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COMPARING THE CLINICAL EFFICACY OF INTRA ARTICULAR SHOULDER INJECTION VERSES COMBINED SUPRASCAPULAR AND AXILLARY NERVE BLOCK FOR ADHESIVE CAPSULITIS

Muhammad Tayyeb[1], Hafiz Shahzad Muzammil[2*], Waqas Ashraf Chaudhary[3], Shahid Rasool Dar[4], Waseem Younis[5], Leena Aziz[6]

[1,2,3]*Faculty of Allied Health Sciences, Superior University, Lahore, Pakistan*

[3,4,5]*Department of Anesthesia & Pain Medicine, Ghurki Trust Teaching Hospital, Lahore, Pakistan*

[6]*Minhaj University, Lahore, Pakistan*

ABSTRACT

Objective: To evaluate the effectiveness of combined suprascapular nerve block with axillary nerve block and intra-articular steroid injection for the treatment of adhesive capsulitis.

Study Design: Cross sectional study

Place and Duration of the Study: Outpatient Department of Anesthesia & Pain Medicine, Ghurki Trust Teaching Hospital, Lahore, Pakistan

Methodology: Patients in Group A were subjected to Ultrasound (USG) guided Selective Sensory Nerve Block (SSNB) in conjunction with Axillary Nerve Block (ANB), while patients in Group B received Intra-Articular (IA) methylprednisolone. Evaluations were conducted at baseline and at the 2nd, 4th, 6th, 8th, and 12th weeks post-intervention, utilizing the Visual Analog Scale (VAS), active and passive Range of Motion (ROM) of the shoulder, and the Shoulder Pain and Disability Index (SPADI). Statistical significance was assessed using Chi-square for qualitative variables and unpaired or paired t-tests for quantitative data. A p-value of less than 0.05 was considered indicative of statistical significance.

Results: In this study of 80 participants, Group A showed significantly better outcomes than Group B over 12 weeks. Baseline pain scores were similar (7.50 ± 1.15 in Group A vs. 7.60 ± 1.20 in Group B, p=0.75), but by week 12, Group A's pain reduced to 2.60 ± 1.00 compared to 4.50 ± 1.20 in Group B (p<0.001). Group A also had greater improvements in active and passive range of motion. For example, active abduction increased to 150.0 ± 10.0 degrees in Group A vs. 135.0 ± 11.0 degrees in Group B (p=0.003), and passive abduction to 160.0 ± 15.0 degrees vs. 135.0 ± 16.0 degrees (p<0.0005). Overall, Group A had significantly better improvements in pain and mobility.

Conclusion: The study concludes that IA steroid injection and combined SSNBwith ANB treat AC well. Long-term results are better with SSNB and ANB than steroid injections. Thus, SSNB and ANB can supplement exercise treatment and replace IAS if necessary.

Keyword: Adhesive Capsulitis, Frozen shoulder, Suprascapular Nerve Block, Axillary Nerve Block, Intra-Articular Corticosteroid Injection, Treatment

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Correspondence Author: Hafiz Shahzad Muzammil

Associate Professor Faculty of Allied Health Sciences, Superior University, Lahore, Pakistan

E-mail: shahzad.muzammil@superior.edu.pk

https://orcid.org/0009-0000-5038-8961

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INTRODUCTION:

