Observational Study

Ultrasound-guided Pulsed Radiofrequency of the Suprascapular Nerve for Chronic Shoulder Pain: A Retrospective Cohort Study Comparison of the Suprascapular and Spinoglenoid Notch Approaches

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Disclaimer: There was no external funding in the preparation of this article.

Conflict of interest: Each author certifies that he or she, or a member of his or her immediate family, has no commercial association (i.e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted article.

Article received: 06-27-2025
Revised article received: 09-22-2025
Accepted for publication: 10-01-2025

Free full article: www.painphysicianjournal.com

Background: Pulsed radiofrequency of the suprascapular nerve is an established treatment for chronic shoulder pain, commonly targeting the suprascapular notch. An alternative approach targets the spinoglenoid notch, but the comparative efficacy of these 2 distal targets remains unclear.

Objectives: To compare the efficacy and safety of ultrasound-guided distal suprascapular nerve pulsed radiofrequency performed at the suprascapular vs the spinoglenoid notch in patients with chronic shoulder pain.

Study Design: A retrospective, observational cohort study.

Setting: The pain medicine outpatient clinic of a tertiary care center.

Methods: We examined the records of 95 patients with chronic unilateral shoulder pain who underwent suprascapular nerve pulsed radiofrequency. Patients were categorized into 2 groups based on the pulsed radiofrequency target: the suprascapular notch (Group 1) or the spinoglenoid notch (Group 2). Outcomes were assessed using the Shoulder Pain and Disability Index (SPADI) and the Visual Analog Scale (VAS) at baseline, and at 4 and 12 weeks postprocedure.

Results: Both groups demonstrated a statistically significant reduction in VAS and SPADI scores at 4 and 12 weeks postprocedure compared to baseline ($P < 0.05$). However, Group 2 showed statistically significant lower (better) scores than Group 1 for activity-related VAS and nighttime VAS at 4 weeks, as well as for activity-related VAS and total SPADI scores at the 12-week follow-up ($P < 0.05$ for all).

Limitations: The retrospective nature of our study contributing to bias and the short-term follow-up are the primary limitations.

Conclusion: Both distal suprascapular nerve pulsed radiofrequency approaches were statistically significant for improving pain and disability scores in patients with chronic shoulder pain. Our findings indicate that pulsed radiofrequency performed at the spinoglenoid notch may yield superior outcomes according to some evaluations compared to the suprascapular notch approach. Therefore, suprascapular nerve pulsed radiofrequency at the spinoglenoid notch appears to be at least as effective and safe as, and potentially a more advantageous alternative to, the conventional suprascapular notch technique.

Key words: Chronic shoulder pain, suprascapular nerve radiofrequency, spinoglenoid notch, suprascapular notch, Shoulder Pain and Disability Index, neuromodulation, ultrasound, pulsed radiofrequency

Pain Physician 2026: 29:185-193

Shoulder pain is estimated to be the third most common musculoskeletal disorder encountered in primary care, following low back and knee pain (1). Pain persisting for more than 3 months is classified as chronic shoulder pain (2). The associated pain and functional limitation significantly affects quality of life while imposing a substantial economic and health care burden. The incidence of chronic shoulder pain increases with age, reaching its peak prevalence in individuals over 70 years old (3). Rotator cuff disease, shoulder impingement syndrome, adhesive capsulitis, tendinitis, and degenerative disorders are among the leading causes of chronic shoulder pain (4).

Treatment often begins with activity modification and analgesic medications. If these are ineffective, a trial of physical therapy focused on a specific diagnosis is indicated. Combined steroid and local anesthetic injections, guided by ultrasound (ULSD) or fluoroscopy, can be used alone or as an adjunct to physical therapy (5). However, the effects of noninvasive and medical treatments for pain often provide only transient relief (6). Surgery may be recommended for patients unresponsive to other treatments, but its efficacy is limited and outcomes are not always successful (7). Moreover, many elderly patients may not be suitable candidates for surgery due to comorbid conditions (8).

The suprascapular nerve (SSN) block (SSNB) has proven to be effective for both acute pain following trauma or surgery and for achieving good pain control in various chronic shoulder pain syndromes (9). Although the SSNB provides rapid and effective pain relief, its clinical use is limited due to its short effective duration (10). While longer-term pain control can be achieved with neurolysis or neurectomy, these techniques carry a risk of irreversible paralysis in the supraspinatus and infraspinatus muscles. For this reason, pulsed radiofrequency (PRF) treatment has emerged as a promising alternative for managing chronic shoulder pain due to its longer-lasting effect (11).

