all patients at 4 weeks after the injection. However, no statistically significant difference in effects on pain and disability was found among these three agents. Additionally, corticosteroid and collagen treatments improved upper-extremity performance 4 weeks after injection, while hyaluronic acid treatment did not affect upper-extremity performance. Corticosteroid treatment was superior to collagen and hyaluronic acid treatments for improving upper-extremity performance in the acute phase. However, hyaluronic acid, corticosteroid, and collagen treatments were not effective in reducing kinesiophobia 4 weeks after injection.

SAIS is in recurrent condition; therefore, patients often receive several treatments in combination. Although studies have shown that each treatment is effective in improving short-term pain and function, the optimal treatment choice for SAIS remains uncertain, and no standard treatment approach exists. Studies demonstrating the effectiveness of treatments applied alone or in combination are limited (22). Treatment of SAIS is primarily conservative, and successful results are generally achieved with this approach (23). Our study yielded results generally consistent with the literature; all three agents applied were significantly effective in reducing pain and disability, with improvements observed in patients in all three groups.

SAIS treatment aims to reduce pain and improve function, and includes the two most preferred conservative treatments, exercise and corticosteroid injection, in addition to patient education, oral analgesia, and cold application (24). Our results show the effectiveness of corticosteroid applications for upper-extremity function in the early period. Corticosteroid applications resulted in significantly better upper-extremity function than hyaluronic acid and collagen applications. In the upper extremity performance test group, corticosteroid applications demonstrated a positive effect and superiority over hyaluronic acid applications in the "wall wash" and "gallon jug" tests.

Corticosteroid injections are widely used to reduce the pain and inflammation associated with SAIS. Studies have shown that corticosteroid injections and physiotherapy have similar effectiveness for both SAIS and other shoulder problems. Numerous steroid preparations are available in clinical practice, and there is no clear evidence regarding which steroid should be used. Corticosteroid injections are widely used to rapidly reduce pain and control inflammation in SAIS. Pain relief and functional improvement are generally seen within the first few weeks of treatment. Although studies show that this treatment method is effective in the short term, some negative effects may occur in the long term (25). Despite their widespread use, local corticosteroid injections are not without potential side effects. Tendon weakness and tearing, skin and subcutaneous atrophy, systemic absorption, infection, and bursal deterioration are some of the long-term risks of corticosteroid therapy (26). Our results, consistent with the literature, demonstrate that early corticosteroid administration is effective in reducing pain and disability, and in restoring upper extremity function. Because the present study was not long-term, the adverse effects of corticosteroid administration reported in the literature were not observed.

Most studies examining the effects of hyaluronic acid on various joints, such as the hip, ankle, shoulder, and knee, have shown this treatment to be safe and effective. Hyaluronic acid provides cartilage stability and slows proteolysis and joint degeneration. Histological evidence suggests that sodium hyaluronate may prevent cartilage degradation and promote regeneration (27). In addition, it has been reported to reduce inflammation and protect against cartilage erosion. It has also been shown to exert direct and indirect analgesic and anti-inflammatory effects at the joint level. Literature on the effectiveness of intra-articular viscosupplementation has primarily focused on the knee, with limited studies on other joints. Strong evidence indicates that viscosupplementation is beneficial for treating knee pain due to osteoarthritis in patients who have failed conservative treatment (28). Hyaluronic acid may reduce pain in SAIS by supporting the cartilage structures in the shoulder joint and increasing synovial fluid. SAIS is often associated with rotator cuff tendinitis and subacromial bursitis. Hyaluronic acid injections can be used to relieve pain and promote healing in the treatment of these conditions (29). Hyaluronic acid injections have become an increasingly popular option for the treatment of SAIS (30). Literature demonstrates the effects of hyaluronic acid in reducing pain and supporting functional recovery. Studies emphasize that hyaluronic acid may be particularly effective in subacromial bursitis and rotator cuff tendinitis, but treatment responses may vary among individuals (31). In our study, consistent with the literature, we observed statistically significant early clinical improvements—particularly in pain and disability—after application of hyaluronic acid.