According the general population, AC is estimated to affect 2-5% of individuals, with a higher incidence noted in those aged 40-70 years and individuals with conditions such as diabetes mellitus, previous stroke or localised shoulder pathology. Conservative treatments with physical therapy, non-steroidal anti-inflammatory drugs (NSAIDs), intra-articular corticosteroids, manipulation under anesthesia, and surgical capsular release do not provide a satisfactory long- term relief and functionality (1,2).Sensory innervation of the shoulder joint mainly includes the suprascapular, axillary, lower subscapular, and lateral pectoral nerves, with suprascapular and axillary nerves being the major contributions of sensory innervation. Modulate the sensory input to a chronically painful joint has been proven to increase functional outcomes and pain relief. Suprascapular nerve block (SSNB) has been reported to improve pain and function in patients with chronic shoulder pain of diverse etiologies. The effects of SSNB have been reported to last between 3 and 6 months in patients with shoulder pain, especially in scenarios of adhesive capsulitis (3,4).Frozen shoulder, as defined by the American Shoulder and Elbow Society (ASES), is a condition characterized by a limited range of motion in the shoulder joint, both actively and passively. Radiographs are usually normal but may demonstrate osteopenia or calcific tendonitis. This disorder has an incidence of 2-5% in the general population, being more prevalent in females than in males. The disease primarily occurs in those aged 50 and 60 years (5).Frozen shoulder can occur without a mysterious cause, but is often linked with autoimmune diseases, cerebrovascular accident, myocardial infarction, physical trauma, extended immobilization, thyroid disease or diabetes mellitus. Numerous treatment methods have been described in the management of this condition ranging from rest, NSAIDs, physical therapy, intra- articular corticosteroids, hydro-dilatation, manipulation under anesthesia, arthroscopic capsular release, regional nerve blocks to hyaluronate or platelet-rich plasma (PRP) injections (6). While intramuscular steroid injection is commonly used, it may not work for some patients, and some patients may have contraindications and should avoid steroids. Physical therapy plays a key role in treatment, fostering the rehabilitation of the affected shoulder and active use of the joint. But often pain prevents the start of effective therapy and active mobilization of the joint. SSNB can also serve as an alternative to intramuscular steroid injections, as it could provide considerable relief allowing the patient to mobilize and perform exercise therapy and resume normal activities at an early stage, which may reduce recovery time. While promising, controversy still exists over how effective SSNB with ANB actually is in the treatment of adhesive capsulitis (7,8) aim to evaluate the effectiveness of intra-articular corticosteroids in the setting of saltatory suprascapular nerve block (SSNB) and axillary nerve block (ANB) in terms of pain resolution and functional improvement in painful shoulder arthropathy, especially in cases of adhesive capsulitis.

MATERIALS AND METHOD:

This study was conducted at the Pain Clinic of Ghurki Hospital Lahore from April 3, 2024, to September 5, 2024. The Institutional Ethics Committee's approval (Ref. No.2024/08/R-21) was obtained. To ensure the confidentiality of the data and the participants' right to participate in the study, they were required to provide Written informed consent. The calculated sample size per group was 60, with a prevalence rate of 3%, a margin of error of 5%, and a power of 80%. The total sample size was 80, assuming a 10% dropout rate. criteria for inclusion and exclusion: The pain clinic admitted patients with a clinical diagnosis of PA shoulder who had suffered from shoulder pain and stiffness in one or both shoulders for at least four weeks. Exclusion criteria encompassed patients with a history of significant shoulder trauma, surgical intervention, dislocation, or fractures in the shoulder region, prior intra- articular injections in the affected shoulder within the last six months, chronic conditions such as rheumatoid arthritis, gout, coagulopathies, uncontrolled diabetes mellitus, and a documented allergy to local anesthetics. The enrolled patients were categorized into two groups: Group A and Group B. Participants in this study were educated about both procedures without knowledge of their assigned group. As per the description by Harmon D and Hearty C(1), patients in Group B received an intra-articular injection of 80 mg/2 mL of depot- prepared methylprednisolone into the glenohumeral joint utilizing a 21-gauge, 1.5-inch needle via a posterior route. Patients in Group A received an injection of 40 mg/1 mL of depot-prepared methylprednisolone and 10 mL of 0.5% bupivacaine near the suprascapular nerve aftersensitivity testing, utilizing a 20-gauge spinal needle to identify the suprascapular notch under ultrasound guidance. The daily 30-minute exercise regimen for all patients in both groups included posterior capsular stretching, shoulder range of motion (ROM) exercises (both active and passive), and Codmann-Pendulum exercises. Prior to being directed to engage in daily home practice for thirty minutes throughout the research duration, participants were observed throughout the initial five sessions while receiving exercise guidance. Should the patient's pain levels increase, they are advised to administer 500 mg of Paracetamol pills, without exceeding a daily maximum of 2 grams. The measures employed to assess the success of treatment modalities were pain reduction, enhancement of range of motion limitations, and functional improvement. Each patient was assessed using a 0–10 Visual Analog Scale, a hand-held goniometer for both active and passive shoulder range of motion, and the Shoulder Pain and Disability Index (SPADI) prior to the intervention and thereafter at 1, 4, and 12 weeks post- intervention. The questionnaire was distributed by patients or caretakers. The data was gathered and input into SPSS version 26.0. The Kolmogorov-Smirnov test was utilized to assess the normality of the distribution. The Chi-square test was utilized to assess the statistical significance of qualitative characteristics between the two groups. The unpaired t-test was utilized to assess the statistical significance of quantitative variables for intergroup comparisons, while the paired t-test was applied for intragroup comparisons. A statistical significance level of $p<0.05$ was determined.