The SSN, which provides approximately 70% of the sensory innervation to the shoulder girdle, originates from the upper trunk of the brachial plexus. It courses posteriorly, deep to the trapezius muscle over the superior aspect of the scapula, reaching the suprascapular notch (12). Upon entering the supraspinous fossa through this notch, the nerve passes inferior to the superior transverse scapular ligament and proceeds deep to the supraspinatus muscle. Finally, it traverses the spinoglenoid notch (incisura spinoglenoidea), a passage bridged by the inferior transverse scapular ligament (spinoglenoid ligament), to enter the infraspinous fossa, where it provides motor innervation to the infraspinatus muscle. (13) (Fig. 1).

In the classic SSNB technique, the target is the suprascapular notch where the nerve passes beneath the superior transverse scapular ligament. This block can be performed using various techniques (14,15). In addition to the suprascapular notch approach, another technique involves blocking the nerve at the spinoglenoid notch. Previous studies have shown that this technique is effective (16) and provides comparable outcomes to the classic suprascapular notch block (17). While numerous studies have evaluated SSN-PRF through the suprascapular notch, to the best of our knowledge, there is limited evidence assessing the effects or side effects of PRF performed via the spinoglenoid notch. Therefore, the aim of our study was to evaluate the efficacy and safety of PRF applied at the spinoglenoid notch for chronic shoulder pain and to compare its outcomes with the classic suprascapular notch approach.

Methods

Study Design and Patients

This retrospective observational cohort study was conducted from June 2023 through June 2024 at 2 tertiary-level training and research hospitals in Istanbul, Republic of Turkey. It was designed and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. Ethical approval was obtained from the Ethics Committee of Istanbul Kanuni Sultan Süleyman Training and Research Hospital (approval date: June 1, 2025; approval number: 2025/01.06). It is also registered on ClinicalTrials.gov (NCT06852781) and was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki, revised in 2013. Prior to their inclusion in the study, all patients signed a written informed consent form approved by the ethics committee.

Patients aged 18 years or older with chronic shoulder pain (duration > 3 months) due to any specific etiology, a Visual Analog Scale (VAS) score above 4 despite conservative treatment, and who provided written informed consent, were screened for eligibility.

Exclusion criteria included: a history of shoulder fracture or surgery; any injection into the affected shoulder within the past 3 months; cervical radiculopathy; hemiplegia; malignancy; systemic conditions that could confound pain assessment (e.g., severe diabetic neu-

ropathy); coagulopathy; local infection in the shoulder area; and allergy to local anesthetics.

The clinical diagnosis of chronic shoulder pain for each included patient was confirmed through a physical examination and radiological imaging (magnetic resonance imaging).

Based on the anatomical target, patients were retrospectively assigned to either Group 1 (suprascapular notch approach) or Group 2 (spinoglenoid notch approach).

Procedures

All injections were performed by a single experienced physician specialized in musculoskeletal procedures using a Toshiba TUS-A300™ ULSD device equipped with an 11L4 linear transducer. For the RF procedures and injections, a Cosman™ RFG-4 RF generator (Boston Scientific) and a Unified™ EchoRF™ All-In-One Electrode, Cannula and Injection Tube (Boston Scientific) with a 100 mm, 20-G, 10-mm active tip hybrid needle were used. Following a successful positive test injection of 5 mL of 0.25% bupivacaine, PRF was applied to the suprascapular nerve at 42°C, 45 V, for 240 seconds. This was followed by negative aspiration and subsequent injection of 5 mL of 0.25% bupivacaine into the same region in order to avoid procedural pain. All procedures were conducted under sterile conditions and local skin anesthesia was administered prior to needle insertion.

In the suprascapular notch PRF approach, the patient was seated between the physician and the ULSD equipment. The hand on the side to be injected was placed on the contralateral shoulder. To visualize the suprascapular notch, the physician placed the ULSD probe over the acromion, parallel to the scapular spine, and gently adjusted it medially. Once the suprascapular notch was visualized, a 20-G, 3.5-inch hybrid RF needle with a 10 mm active tip was carefully advanced beneath the transverse scapular ligament. The RF electrode was connected in order to complete sensory and motor stimulation testing of the target nerve. Upon sensory testing at 50 Hz and 0.3 V–0.5 V, the patient reported distinct shoulder paresthesia; during motor testing at 2 Hz and 0.3 V–0.5 V, visible contractions were elicited in the supraspinatus and infraspinatus shoulder muscles. Once the correct position was confirmed and appropriate responses were elicited, PRF was applied, followed by administering the local anesthetic.

