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The Effectiveness of Supraclavicular Suprascapular Nerve Block in the Treatment of Shoulder Pain: Prospective Randomized Trial

Supraskapular Sinirin Supraklavikuler Yaklaşımla Bloğunun Omuz Ağrısı Tedavisinde Etkinliği: Prospektif Randomize Klinik Çalışma

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ABSTRACT

Objective: Suprascapular nerve blockade is one of the treatment methods used in various shoulder pains. The aim of this study is to investigate the clinical efficacy of suprascapular nerve block performed using the supraclavicular approach in patients with shoulder pain.

Methods: This study involved patients treated for shoulder pain. Forty-patients were randomly divided into two groups, one treated with suprascapular nerve block with the supraclavicular approach, and conventional suprascapular nerve block. Both groups received 5 mL of 0.5% levobupivacaine. The patients' range of motion (ROM) and pain (Verbal Analogue Scale, VAS) were measured before the procedures. Short-form-36 (SF-36), and the Disability of Arm, Shoulder and Hand (DASH) questionnaire were studied. The patients were re-evaluated at the 1st hour of the procedure and 3 weeks after the procedure.

Results: Mean VAS scores at the 3rd week were significantly lower than at the 1st hour and before the procedure in both groups ($p<0.001$). Mean 3rd week ROM-abduction and ROM-flexion scores were significantly higher than the pre-procedural values ($p<0.001$). In both treatment groups, the mean DASH value at the 3rd week was significantly lower ($p<0.001$), whereas, the mean 3rd week SF-36 value was significantly higher ($p<0.001$) than the pre-procedural values. No significant differences were observed between the groups in terms of the mean VAS, ROM, SF-36 or DASH values ($p>0.05$).

Conclusion: In our study, it has been shown that with the supraclavicular approach, the suprascapular nerve can be easily detected and blocked in the neck region under the omohyoid muscle and is clinically as effective as the classical method of suprascapular nerve block in the treatment of shoulder pain. It was found that nerve blocks not only reduced shoulder pain, but also effectively reduced the limitation of movement and improved the quality of life of the patients.

Keywords: Shoulder pain, suprascapular nerve blockade, ultrasonography, disability evaluation, surveys and questionnaires

ÖZ

Amaç: Supraskapuler sinir blokajı çeşitli omuz ağrılarında kullanılan tedavi yöntemlerinden birisidir. Çalışmamızın amacı omuz ağrısı olan hastalarda supraklavikuler yaklaşımla yapılan bloğunun klinik olarak etkinliğini araştırmaktır.

Yöntem: Çalışmamız 6 ay içerisinde omuz ağrısı nedeniyle tedavi gören hastalar üzerinde yapılmıştır. Toplam 40 hasta çalışmaya alındı ve supraklavikuler yaklaşımla supraskapular sinir bloğu ve konvansiyonel supraskapular sinir bloğu uygulanan hastalar olmak üzere iki gruba randomize olarak ayrıldı. Her iki gruba %0.5 levobupivakain 5 mL uygulandı. İşlem öncesi hastaların eklem hareket açıklığı (EHA), ağrıları (Verbal Analogue Scale, VAS) ölçüldü. Yaşam kalitelerinin değerlendirilmesi için kısa-form-36 (SF-36), "Disability of Arm, Shoulder and Hand-questionnaire" (DASH) ölçütleri dolduruldu. İşlem sonrası 1. saat ve 3. haftada hastalar tekrar değerlendirildi.