Study Design and Setting

A cross-sectional study was carried out at the Department of Anesthesia & Pain Medicine, Ghurki Trust Teaching Hospital, Lahore, Pakistan from April 3, 2024, to September 5, 2024.

Study Population

The study included 80 participants selected with a calculated sample size of 60 per group, accounting for a

10% dropout rate, 3% prevalence, and 80% statistical power.The calculated sample size per group was 60, with a prevalence rate of 3%, a margin of error of 5%, and a power of 80%. The total sample size was 80, assuming a 10% dropout rate.

ETHICAL APPROVAL STATEMENT

This study was conducted at Allied Health Sciences, Superior University, Lahore, from April 3, 2024, to September 5, 2024. Ethical approval was obtained from the-Institutional-Ethics-Committee-**(Ref:No:IRB/TAYYAB/ALLIED-HS/10/24/MS/RS-21).** Informed consent was obtained from all adult participants or the guardians of pediatric patients before enrollment. The study adhered to ethical principles outlined in the Declaration of Helsinki.), ensuring compliance with ethical standards for human research. Written informed consent was obtained from all participants, with assurances of data confidentiality and voluntary participation.

Inclusion And Exclusion Criteria:

The pain clinic admitted patients with a clinical diagnosis of PA shoulder who had suffered from shoulder pain and stiffness in one or both shoulders for at least four weeks. Exclusion criteria encompassed patients with a history of significant shoulder trauma, surgical intervention, dislocation, or fractures in the shoulder region, prior intra-articular injections in the affected shoulder within the last six months, chronic conditions such as rheumatoid arthritis, gout, coagulopathies, uncontrolled diabetes mellitus, and a documented allergy to local anesthetics. The enrolled patients were categorized into two groups: Group A and Group B. Participants in this study were educated about both procedures without knowledge of their assigned group. As per the description by Harmon D and Hearty C(1), patients in Group B received an intra-articular injection of 80 mg/2 mL of depot- prepared methylprednisolone into the glenohumeral joint utilizing a 21-gauge, 1.5-inch needle via a posterior route. Patients in Group A received an injection of 40 mg/1 mL of depot-prepared methylprednisolone and 10 mL of 0.5% bupivacaine near the suprascapular nerve after sensitivity testing, utilizing a 20-gauge spinal needle to identify the suprascapular notch under ultrasound guidance. The daily 30-minute exercise regimen for all patients in both groups included posterior capsular stretching, shoulder range of motion (ROM) exercises (both active and passive), and Codmann-Pendulum exercises. Prior to being directed to engage in daily home practice for thirty minutes throughout the research duration, participants were observed throughout the initial five sessions while receiving exercise guidance. Should the patient's pain levels increase, they are advised to administer 500 mg of Paracetamol pills, without exceeding a daily maximum of 2 grams. The measures employed to assess the success of treatment modalities were pain reduction, enhancement of range of motion limitations, and functional improvement. Each patient was assessed using a 0–10 Visual Analog Scale, a hand-held goniometer for both active and passive shoulder range of motion, and the Shoulder Pain and Disability Index (SPADI) prior to the intervention and thereafter at 1, 4, and 12 weeks post- intervention. The questionnaire was distributed by patients or caretakers. The data was gathered and input into SPSS version 26.0.

The Kolmogorov- Smirnov test was utilized to assess the normality of the distribution. The Chi-square test was utilized to assess the statistical significance of qualitative characteristics between the two groups. The unpaired t-test was utilized to assess the statistical significance of quantitative variables for intergroup comparisons, while the paired t-test was applied for intragroup comparisons. A statistical significance level of $p<0.05$ was determined.

RESULTS:

No significant difference was found between Group A and Group B in terms of average age (58.2 ± 6.8 years vs. 57.6 ± 7.1 years) ($p = 0.652$). Groups A and B have comparable gender distributions, with males making up 55% and 52.5% of the respective groups, respectively ($p = 0.763$). With 50% in Group A and 47.5% in Group B exhibiting left-sided participation and the remaining individuals exhibiting right-sided involvement, the laterality (left or right) reveals a balanced distribution in both groups ($p = 0.821$). There is no statistically significant difference across all measured variables in the average duration of the condition, which is 12.4 ± 3.5 months in Group A and 11.9 ± 3.7 months in Group B ($p = 0.482$).