For the spinoglenoid notch PRF approach, patients were placed in the lateral decubitus position on a stretcher between the physician and the ULSD device, with the hand of the affected side resting on the contralateral shoulder. The transducer was placed over the glenohumeral joint, parallel to the inferior margin of the scapular spine, and then gently shifted medially in order to visualize the spinoglenoid notch (Fig. 2). After the notch was identified, a 20-G, 3.5-inch hybrid RF needle with a 10 mm active tip was advanced

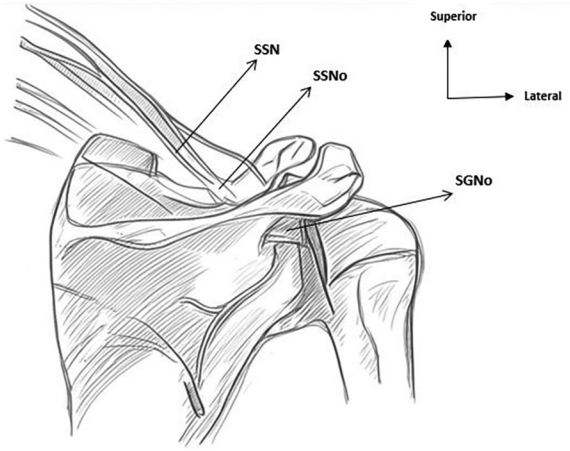


Fig. 1. *Anatomy and course of the suprascapular nerve through the suprascapular and spinoglenoid notches.*

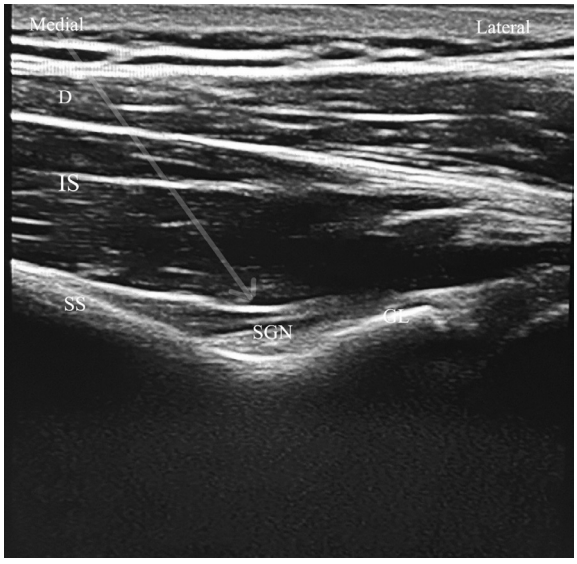


Fig. 2. *Ultrasound-guided pulsed radiofrequency of the suprascapular nerve at the spinoglenoid notch.*
Arrow: Needle path, SGN: Spinoglenoid notch, SS: Spina scapula, GL: Glenoid, IS: Infraspinatus muscle, D: Deltoid muscle

carefully under doppler guidance toward the notch's medial wall. The RF electrode was connected in order to perform sensory and motor testing. As with the suprascapular notch approach, sensory testing (50 Hz, 0.3 V–0.5 V) produced notable shoulder paresthesia, and motor testing (2 Hz, 0.3 V–0.5 V) resulted in contraction of the infraspinatus (shoulder) muscles. Once the correct position was confirmed and appropriate responses were elicited, PRF was applied, followed by administering the local anesthetic.

At one week postinjection, all patients were provided with an exercise booklet in order to perform a home-based rehabilitation program. A physiotherapist demonstrated the exercises, which included self-stretching, range-of-motion activities, and strengthening exercises.

Patients were advised to take 500 mg of acetaminophen as needed (up to a maximum of 4 tablets per day). They were instructed not to take any analgesics on the day of follow-up assessments or the day before, as this could influence clinical outcome measurements.

Outcome Measures

All patients were assessed by the investigators at baseline (preinjection) and again at 4 and 12 weeks postinjection for both primary and secondary outcome measures. The primary outcome measure was the Shoulder Pain and Disability Index (SPADI) score, while secondary outcome measures included VAS scores and average daily acetaminophen consumption. All adverse events occurring during the procedure or follow-up visits were documented.

Primary Outcome Measure

The SPADI is a shoulder-specific index of 13 items assessing pain and disability across 2 separate subscales. Each item is scored on a scale from 0 to 10; the total score is converted to a 100-point scale for the pain, disability, and total subscales individually. Higher SPADI scores indicate increased shoulder-related pain and disability. A decrease of 18 points or more in the total SPADI score from baseline to week 12 (final follow-up) was considered indicative of treatment success (18). The Turkish version of the SPADI has been shown to be valid and reliable (19).

Secondary Outcome Measures

Pain intensity was assessed using a 10-centimeter Visual Analog Scale (VAS), where 0 cm represented 'no pain' and 10 cm represented 'the worst imaginable pain.' Patients marked their pain level on a continuous 10-cm line, and the scores were measured in centimeters. Separate VAS scores were recorded for nighttime pain and pain during activity. Additionally, at postinjection weeks 4 and 12, patients were asked how many times they took 500 mg of acetaminophen while at home. The total amount of acetaminophen consumed was recorded.