Bulgular: Her iki gruptaki hastaların VAS skoru 3. hafta ortalaması 1. saat ve işlem öncesi ortalamalarından; 1. saat ortalaması da işlem öncesi ortalamalarından anlamlı düşük bulunmuştur ($p<0,001$; $p=0,001$; $p<0,001$). Eklem hareket açıklığı-abdüksiyon ve EHA-fleksiyon 3. hafta ortalamalarının işlem öncesi değerlere göre anlamlı derecede arttığı gözlenmiştir ($p<0,001$). Her iki tedavi grubunda da işlem öncesi ortalamalarıyla karşılaştırıldığında, DASH 3. hafta ortalaması anlamlı derecede daha düşük ($p<0,001$) bulunurken, SF-36 3. hafta ortalaması anlamlı derecede daha yüksek bulunmuştur ($p<0,001$). Tedavi grupları karşılaştırıldığında VAS, EHA, SF-36 ve DASH ortalamaları bakımından gruplar arasında anlamlı farklılıklar gözlenmemiştir.

Sonuç: Çalışmamızda, supraklavikuler yaklaşımla uygulanan supraskapuler blok ile, supraskapular sinirin omohiyoid kas altında, boyun bölgesinde kolayca tespit edilerek bloke edilebildiği ve klinik olarak omuz ağrısı tedavisinde en az klasik yöntemle yapılan supraskapular sinir bloğu kadar etkin olduğu gösterilmiştir. Supraskapular sinir bloklarının, omuz ağrısını azaltmalarının yanı sıra, hareket kısıtlılığını da etkin bir şekilde azalttığı ve hastaların yaşam kalitelerini iyileştirdiği saptandı.

Anahtar sözcükler: Omuz ağrısı, supraskapuler sinir bloğu, ultrasonografi, engellilik değerlendirmesi, anketler

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INTRODUCTION

The suprascapular nerve which separates from the brachial plexus is responsible for sensation, especially in the posterior and superior parts of the shoulder. Various painful conditions of the shoulder region can be treated by blockade of the suprascapular nerve (1). The suprascapular nerve can be blocked by a blind technique using anatomical markers, under fluoroscopy, computed tomography, or ultrasound guidance. These methods are applied by detecting the nerve in the supraspinous fossa. However, the classical posterior approach involves difficulties in practice due to changes in bone structures and to the deep location of the nerve, making it difficult to detect even with the assistance of ultrasound (2).

The suprascapular nerve branches off from the 5th cervical nerve root and the superior trunk of the brachial plexus. In the supraclavicular region, it passes under the omohyoid muscle, courses close to the clavicle, moves towards the suprascapular notch, and divides into motor and sensory branches (3). Siegenthaler et al. showed in their cadaver and ultrasound study that the suprascapular nerve could be better and more successfully detected under the omohyoid muscle in the supraclavicular region (4). Studies have shown that suprascapular nerve block with the supraclavicular approach is at least as effective as interscalene block in shoulder arthroscopies (5,6).

The aim of this study was to investigate the clinical efficacy of suprascapular nerve block performed with the supraclavicular approach in patients with shoulder pain.

MATERIAL and METHODS

This study involved patients treated for shoulder pain. Approval for the study was obtained from the Istanbul Education and Research Hospital Ethical Committee (No. 99-16.03.2012). Patients between the ages of 18 and 80 experiencing shoulder pain for at least 4 weeks and diagnosed with supraspinatus tendinitis or impingement syndrome were included in the study. Patients in both groups used 2 g of paracetamol per day for analgesia throughout the study period.

Patients with severe degenerative changes in the glenohumeral joint (detected at anteroposterior shoulder direct radiography) and full thickness tears in the rotator cuff tendons requiring surgical treatment (supported by motion system examination and ultrasonography or magnetic resonance), radicular pain in the upper extremity with a cervical origin, a history of trauma within the previous four weeks, extremity deformity, systemic rheumatic disease, malignancy, stroke, polyneuropathy, cognitive dysfunction, communication difficulties, and allergy to drugs were excluded from the study.