Collagen applications are attracting attention as an option to support tendon healing in conditions such as SAIS. The literature demonstrates that collagen injections and oral collagen supplements improve tendon health, reduce pain, and accelerate tissue repair. However, studies in this area have generally focused on tendonitis, tendon tears, and joint disorders, whereas research on SAIS is limited (31). Over the past decade, the literature has highlighted the role of hydrolyzed collagen as a therapeutic option in cases of osteoarthritis and other musculoskeletal disorders, including rotator cuff tendinopathy (32). Collagen, taken orally or administered by intra-articular injection, has been found to improve muscle performance in patients with knee osteoarthritis and rotator cuff pathologies, and to be effective in preventing soft tissue injuries in athletes (33). In our study, consistent with literature, collagen application produced statistically significant clinical improvement in the early period, particularly in pain and disability.

When the early treatment results of studies comparing local applications of hyaluronic acid and corticosteroids in

the treatment of SAIS are reviewed, corticosteroids appear more effective than hyaluronic acid, but this difference is not significant in the long term (34,35). In our study, corticosteroid application provided an early-term advantage in upper-extremity function compared with hyaluronic acid in the treatment of SAIS. Our study is like those reported in the literature when early results are considered.

When the studies by Shibata et al. (36), Sadeghifar et al. (37), and Kim et al. (30), which compared subacromial corticosteroid and hyaluronic acid injections with each other and with physiotherapy in patients with SAIS, were examined, our study showed generally similar results in terms of pain and disability, but corticosteroids produced better recovery of extremity function.

Agnieszka's study, which compared physiotherapy and rehabilitation with corticosteroid and collagen applications, reported that collagen applications may be an alternative treatment for SAIS in elderly patients with multimorbidity (38). Our study also presents collagen as an alternative to corticosteroids for early recovery from pain and disability.

Painful shoulder problems that limit shoulder function affect approximately one in three adults. The majority of patients report pain radiating to the shoulder and arm, particularly during overhead movements. Furthermore, pain can trigger fear-avoidance of movement, and this fear is known to limit the individual's functioning far more than the pain itself. The resulting fear of movement, known as kinesiophobia, can lead to limitations in daily life. This can lead to problems, such as limited joint movement, loss of strength, decreased function and performance, and poor posture (11). The treatment methods we applied in our study were not effective in reducing kinesiophobia in patients. Although the agents used have a therapeutic effect on pain, disability, and extremity function, this situation shows that there is no change in the fear of movement that the patients face in their daily lives.

In previous studies on SAIS treatment, two agents are generally compared in local injection applications. In our study, we compared the effects of local injections of three agents (corticosteroid, hyaluronic acid, and collagen) used in the treatment of SAIS on pain, shoulder function, clinical recovery, and, therefore, quality of life, unlike previous studies. We believe that the principal advantage of our study in this regard is that it evaluated three different agents.

Study Limitations

More statistically robust data can be obtained with a larger patient sample.

Our study is retrospective; prospective studies are needed.

The study reports early results of injection therapy in patients with SAIS. Studies with long-term, periodic follow-up are possible.

In our study, injection therapy was standardized by resting the extremity in a simple sling, avoiding strenuous activities, and performing simple home exercises. Different treatment strategies can be developed by combining injection therapies for SAIS with physiotherapy and other rehabilitation methods.

Conclusion

Our study demonstrated that applications of corticosteroid, hyaluronic acid, and collagen, combined with extremity rest and simple exercises, were effective in significantly reducing pain and disability in the early stages. Furthermore, corticosteroid application was more effective than hyaluronic acid and collagen in restoring upper-extremity function during the early stages. However, hyaluronic acid injections, corticosteroid injections, and collagen injections had no effect on kinesiophobia in the acute stage.

Ethics

Ethics Committee Approval: Ethical approval for the study was obtained from the Bakircay University Ethics Committee (08.10.2025/decision no: 2516/study no: 2504). Patients admitted to the Orthopedics and Traumatology Outpatient Clinic of Bakircay University Faculty of Medicine Hospital between January 2024 and June 2025 were included in this study.

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: C.K., Concept: C.K., K.O., T.S.K., Design: K.O., T.S.K., U.E., Data Collection or Processing: T.S.K., U.E., Analysis or Interpretation: C.K., U.E., Literature Search: C.K., K.O., T.S.K., Writing: C.K.

Conflict of Interest: No conflict of interest was declared by the authors.

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