Statistical Analyses

All data were analyzed using IBM SPSS Statistics 22.0 (IBM Corporation). Descriptive statistics were expressed as mean (SD) and median (minimum and maximum) for continuous variables, and as frequency and percentage for categorical variables. The Shapiro–Wilk test was used to assess the normality of distribution for continuous variables. For normally distributed data, comparisons between independent groups were made using the independent samples t test, while the Mann–Whitney U test was used when normality was not met. Categorical variables were compared using the χ^2 test. Paired comparisons of dependent variables were performed using the Wilcoxon signed-rank test, and correlations between continuous variables were assessed using Spearman's rank correlation coefficient. A P value < 0.05 was considered statistically significant.

Results

A total of 126 patient records were screened for eligibility. After excluding 23 patients based on the exclusion criteria and 8 patients due to loss to follow-up, 95 patients were included in the final analysis. These patients were divided into 2 groups based on the PRF application site: suprascapular notch (Group 1; n = 44) and spinoglenoid notch (Group 2; n = 51) (Fig. 3). Among the included patients, 61 had rotator cuff tears, 9 had adhesive capsulitis, 9 had subacromial impingement syndrome, 9 had acromioclavicular joint pathology, and 7 had biceps tendinitis. Other clinical and demographic characteristics were similar between the groups (Table 1).

Baseline VAS scores, SPADI scores, and mean daily acetaminophen consumption did not differ significantly between the groups (P > 0.05) (Table 2). At both 4 weeks and 12 weeks follow-up, VAS and SPADI scores were significantly reduced compared to baseline in both groups (P < 0.001). However, when we compared these reductions between the 2 groups, a statistically significant difference was detected only in the VAS for activity between the baseline and 12-week postoperative assessments (P = 0.016) (Table3).

At the 4-week follow-up, there were no statistically significant between-group differences in resting VAS, SPADI scores, or acetaminophen consumption ($P > 0.05$). However, Group 2 demonstrated statistically significant lower scores for both activity-related VAS and nighttime VAS compared to Group 1 ($P < 0.005$) (Table 4).

At the 12-week follow-up, Group 2 reported statistically significant lower activity-related VAS scores and total SPADI scores compared to Group 1 ($P < 0.05$). In comparison, no statistically significant differences were observed between the groups in resting VAS, nighttime VAS, or acetaminophen consumption at this time point ($P > 0.05$) (Table 5)

The procedures were well-tolerated in both groups. All reported adverse events were mild, transient, and self-limiting. During the procedure, 6 patients in Group 1 were positive for blood detected on aspiration, which resolved after repositioning the needle. No bleeding occurred in Group 2. The rate of bleeding observed on aspiration was statistically significantly higher in Group 1 ($P = 0.018$). Vasovagal symptoms were observed in 4 patients in Group 1 and 3 patients in Group 2.

Discussion

In this retrospective observational cohort study, we compared the efficacy and safety of ULSD-guided SSN-PRF applied at the suprascapular notch versus the spinoglenoid notch in patients with chronic shoulder pain. Our hypothesis was that SSN-PRF applied at the suprascapular notch would yield clinical outcomes comparable to those achieved at the spinoglenoid notch. Our findings show that both distal SSN-PRF approaches, performed at 2 distinct anatomical locations, resulted