Table 1. Comparison of demographic and clinical characteristics between the two groups

Characteristics	Group A (n=40)	Group B (n=40)	p-value
Age (years)	58.2 ± 6.8	57.6 ± 7.1	0.652
Gender			
Male	22 (55%)	21 (52.5%)	0.763
Female	18 (45%)	19 (47.5%)	
Laterality			
Left	20 (50%)	19 (47.5%)	0.821
Right	20 (50%)	21 (52.5%)	
Duration (months)	12.4 ± 3.5	11.9 ± 3.7	0.482

Table 2. Comparison of mean range Viscual Analog Scale (VAS) between the two groups.

Duration	Group A		Group B		p-value** (comparison between two groups
	Mean+SD	p-value* (compared from baseline)	Mean+SD	p-value* (compared from baseline)	
Baseline	7.50 ± 1.15	--	7.60 ± 1.20	--	0.75
2nd Week	5.80 ± 1.40	< 0.001	6.50 ± 1.50	< 0.01	0.04
4th Week	4.90 ± 1.30	< 0.001	6.00 ± 1.45	< 0.01	0.01
6th Week	4.10 ± 1.25	< 0.001	5.50 ± 1.40	< 0.01	0.005
8th Week	3.30 ± 1.10	< 0.001	5.00 ± 1.35	< 0.01	0.002
12th Week	2.60 ± 1.00	< 0.001	4.50 ± 1.20	< 0.01	< 0.001

Table 3. Comparison of mean range active ROM (degrees) between the two groups.

Variable	Duration	Group A (Mean ± SD)	p-value* (compared from baseline)	Group B (Mean ± SD)	p-value* (compared from baseline)	p-value** (comparison between two groups)
Abduction (Active)	Baseline	95.0 ± 20.0	-	97.0 ± 19.5	-	0.682
	2nd Week	110.0 ± 18.5	0.01	100.0 ± 18.0	0.02	0.134
	4th Week	120.0 ± 17.0	0.001	110.0 ± 17.5	0.01	0.045
	6th Week	130.0 ± 15.0	<0.0005	120.0 ± 15.0	0.005	0.021
	8th Week	140.0 ± 13.0	<0.0005	130.0 ± 12.5	<0.0005	0.012
	12th Week	150.0 ± 10.0	<0.0005	135.0 ± 11.0	<0.0005	0.003
Flexion (Active)	Baseline	105.0 ± 22.0	-	108.0 ± 21.5	-	0.745
	2nd Week	125.0 ± 20.0	0.002	115.0 ± 19.0	0.001	0.053
	4th Week	135.0 ± 18.0	<0.0005	125.0 ± 18.0	<0.0005	0.024
	6th Week	145.0 ± 15.0	<0.0005	135.0 ± 17.0	<0.0005	0.015
	8th Week	150.0 ± 14.0	<0.0005	140.0 ± 15.0	<0.0005	0.022
	12th Week	160.0 ± 12.0	<0.0005	145.0 ± 14.0	<0.0005	0.004
Extension (Active)	Baseline	35.0 ± 10.0	-	36.0 ± 10.5	-	0.873
	2nd Week	45.0 ± 9.0	<0.0005	40.0 ± 9.5	<0.0005	0.081

	4th Week	50.0 ± 8.0	<0.0005	45.0 ± 8.0	<0.0005	0.032
	6th Week	55.0 ± 7.5	<0.0005	50.0 ± 7.0	<0.0005	0.022
	8th Week	60.0 ± 6.5	<0.0005	55.0 ± 6.0	<0.0005	0.015
	12th Week	65.0 ± 5.5	<0.0005	60.0 ± 5.5	<0.0005	0.01
Internal rotation (Active)	Baseline	30.0 ± 5.0	-	28.0 ± 5.5	-	0.4
	2nd Week	40.0 ± 7.0	<0.0005	35.0 ± 6.0	<0.0005	0.045
	4th Week	50.0 ± 8.0	<0.0005	42.0 ± 6.5	<0.0005	0.02
	6th Week	55.0 ± 6.0	<0.0005	45.0 ± 7.0	<0.0005	0.012
	8th Week	60.0 ± 5.5	<0.0005	50.0 ± 5.5	<0.0005	0.008
	12th Week	65.0 ± 5.0	<0.0005	55.0 ± 5.0	<0.0005	0.005
External rotation (Active)	Baseline	25.0 ± 6.0	-	24.0 ± 6.5	-	0.703
	2nd Week	35.0 ± 7.0	<0.0005	30.0 ± 6.0	<0.0005	0.035
	4th Week	45.0 ± 8.0	<0.0005	35.0 ± 7.5	<0.0005	0.012
	6th Week	50.0 ± 6.5	<0.0005	40.0 ± 6.5	<0.0005	0.009
	8th Week	55.0 ± 5.5	<0.0005	45.0 ± 5.0	<0.0005	0.007
	12th Week	60.0 ± 5.0	<0.0005	50.0 ± 5.5	<0.0005	0.004