This study included 40 individuals who were being treated for shoulder pain. Following the requisite evaluations for inclusion in the study, patients presenting to the physical therapy clinical with shoulder pain underwent joint range of motion (ROM) measurements and related extremity motor and sensory examinations. Pain was assessed using a Verbal Analogue Scale (VAS). On this scale, current pain is indicated as 0 points for no pain and 10 points for the most severe pain ever experienced. Short-form-36 (SF-36) criteria were used to evaluate quality of life and Disability of Arm, Shoulder and Hand (DASH) questionnaire criteria to evaluate the contribution of shoulder pain to upper extremity disability. Short-form-36 is a self assessment scale examining eight health dimensions with 36 items, such as physical function, social function, role limitations (due to physical and emotional causes), mental health, vitality (energy), pain and general perception of health. Possible scores range from 0-100. A score of 100 indicates good health, while a score of 0 indicates poor health. Disability of Arm, Shoulder and Hand questionnaire is the most studied and reliable method for evaluating pain (7). This is used to evaluate the contribution of shoulder pain to upper extremity disability under 30 main headings. Possible values range between 0 and 100. A score of 0 represents no disability, and a score of 100 the most severe disability (8). The validity and reliability of the Turkish language versions of both questionnaires have previously been confirmed (9,10).

Following the first examination and tests, the patients were randomly divided into two groups, one scheduled for suprascapular nerve block with the supraclavicular approach (Group ASB) and one for conventional suprascapular nerve block (Group SC), using a predetermined list via computer. Patients in Group ASB were placed in the supine position with their heads facing the opposite side. A 10-18 Mhz linear ultrasound probe (Esaote My Lab 5, Italy) was placed in the supraclavicular region in a coronal oblique fashion. The omohyoid muscle, suprascapular nerve, brachial plexus and subclavian artery were then detected. The suprascapular nerve was approached posteriorly in-plane with an 80 mm peripheral nerve needle (Braun, Stimuplex). Five mL of 0.5% levobupivacaine (Chirocaine %0.5, 10 mL, Abbott, USA) was injected, the nerve structure being confirmed by means of stimulation in the supraspinous muscle with a nerve stimulator (Figure 1A).

In Group SC, the linear ultrasound probe was inserted transversely into the scapular spinous process with the patient in a sitting position. The suprascapular nerve was detected in the scapular notch immediately below the trapezius and supraspinatus muscles. The nerve was accessed with an 80 mm peripheral nerve needle (Braun, Stimuplex) via “in-plane” approach and 5 mL of 0.5% levobupivacaine was administered (Figure 1B).

All patients' ROM and VAS scores were recorded at the 1st hour following the procedures. Control examinations were performed 3 weeks subsequently, at which ROM measurements, VAS pain and SF-36 and DASH scores were re-evaluated.

Statistical Analysis

The quantitative measurements in this study are expressed as mean, standard deviation, median, minimum and maximum. Descriptive values for categorical measurements are expressed as numbers (n) and percentages (%). Pearson's Chi-Square test was used for group comparisons in terms of gender distributions. Normality of distribution of quantitative variables was examined using the Shapiro Wilk test. The Mann Whitney U and Independent t tests were used for comparisons between groups in terms of the means of quantitative variables. The Paired t test and Wilcoxon signed rank test were used to investigate the mean differences between time periods. P<0.05 were considered statistically significant. For analysis SPSS version 21 software was used.

RESULTS

Forty patients were randomly allocated to the two study groups. All patients were followed up during the study period with no drop outs, and the data for all patients were included in the analysis (Groups SC/ASB=20/20) (Figure 2). There was no statistically significant difference between the groups in terms of mean age, gender, body weight and height distribution (Table I).

Mean VAS scores at the 3rd week were significantly lower than those at the 1st hour and before the procedure in both groups, and the mean VAS score at the 1st hour was also significantly lower compared to the pre-procedural VAS score (p<0.001 for all) (Figure 3). No significant differences were observed between the groups in terms of median VAS differences (p>0.05).