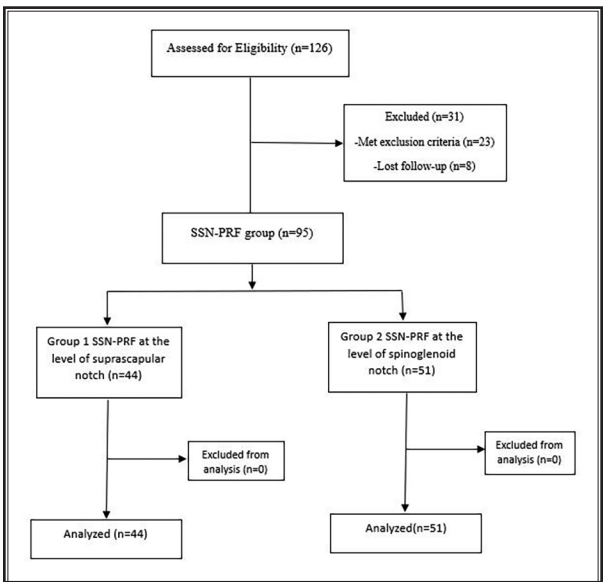


Fig. 3. *Study flow diagram showing patient selection and group assignment.*

Table 1. *Comparison of demographic and clinical data of the groups.*

	Group 1 (n = 44)	Group 2 (n = 51)	P
Age, years, mean (SD)	53.57 (12.54)	56.84 (13.53)	[a]0.227
Gender			
Men	10 (22.7%)	15 (29.4%)	[b]0.461
Women	34 (77.3%)	36 (70.6%)	
Body Mass Index, kg/m^2, mean (SD)	29.22 (3.78)	28.11 (3.95)	[a]0.165
Symptom duration, months, median (min-max)	8.5 (3–45)	9 (3–47)	[c]0.869
Diagnosis, n (%)			
Rotator cuff tears	27 (61.4%)	34 (66.7%)	[b] 0.984
Adhesive capsulitis	4 (9.1%)	5 (9.8%)	
Subacromial impingement syndrome	5 (11.4%)	4 (7.8%)	
Acromioclavicular joint pathology	4(9.5%)	5 (9.1%)	
Bicipital tendinitis	4 (9.1%)	3 (5.9%)	
Side			
Right	30 (68.2%)	22 (43.1%)	0.014
Left	14 (31.8%)	29 (59.6%)	

a: t test on independent variables, b: χ^2 test or Fisher's exact test, c: Mann Whitney U test

Table 2. *Comparison of preprocedure acetaminophen consumption, Visual Analog Scale (VAS) score, and Shoulder Pain and Disability Index (SPADI) score.*

	Group 1 (n = 44)	Group 2 (n = 51)	P
Acetaminophen consumption (mg)	1,000 (0–2,000)	1,000 (0–3,000)	0.794
VAS score			
Activity	7 (6–10)	8 (6–10)	0.477
Rest	2 (0–5)	2 (0–4)	0.544
Night	6 (5–9)	7 (3–10)	0.569
SPADI score			
Pain	70 (54–98)	76 (54–98)	0.946
Disability	69 (54–95)	74 (52–95)	0.849
Total	69 (54–96)	75 (52–96)	0.709

Data are shown as median (min-max). Mann Whitney U test

in significant improvements in pain and function from baseline to postoperative week 12 in patients with chronic shoulder pain. Notably, the spinoglenoid notch group (Group 2) demonstrated significantly greater improvements in activity-related and nighttime pain at 4 weeks postoperative; this superiority was maintained for activity-related pain and the total SPADI score at the 12-week follow-up.

Another important finding of our study is that injection-related adverse events were generally mild and transient in both groups. Although the incidence of vasovagal symptoms was similar between groups, bleeding detected on aspiration occurred exclusively in patients who received SSN-PRF at the suprascapular notch (Group 1). In these instances, the procedure was safely continued after repositioning the needle; no serious complications occurred, classifying these events as minor. Therefore, both RF techniques applied under ULSD guidance can be considered effective and safe. To our knowledge, this is the first study to directly compare the efficacy of ULSD-guided SSN-PRF performed at the suprascapular notch vs the spinoglenoid notch for treating shoulder pain.

A suprascapular nerve block via the spinoglenoid notch was first described by Chansoria, et al (16) in a study involving 40 patients with shoulder pain. A blind SSNB was performed at the spinoglenoid notch level. Statistically significant improvements were observed in

Table 3. *Comparison of Visual Analog Scale (VAS) score and Shoulder Pain and Disability Index (SPADI) score changes between groups.*

	Group 1 (n = 44)	Group 2 (n = 51)	*P*
VAS (Activity)			
T0-T1	6.14 (1.05)	6.41 (1.02)	0.199
T0-T2	5.89 (1.24)	6.55 (1.38)	0.016
T1-T2	-0.25 (1.01)	0.13 (1.29)	0.112
VAS (Rest)			
T0-T1	1.70 (1.36)	1.43 (0.90)	0.245
T0-T2	1.82 (1.35)	1.63 (0.96)	0.425
T1-T2	0.11 (0.32)	0.19 (0.52)	0.371
VAS (Night)			
T0-T1	5.68 (1.33)	6.16 (1.76)	0.146
T0-T2	5.80 (0.41)	6.18 (1.62)	0.228
T1-T2	0.11 (1.38)	0.01 (1.61)	0.764
SPADI (Pain)			
T0-T1	58.75 (12.73)	59.10 (10.13)	0.881
T0-T2	55.95 (14.34)	60.10 (14.68)	0.168
T1-T2	-2.79 (9.97)	1.00 (12.78)	0.114
SPADI (Disability)			
T0-T1	57.50 (11.85)	57.94 (9.17)	0.837
T0-T2	55.27 (13.03)	59.13 (13.49)	0.162
T1-T2	-2.22 (9.40)	1.18 (11.93)	0.130
SPADI (Total)			
T0-T1	57.99 (12.06)	58.38 (9.41)	0.857
T0-T2	55.57 (13.40)	59.48 (13.81)	0.166
T1-T2	-2.41 (9.60)	1.09 (12.08)	0.124