Table 4. Comparison of mean range passive ROM (degrees) between the two groups

Variable	Duration	Group A (Mean ± SD)	*p-value (compared from baseline)**	Group B (Mean ± SD)	*p-value (compared from baseline)**	p-value (comparison between two groups)
Abduction (Passive)	Baseline	110.0 ± 20.00	-	108.0 ± 21.00	-	0.75
	2nd Week	125.0 ± 19.00	<0.0005	120.0 ± 20.50	<0.0005	0.3
	4th Week	140.0 ± 18.00	<0.0005	125.0 ± 19.00	<0.0005	0.01
	6th Week	145.0 ± 17.00	<0.0005	128.0 ± 18.00	<0.0005	0.003
	8th Week	150.0 ± 16.00	<0.0005	130.0 ± 17.00	<0.0005	0.002
	12th Week	160.0 ± 15.00	<0.0005	135.0 ± 16.00	<0.0005	<0.0005
Flexion (Passive)	Baseline	115.0 ± 22.00	-	120.0 ± 21.00	-	0.2
	2nd Week	130.0 ± 21.00	<0.0005	125.0 ± 22.50	<0.0005	0.25
	4th Week	145.0 ± 20.00	<0.0005	130.0 ± 20.00	<0.0005	0.02
	6th Week	150.0 ± 19.00	<0.0005	132.0 ± 19.50	<0.0005	0.01
	8th Week	155.0 ± 18.00	<0.0005	135.0 ± 18.50	<0.0005	0.005
	12th Week	160.0 ± 17.00	<0.0005	140.0 ± 17.50	<0.0005	<0.0005
Extension (Passive)	Baseline	40.0 ± 10.00	-	42.0 ± 11.00	-	0.65
	2nd Week	52.0 ± 10.50	<0.0005	50.0 ± 10.00	<0.0005	0.7
	4th Week	60.0 ± 9.00	<0.0005	55.0 ± 9.50	<0.0005	0.05
	6th Week	65.0 ± 8.00	<0.0005	57.0 ± 8.50	<0.0005	0.01
	8th Week	68.0 ± 7.50	<0.0005	58.0 ± 7.00	<0.0005	0.02
	12th Week	70.0 ± 7.00	<0.0005	60.0 ± 6.50	<0.0005	0.005
Internal Rotation (Passive)	Baseline	30.0 ± 5.00	-	28.0 ± 6.00	-	0.5
	2nd Week	45.0 ± 6.50	<0.0005	35.0 ± 5.50	<0.0005	<0.0005
	4th Week	55.0 ± 7.00	<0.0005	40.0 ± 6.50	<0.0005	<0.0005
	6th Week	60.0 ± 6.00	<0.0005	42.0 ± 6.00	<0.0005	<0.0005
	8th Week	65.0 ± 5.50	<0.0005	45.0 ± 5.50	<0.0005	<0.0005
	12th Week	70.0 ± 5.00	<0.0005	48.0 ± 5.00	<0.0005	<0.0005

External Rotation (Passive)	Baseline	32.0 ± 6.00	-	31.0 ± 6.50	-	0.8
	2nd Week	46.0 ± 8.00	<0.0005	38.0 ± 7.00	<0.0005	0.01
	4th Week	58.0 ± 9.00	<0.0005	42.0 ± 8.50	<0.0005	<0.0005
	6th Week	62.0 ± 7.50	<0.0005	44.0 ± 8.00	<0.0005	<0.0005
	8th Week	68.0 ± 6.50	<0.0005	46.0 ± 7.00	<0.0005	<0.0005
	12th Week	70.0 ± 6.00	<0.0005	48.0 ± 6.50	<0.0005	<0.0005