The ROM-abduction and ROM-flexion values increased slightly in both groups at the 1st hour post-block (p>0.05). Mean ROM-abduction and ROM-flexion 3rd week values were significantly higher than the pre-procedural values (p<0.001) (Figure 4). Analysis of the differences between the values

Table I. Age, Gender, Weight and Height Differences of the Groups

		Conventional suprascapular nerve blockade		Supraclavicular suprascapular nerve blockade		
		n	%	n	%	p
Gender	Male	9	45.0	7	35.0	0.519
	Female	11	55.0	13	65.0	
		Median	**Min-Max**	**Median**	**Min-Max**	
Age (years)		54	47-71	58	40-78	0.101
Weight (kg)		75.3	53-92	76.4	54-96	0.585
Height (cm)		169.6	151-188	170.5	156-187	0.234

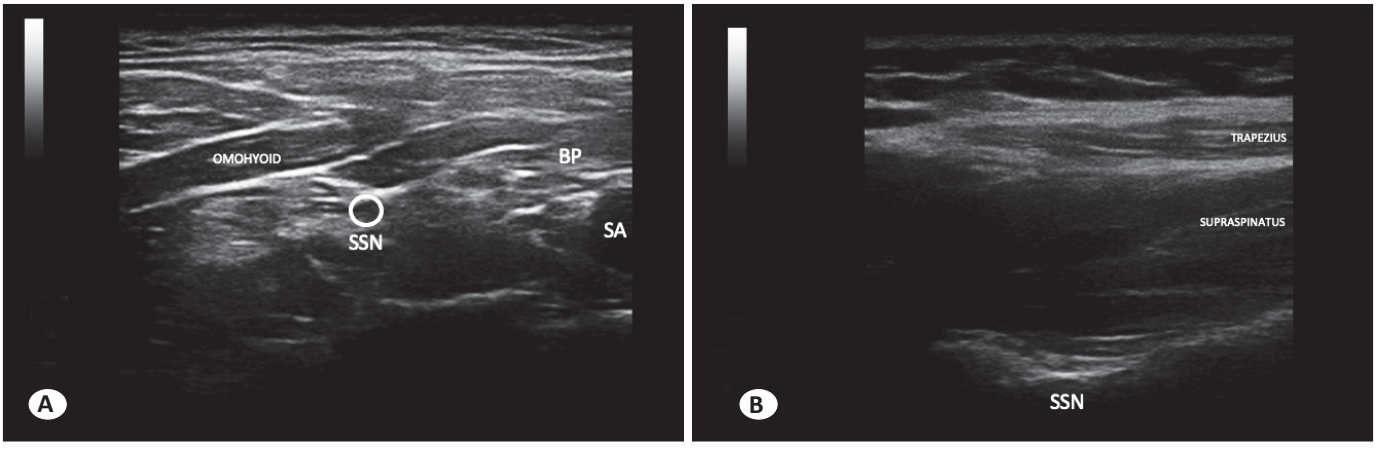

Figure 1. A) Sonogram of the supraclavicular area. **B)** Sonogram of the conventional suprascapular nerve block view. **SSN:** Suprascapular nerve, **BP:** Brachial plexus, **OM:** Omohyoid muscle, **SA:** Subclavian artery.