Data are shown as mean (SD). T0= Before the procedure (baseline), T1= postprocedure week 4, T2= postprocedure week 12.
t test on independent variables

Table 4. *Comparison of acetaminophen consumption, Visual Analog Scale scores (VAS) and Shoulder Pain and Disability Index (SPADI) scores at postprocedure week 4.*

	Group 1 (n = 44)	Group 2 (n = 51)	*P*
Acetaminophen consumption (mg)	0 (0–500)	0 (0–1000)	0.571
VAS			
Activity	1.5 (0–4)	1 (0–5)	0.023
Rest	0 (0–1)	0 (0–2)	0.534
Night	1 (0–4)	0 (0–5)	0.012
SPADI			
Pain	13 (2–40)	12 (2–40)	0.697
Disability	15 (0–40)	12.5 (0–38)	0.443
Total	14 (0–40)	12 (0–39)	0.501

Data are shown as median (min-max).
Mann Whitney U test

Table 5. *Comparison of acetaminophen consumption, Visual Analog Scale (VAS) scores and Shoulder Pain and Disability Index (SPADI) scores at postprocedure 12 weeks.*

	Group 1 (n = 44)	Group 2 (n = 51)	*P*
Acetaminophen consumption (mg)	0 (0–1000)	0 (0–1000)	0.806
VAS			
Activity	1.5 (0–4)	1 (0–5)	0.023
Rest	0 (0–1)	0 (0–2)	0.575
Night	0 (0–4)	0 (0–4)	0.203
SPADI			
Pain	13 (0–46)	8 (0–54)	0.019
Disability	17 (0–40)	7.5 (0–52)	0.017
Total	17 (0–42)	8.5 (0–53)	0.013

Data are shown as median (min-max)
Mann Whitney U test

both VAS and SPADI scores at one month postinjection. Their described technique involved inserting a needle parallel to the skin from the suprascapular fossa and advancing it toward the spinoglenoid notch. A high-volume solution (10 mL) was injected to spread across the base of the suprascapular fossa, indirectly blocking both proximal and distal branches of the suprascapular nerve (16). In comparison, the technique used in our study differed in several respects. We employed a ULSD-guided approach similar to the one described by Messina, et al (20), placing the patient in the lateral decubitus position to minimize the risk of vasovagal reactions. Under direct ULSD visualization, and with the aid of sensory and motor stimulation, PRF was applied as close to the nerve as possible at the identified notch location.

In a study by Yıldızhan, et al (17), similar to our research, the spinoglenoid notch and suprascapular notch approaches for SSNB were compared in patients with chronic shoulder pain. It was found that both distal SSNB approaches statistically significantly improved pain and disability scores, with no observable difference in the short to medium term (up to 12 weeks). Therefore, SSNB performed at the spinoglenoid notch was considered noninferior to the suprascapular notch approach in terms of efficacy and safety. In comparison to that study, our research utilized SSN-PRF instead of SSNB, allowing us to observe the effects of neuromodulation. Furthermore, we also compared the groups in terms of analgesic consumption. This contrasts with the findings of Yıldızhan, et al (17), who reported no difference between the 2 approaches. This discrepancy may be attributable to the different modalities used; while a single-shot nerve block provides a temporary anesthetic effect, the neuromodulatory action of PRF may have a more pronounced and durable effect, potentially revealing differences in efficacy between the 2 anatomical targets over time. The authors also suggested that neuromodulation of the suprascapular nerve could provide pain and functional benefits for longer than 12 weeks. They posited that a future randomized controlled trial with a longer follow-up period would result in an extended effect duration for SSN-PRF beyond that of SSNB (17).

Retraction of tendon and muscle tissue due to rotator cuff tears may exert a traction effect on the suprascapular nerve. This traction commonly occurs at 2 anatomical sites where the nerve's mobility is limited and the risk of entrapment neuropathy is highest: the suprascapular notch and the spinoglenoid notch (21). Several studies have compared an SSNB at the suprascapular notch with subacromial injections in patients with shoulder pain and found an SSNB to be more effective (22,23). Similar to SSNB, SSN-PRF may also be more effective than subacromial injections in relieving pain, particularly because pain may be related not only to inflammation, but also to increased tension on the nerve due to massive rotator cuff tears. Given that the spinoglenoid notch is one of the regions where the suprascapular nerve is most vulnerable to traction and compressive forces, it may represent an appropriate target for SSN-PRF in shoulder pain secondary to rotator cuff pathology. Furthermore, previous studies have shown that an SSNB is as effective as glenohumeral joint injections in adhesive capsulitis and that it may even provide additional benefit when combined with intra-articular treatments (24,25). However, further randomized controlled trials are needed to evaluate the efficacy of SSN-PRF in these specific clinical scenarios.