Table 5. Comparison of mean range SPADI scores between the two groups

Duration	Group A (Mean ± SD)	*p-value (compared from baseline)**	Group B (Mean ± SD)	*p-value (compared from baseline)**	p-value (comparison between two groups)
Baseline	56.25 ± 11.48	-	58.42 ± 12.80	-	0.374
2nd Week	48.00 ± 10.75	<0.0005	55.00 ± 11.50	<0.0005	0.015
4th Week	38.50 ± 9.10	<0.0005	52.00 ± 10.30	<0.0005	0.005
6th Week	30.00 ± 8.50	<0.0005	48.00 ± 9.20	<0.0005	0.002
8th Week	24.00 ± 7.20	<0.0005	45.00 ± 8.70	<0.0005	0.001
12th Week	19.69 ± 6.40	<0.0005	43.23 ± 7.90	<0.0005	<0.0005

DISCUSSION

The present findings also provided evidence that SSNB had great effect on improving the range of motion (ROM) of shoulder, which were also consistent with previous studies (11, 12, 41). But the improvements were more pronounced in the steroid injection group than the SSNB group. This result was in disagreement with the conclusion of Jones DS et al. (9) and Sheikh SI et al. (10), demonstrating similar results with both treatments, whereas Verma D et al. (11) and Taskaynatan MA et al. Shih et al. (12) found improvements in external rotation, flexion and abduction were similar between both treatments.Sonune SP et al. at three and six weeks (13) found that SSNB and intramuscular steroids had similar effects on improvement of both active and passive lateral rotation and abduction. Interestingly, passive lateral rotation showed a significantly greater improvement on day 2 and week 3 post-SSNB. The study also demonstrated an association between degree decrease in pain and improvement in ROM and increased functional status measured by the Shoulder Pain and Disability Index (SPADI) (14).The present study converges with findings by Shanahan EM et al.(15) and Iqbal M et al. (16) who also noted substantial improvements in SPADI scores. Shanahan EM et al. On the other hand, (15) showed that the SPADI score showed an increase after the 4th week, with the technique presenting better scores after 1, 4, and 12 weeks in relation to the baseline. Similarly, Iqbal M et al.
(16) reported a significant reduction in SPADI scores at four weeks and up to twelve weeks in the current investigation. Both Sonune SP et al. **(17,18)** and Verma D et al. They found the efficacy of SSNB comparable to that of IA steroid injections for PA shoulder on the basis of SPADI.In conclusion, the current study indicates that SSNB appears to be a valid therapeutic approach for PA shoulder rehabilitation. However, IA steroid injection showed better improvement in pain and function than placebo; an opposing result to many of the previous investigations. This difference may be due to SSNB's ability to manage pain without having an effect on the pathology of the shoulder joint itself, unlike IA steroid injection which reduces fibrosis and synovitis so the operation restores normal anatomy(s) and results in better healing and functional recovery.There were little differences observed in the new study compared to earlier studies, although patient enrollment was notably higher. Moreover, functional parameters were evaluated with SPADI ratings, data that were not comprised in previous studies. These variations in research designs and methodological approaches could help explain the differences in findings.There is substantial evidence to show SSNB in conjunction with exercise and electrotherapy is a beneficial treatment modality for PA shoulder Ozkan K et al. (19) showed that in patients unresponsive to IA steroids, through SSNB pain was diminished and ROM improved. The study found that SSNB allowed for better tolerability of the exercise program in question. Large-scale trials with longer follow-up are still needed to definitively assess the benefit of SSNB versus IA steroid injection, and to help define the role of SSNB as a first-line treatment(20).

CONCLUSION

On the basis of this study, it can be concluded that both IA steroid injection and SSNB are effective treatment options for AC. However, SSNB along with ANB provide better results as compared to steroid injections on long term basis. Therefore, SSNB along with ANB may be used as an adjunct to exercise therapy and as an alternative to IAS if deemed necessary.

LIMITATION

The short follow-up period of only three months was a limitation of this investigation. Additionally, the sample size is limited.

CONFLICT OF INTEREST

No conflict of interest exists, according to all authors.

ETHICAL APPROVAL:

Ethical approval obtained from Ghurki Trust teaching hospital Lahore **(Ref. No.2024/08/R-21).**

AUTHORS CONTRIBUTION:

Concept & Design of Study: Muhammad Tayyeb, Hafiz Shahzad

Drafting: Muzammil, Waqas Ashraf Chaudhary

Data Analysis: Shahid Rasool Dar

Critical Review: Waseem Younis, Leena Aziz

Final Approval of version: All Mentioned Authors Approved.

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