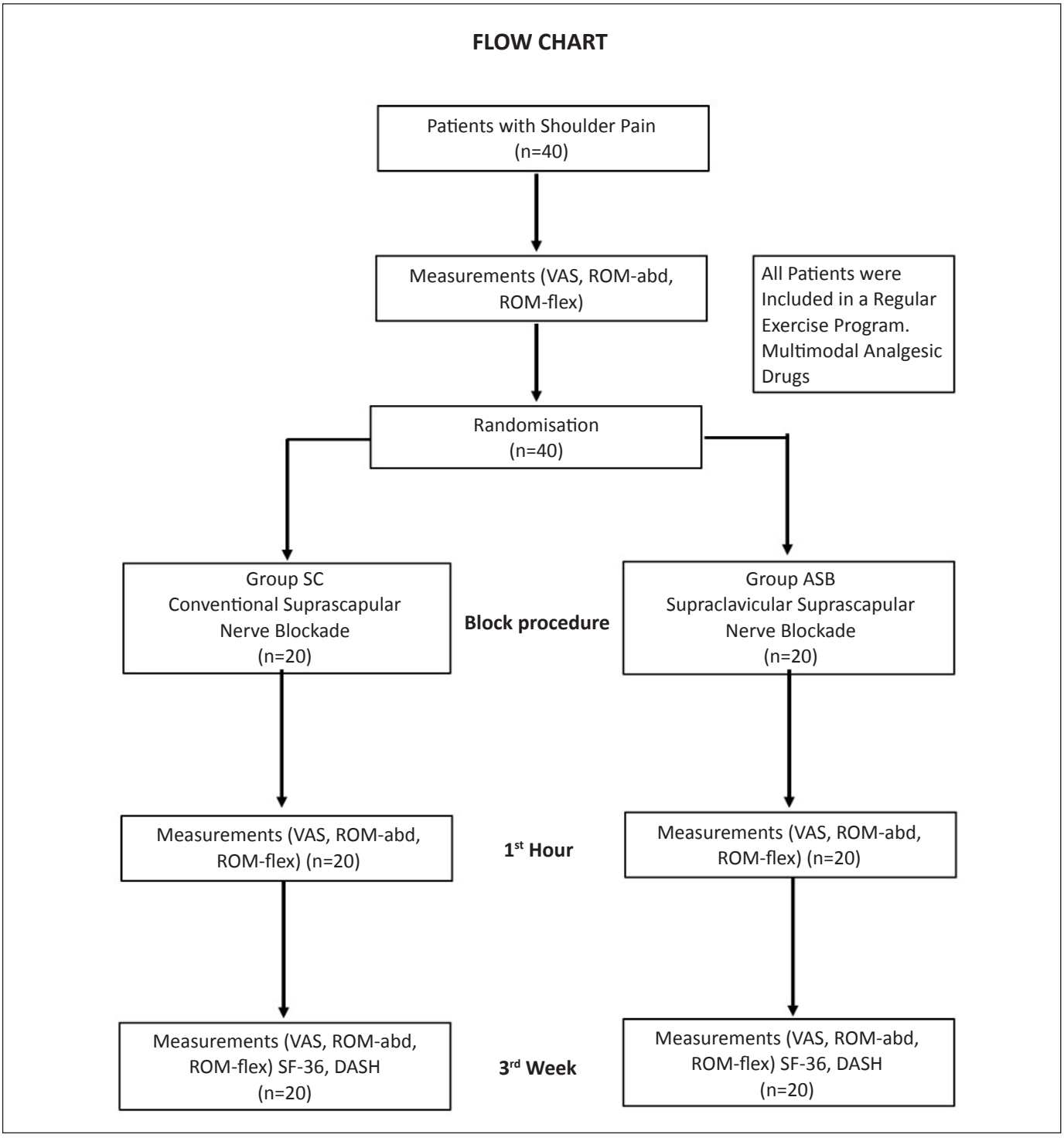

Figure 2. Flow chart for the study (**VAS:** Verbal analogue score, **ROM:** Range of motion, **DASH:** Disability of arm, shoulder and hand questionnaire, **SF-36:** Short-form-36).