Although the spinoglenoid notch is most commonly discussed in the literature in the context of ganglion cysts, there are very few publications specifically addressing suprascapular nerve radiofrequency procedures performed at this site. Aside from a few case reports (26,27), the only substantial study is by Mermekli, et al (28) who applied continuous radiofrequency at the spinoglenoid notch in 127 patients with chronic shoulder pain (28). They reported that the procedure was a safe treatment option for shoulder pain in patients with chronic osteoarthritis and was associated with significant improvements in VAS pain scores (28). Our study differs from theirs in that ours was performed using the pulsed radiofrequency method rather than the thermal technique. Consequently, the risks, such as nerve damage, muscle paralysis, and permanent sensory deficits, were lower. Furthermore, unlike their study, the patients in our study were followed for 12 weeks and SPADI scores were measured in addition to VAS scores.

In our study, among the 95 patients who underwent SSN-PRF, transient adverse effects were observed in 7 patients (vasovagal reactions) and 6 patients (presence of blood in the hybrid needle cannula); all bleeding only occurred in Group 1. In a systematic review by Annison, et al (29), a total of 111 studies were included, reporting 168 adverse events among 4,142 patients, ranging in severity from pneumothorax (n = 5) to localized pain and bruising (n = 50). The main disadvantages of targeting the SSN at the suprascapular notch include potential risks

such as pneumothorax, intravascular injection, injury, or needle misplacement (30). However, to our knowledge, no cases of pneumothorax have been reported following ULSD-guided SSNB or SSN-PRF procedures.

Limitations

Our study has several limitations. First, it was a retrospective observational cohort study; patients were not evaluated prospectively or randomized, contributing to potential bias. Additionally, as this is an RF intervention study, the follow-up duration could have been longer. Nevertheless, a major strength of our study is that it is the first to compare ULSD-guided SSN-PRF treatment at the spinoglenoid notch with the suprascapular notch, while also evaluating not only pain outcomes but also disability and analgesic use.

Conclusion

Our study shows that ULSD-guided SSN-PRF techniques, performed at both the spinoglenoid notch and suprascapular notch levels, provide significant improvements in pain and disability scores in the short- to mid-term for patients with chronic shoulder pain. According to the specific functional and pain outcome measures in our study, PRF performed at the spinoglenoid notch yields superior outcomes compared to PRF at the suprascapular notch. Postprocedure analgesic consumption decreased similarly in both groups, and injection-related adverse events were mild and transient. These findings suggest that SSN-PRF performed at the spinoglenoid notch level is noninferior to SSN-PRF at the suprascapular notch level in terms of efficacy and safety.