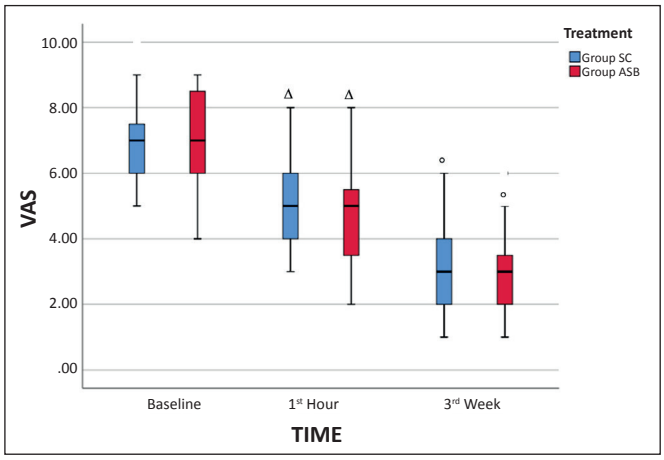

Figure 3. Comparison of pain scores between the groups. **o:** Mean VAS scores were significantly lower at the 3rd week compared to the pre-procedural and 1st hour ($p < 0.001$). Δ: Mean VAS scores were significantly lower at the 1st hour compared to the pre-procedural ($p < 0.001$). **VAS:** Verbal pain score, **Group SC:** Conventional suprascapular nerve block group, **Group ASB:** Supraclavicular suprascapular nerve block group.

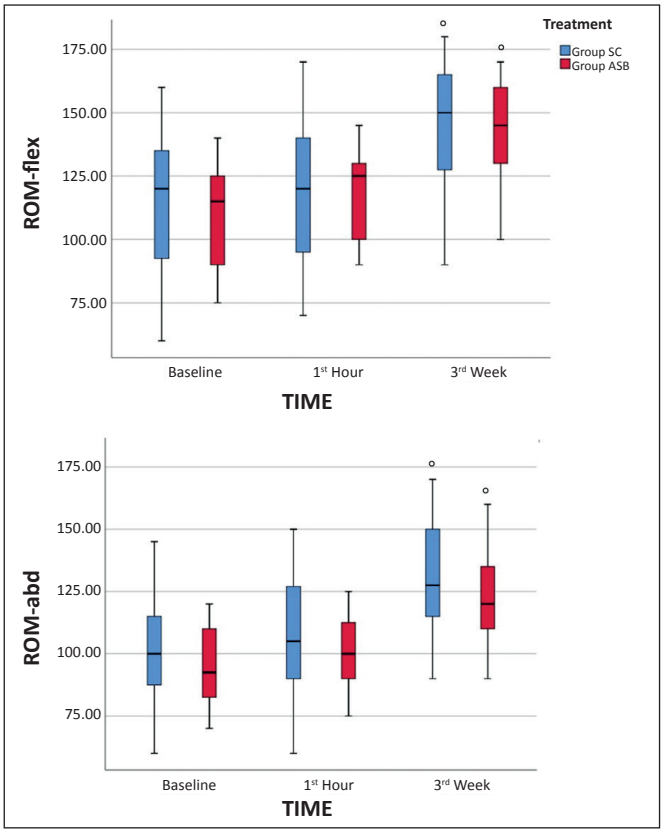

Figure 4. Comparison of ROM-abduction and ROM-flexion values by time intervals in the treatment groups. **o:** Mean ROM-abduction and ROM-flexion 3rd week values were significantly higher than the pre-procedural values ($p < 0.001$). **ROM:** Joint range of motion, **Group SC:** Conventional suprascapular nerve block group, **Group ASB:** Supraclavicular suprascapular nerve block group.