References

1. Urwin M, Symmons D, Allison T, et al. Estimating the burden of musculoskeletal disorders in the community: The comparative prevalence of symptoms at different anatomical sites, and the relation to social deprivation. *Ann Rheum Dis* 1998; 57:649-655.
2. Treede RD, Rief W, Barke A, et al. Chronic pain as a symptom or a disease: The IASP Classification of Chronic Pain for the International Classification of Diseases (ICD-11). *Pain* 2019; 160:19-27.
3. van der Heijden GJ. Shoulder disorders: A state-of-the-art review. *Baillieres Best Pract Res Clin Rheumatol* 1999; 13:287-309.
4. Neer 2nd CS. Anterior acromioplasty for the chronic impingement syndrome in the shoulder. 1972. *J Bone Joint Surg Am* 2005; 87:1399.
5. Burbank KM, Stevenson JH, Czarnecki GR, Dorfman J. Chronic shoulder pain: Part II. Treatment. Am Fam Physician 2008; 77:493-497.
6. Thomas M, Bidwai A, Rangan A, et al. Glenohumeral osteoarthritis. *Shoulder Elbow* 2016; 8:203-214.
7. Singh JA, Sperling J, Buchbinder R, McMaken K. Surgery for shoulder osteoarthritis: A Cochrane systematic review. *J Rheumatol* 2011; 38:598-605.
8. Ammitzboell M, Baram A, Brorson S, Olsen BS, Rasmussen JV. Poor patient-reported outcome after shoulder replacement in young patients with cuff-tear arthropathy: A matched-pair analysis from the Danish Shoulder Arthroplasty Registry. *Acta Orthop* 2019; 90:119-122.
9. Vecchio PC, Adebajo AO, Hazleman BL. Suprascapular nerve block for persistent rotator cuff lesions. *J Rheumatol* 1993; 20:453-455.
10. Shanahan EM, Ahern M, Smith M, Wetherall M, Bresnihan B, Fitzgerald O. Suprascapular nerve block (using bupivacaine and methylprednisolone acetate) in chronic shoulder pain. *Ann Rheum Dis* 2003; 62:400-406.
11. Keskinbora K, Aydinli I [Long-term results of suprascapular pulsed radiofrequency in chronic shoulder pain]. Article in Turkish. *Agri* 2009; 21:16-21.
12. Cummins CA, Messer TM, Nuber GW. Suprascapular nerve entrapment. *J Bone Joint Surg Am 2000*; 82:415-424.
13. Antonopoulos I, Pechlivanidou E, Olewnik ŁH, et al. Morphology and prevalence of the inferior transverse scapular ligament: Systematic review, meta-analysis, and proposal for classification. *Medicina (Kaunas)* 2024; 60(9):1504.
14. Dangoisse MJ, Wilson DJ, Glynn CJ. MRI and clinical study of an easy and safe technique of suprascapular nerve blockade. *Acta Anaesthesiol Belg* 1994; 45:49-54.
15. Meier G, Bauereis C, Maurer H. [The modified technique of continuous suprascapular nerve block. A safe technique in the treatment of shoulder pain]. Article in German. *Anaesthesist* 2002; 51:747-753.
16. Chansoria M, Das G, Mathankar N, Chandar D, Vyas N, Upadhya S. A preliminary study of a novel technique of suprascapular nerve block in treating chronic shoulder pain. *Indian J Pain* 2015; 29:91-95.
17. Yildizhan R, Cuce I, Veziroglu E, Calis M. Comparison of spinoglenoid versus suprascapular notch approaches for ultrasound-guided distal suprascapular nerve blocks for shoulder pain: A prospective randomized trial. *Pain Physician* 2024; 27:11-19.
18. Roy JS, MacDermid JC, Woodhouse LJ. Measuring shoulder function: A systematic review of four questionnaires. *Arthritis Rheum* 2009; 61:623-632.
19. Kuyulu Haksal P, Caylan Gurses K, Dingirdan B, et al. Cross-cultural adaptation of the Avoidance of Daily Activities Photo Scale for Turkish patients with shoulder pain: Reliability and validity assessment according to the COSMIN guideline. *Musculoskelet Sci Pract* 2024; 74:103180.
20. Messina C, Banfi G, Orlandi D, et al. Ultrasound-guided interventional procedures around the shoulder. *Br J Radiol* 2016; 89:20150372.

21. Albritton MJ, Graham RD, Richards RS 2nd, Basamania CJ. An anatomic study of the effects on the suprascapular nerve due to retraction of the supraspinatus muscle after a rotator cuff tear. *J Shoulder Elbow Surg* 2003; 12:497-500.
22. Bae KH, Kim HH, Lim TK. Proximal approach of ultrasound-guided suprascapular nerve block: Comparison with subacromial steroid injection. *Clin Shoulder Elb* 2019; 22:210-215.
23. Coory JA, Parr AF, Wilkinson MP, Gupta A. Efficacy of suprascapular nerve block compared with subacromial injection: A randomized controlled trial in patients with rotator cuff tears. *J Shoulder Elbow Surg* 2019; 28:430-436.
24. Sarı MH, Akdağ A, Hekim HH, Bilgilisoy-Filiz M. Comparison of the treatment efficacy of suprascapular nerve block and intra-articular shoulder injection techniques in patients diagnosed with adhesive capsulitis. *PM R* 2025; 17:505-512.
25. Shanahan EM, Gill TK, Briggs E, Hill CL, Bain G, Morris T. Suprascapular nerve block for the treatment of adhesive capsulitis: A randomised double-blind placebo-controlled trial. *RMD Open* 2022; 8:e002648.
26. Chung Y-H, Lee J-H, Koo B-S, Jung J, Lee SJ. Ultrasound-guided pulsed radiofrequency treatment for distal suprascapular neuropathy: A case report. *Medicine (Baltimore)* 2020; 99:e22469.
27. Asperti A, Peterson N, Casnovsky J, Gharib M. Peripheral nerve stimulation at the spinoglenoid notch may have advantages over suprascapular notch - Case report. *Pain Med Case Rep* 2025; 9:55-58.
28. Mermekli A, Reddy P, McKean D, Abdelsalam H, Teh J, Mansour R. Ultrasound-guided continuous radiofrequency ablation of the suprascapular nerve for chronic shoulder pain secondary to osteoarthritis: A retrospective cohort study. *Eur Radiol* 2022; 32:6230-6237.
29. Annison DR, Smith N, Salt E, Noblet T, Rangan A, McDaid C. Physical harms associated with suprascapular nerve block interventions in the non-surgical management of acute and chronic shoulder pain: A systematic review. *Shoulder Elbow* 2024; 17:236-253.
30. Peng PW, Wiley MJ, Liang J, Bellingham GA. Ultrasound-guided suprascapular nerve block: A correlation with fluoroscopic and cadaveric findings. *Can J Anaesth* 2010; 57:143-148.