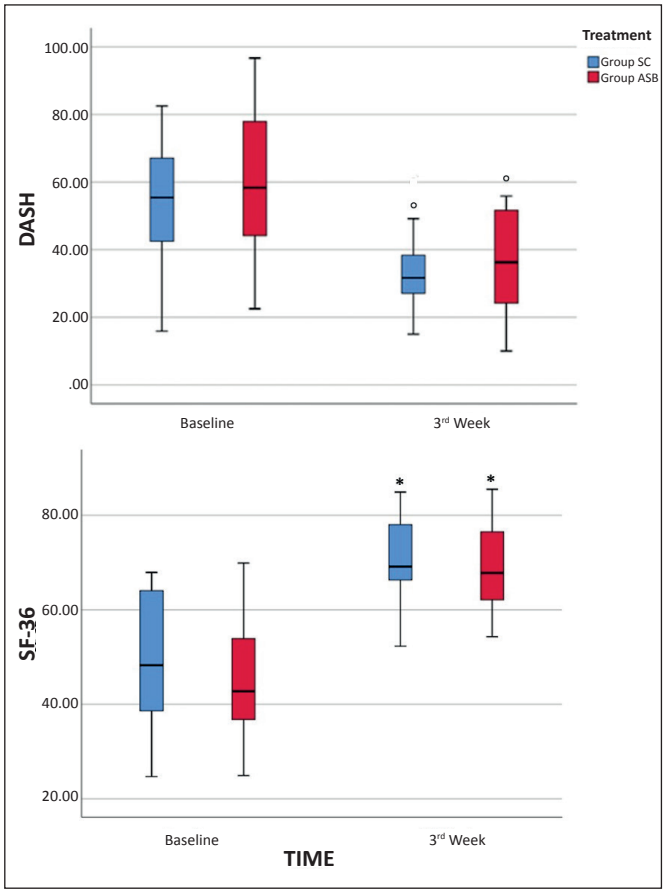

Figure 5. Comparison of time-dependent DASH and SF-36 values in the treatment groups. **o:** Mean week 3 DASH values were significantly lower, ***:** Mean week 3 SF-36 values were significantly higher compared to the pre-procedural ($p < 0.001$). **DASH:** Disability of Arm, Shoulder and Hand questionnaire, **SF-36:** Short-form-36, **Group SC:** Conventional suprascapular nerve block group, **Group ASB:** Supraclavicular suprascapular nerve block group.

performed to determine which treatment was more effective revealed no significant difference between the groups in terms of mean ROM-abduction or ROM-flexion differences ($p > 0.05$).

Mean 3rd week DASH values were significantly lower in both treatment groups compared to the pre-procedural values ($p < 0.001$). Mean 3rd week SF-36 values were significantly higher in both treatment groups compared to the pre-procedural mean ($p < 0.001$) (Figure 5). There was no significant difference between the treatment groups in terms of mean DASH or SF-36 values.

DISCUSSION

This study shows that via supraclavicular approach the suprascapular nerve can be easily detected and blocked under the omohyoid muscle in the neck region, and that this

technique is clinically as effective as the classical method of suprascapular nerve block in the treatment of shoulder pain.

Shoulder pain can lead to limitation of movement and adversely affect daily activities such as eating, drinking, and dressing. Prevalence rates of 16-26% have been reported (11). A previous systematic review of shoulder pain provided information concerning the efficacy and safety of a wide variety of interventions (12).

The suprascapular nerve supplies 70% of sensation in the shoulder (13). Blocking this nerve has been described as an alternative treatment for painful conditions caused by arthritis in the shoulder region (14). In a study comparing recurrent suprascapular block with placebo in cases of frozen shoulder, more adequate analgesia was achieved in the suprascapular block group at one month (64% in the bupivacaine group vs. 13% in the placebo group p=0.03) (15). The same study failed to show any difference in terms of shoulder function and shoulder range of motion. Adding the suprascapular nerve block to the interscalene block in non-arthroscopic shoulder surgeries slightly prolongs the onset of first severe pain, but causes no change in pain, patient satisfaction or sleep quality at 24 hours (16). In the present study, suprascapular nerve block decreased pre-procedural VAS from 7 to 3. Joint range of motion also increased significantly. These positive effects in the 3rd week after block suggest that a single suprascapular nerve block effectively reduces pain and breaks the vicious cycle of pain immobility.

Suprascapular nerve block can be performed using anatomical markers, and also by radiologists with computed tomography (CT). Neither of these two methods is superior to the other, and both are effective in relieving shoulder pain (17). The use of CT naturally imposes an additional radiation burden on patients. Ultrasonography is preferable since it does not involve radiation, is less expensive, and can reduce complications such as pneumothorax related to suprascapular nerve block (2). The use of ultrasonography also helps the procedure to be performed safely and effectively in cases with anatomical variations without suprascapular protrusion (18).

Sensory innervation of the shoulder is from the axillary, lateral pectoral, subscapular, and suprascapular nerves (19). Siegenthaler et al. showed in their cadaver and ultrasound study that the suprascapular nerve can be detected better and more successfully due to its superficial location in the supraclavicular region (4). The effectiveness of proximal suprascapular nerve block from the neck region was demonstrated in volunteers in a previous study (20). Blasco et al., in their cadaver study, showed that the classic approach under ultrasound guidance from the neck region affected the nerves sufficiently (21). Studies involving arthroscopic shoulder surgery cases have shown that anterior suprascapular nerve block applied from the neck region is at least as effective as interscalene block in reducing pain (5,6). A previous cadaver study showed that the posterior division of the upper trunk lies in close approximation to the suprascapular nerve (22). Local anesthetic drug delivered to the anterior suprascapular nerve is likely to spread to the posterior division of the upper trunk. Posterior division eventually gives rise to the axillary and subscapular nerves that also contribute to shoulder innervation. This mechanism may explain the comprehensive analgesic efficacy of the anterior approach in the suprascapular nerve block (6). In the present study, the supraclavicular nerve was easily detected using the suprascapular approach.

Blocking the nerve in this region reduced patients' pain and significantly increased the joints' range of motion. Similar results were obtained with the suprascapular nerve block performed using the conventional posterior approach. No complications were encountered in either group in the present study. Our results demonstrate that suprascapular nerve block with the supraclavicular approach is safe and clinically effective.

Shoulder pain is a common and disabling condition. Several questionnaires have been used in order to determine the severity of the condition. The DASH is the most preferred and reliable questionnaire (7). The questionnaire evaluates the contribution of shoulder pain to upper extremity disability under 30 items; difficulty performing various physical activities that require upper extremity function (physical function 21 items), pain symptoms, activity-related pain, tingling, weakness, stiffness (pain symptoms, 5 items), and the effect of symptoms on social activities, work, sleep, and psychological well-being (emotional and social function, 4 items). Average pre-procedural DASH scores in the present study were 55 and 58 in groups SC and ASB respectively. The scores decreased to 31 and 36 in groups SC and ASB respectively (p=0.001). Our findings show that suprascapular nerve block not only lowers pain, but also effectively reduces disability related to shoulder pain.

Short-form-36 can be used for the follow-up of patients in order to determine quality of life, the psycho-social aspect of the disease, and changes occurring as a result of treatment (10). It examines quality of life under eight dimensions of health with 36 items. It is a self-assessment form and can be completed in a short time (10). In the present study, pre-procedural SF-36 scores were 44 and 49 in groups SC and ASB respectively. However, SF-36 scores increased to 71 and 68 in groups SC and ASB respectively (p=0.001). Our findings confirm that suprascapular nerve block effectively improves quality of life in the treatment of shoulder pain.

There are a number of limitations to this study. First, we were unable to discuss the long-term results of suprascapular nerve block on shoulder pain since the patients were evaluated only

in the 3rd week. The small number of patients, sample size estimation has not been made, block performance time is not recorded and the fact that the individuals who performed the block procedure and kept the scores were not blinded to the study groups represent other limitations.

CONCLUSION

This research reveals that the suprascapular nerve can be easily located and blocked under the omohyoid muscle in the neck region using a supraclavicular approach, and that this technique is clinically as effective as the conventional suprascapular nerve block in the treatment of shoulder pain.

AUTHOR CONTRIBUTIONS

Conception or design of the work: ATD, YPD, ENT

Data collection: ATD, YPD

Data analysis and interpretation: ATD, YPD, SKC, ÖE

Drafting the article: ATD, YPD, SKC

Critical revision of the article: ATD, SKC, YPD, ENT, ÖE

Other (study supervision, fundings, materials, etc): ATD

All authors (ATD, YPD, SKC, EOT, OE) reviewed the results and approved the final version of the manuscript.

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