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Randomized Control Trial

A Comparison of the Effectiveness of Ultrasound-Guided Versus Landmark-Guided Suprascapular Nerve Block in Chronic Shoulder Pain: A Prospective Randomized Study

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Background: Suprascapular nerve block (SSNB) is an effective therapeutic approach for shoulder pain and has been increasingly used by professionals in clinical practice. In the landmark-guided nerve block technique, it could be difficult to determine the exact localization of the suprascapular nerve.

Objectives: To evaluate and compare the clinical and functional outcomes of ultrasound (US)-guided versus landmark-guided SSNB for the treatment of chronic shoulder pain.

Study Design: Randomized, prospective analysis.

Setting: Outpatient physical therapy and rehabilitation clinic.

Methods: Seventy-two patients with chronic shoulder pain were enrolled into this study. The patients were randomly allocated to 2 groups. Thirty-six patients received US-guided SSNB and 36 underwent landmark-guided SSNB. Initial examinations before injection and for the first week and first and third months postinjection were recorded. Visual Analog Scale (VAS) pain intensity levels, shoulder functions based on the Shoulder Pain and Disability Index (SPADI), and quality of life levels based on the Health Assessment Questionnaire (HAQ) were evaluated at each control.

Results: Statistically significant recovery was observed in terms of VAS pain levels, SPADI, and HAQ from the first week after injection in both groups, but no significant difference was observed between the groups.

Limitations: The absence of a control group.

Conclusions: Our results indicate that US-guided SSNB does not potentially offer a significantly greater clinical improvement over landmark-guided SSNB in patients with chronic shoulder pain. Further research is required to establish whether this hypothesis is consistently supported in practice.

Key words: Shoulder pain, suprascapular nerve block, ultrasound

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The reported prevalence of shoulder pain is 7%–10%, and this represents the most common reason for referral to clinics after waist and neck pain (1-4). Many diseases, such as subacromial impingement syndrome, rotator cuff (RC) pathologies, calcific tendinitis, bicipital tendon pathologies, adhesive capsulitis, glenohumeral and acromioclavicular joint osteoarthritis, and inflammatory arthritis can lead to shoulder pain (5). The most important aims in the approach to shoulder pain are pain relief, mobility, and recovery of function, in descending order (6). Conservative treatment includes

different approaches such as rest, activity regulation, nonsteroidal anti-inflammatory drug (NSAID) use, physical therapy modalities, therapeutic exercises, subacromial or intraarticular corticosteroid injections, and suprascapular nerve blocks (SSNBs) (7,8). Surgical treatment is recommended if conservative treatment is not sufficient for clinical improvement within 3 to 6 months.

The suprascapular nerve originates from the superior trunk of the brachial plexus (C5-6). On the upper side of the scapula, it passes posteriorly under the trapezius muscle, and then it travels posteriorly toward the suprascapular notch (9). After sending a branch to the supraspinatus muscle, it progresses inferiorly and then gives a sensory ring to the posterior part of the glenohumeral joint capsule. The nerve then passes through a fibro-osseous tunnel formed by the spina scapulae and the spinoglenoid ligament, and finally terminates by giving a narrow arcuate line around the spina scapulae and a few terminal motor branches, which innervate the infraspinatus muscle. The suprascapular nerve is involved in 70% of the sensory innervation of the shoulder girdle, the rest being provided by axillary nerve branches. SSNB is a therapeutic method that can be used in many shoulder pathologies, such as RC lesions, rheumatic diseases involving the shoulder, adhesive capsulitis, and hemiplegic shoulder (10,11). Other possible indications are postoperative analgesia after shoulder area operations and pain management in advanced-stage shoulder tumors (12-13). The block was first described by Wertheim and Rovenstein in 1941 (13), and is an economic, safe, and effective method well tolerated by patients (14). In SSNB injection, the suprascapular notch is targeted where the suprascapular nerve passes under the superior transverse scapular ligament. It can be applied using various different techniques (14,15). In the Shanahan et al (16) technique, an injection is made 2 cm laterally to the intersection point (located on the upper-outer quadrant of the scapula) from the inferior aspect of the scapula, perpendicular to the scapular spine.

A few previous studies have compared ultrasound (US)-guided versus landmark-guided SSNB in patients with shoulder pain and the results are conflicting. Although literature is insufficient for this topic, we aimed to compare the effects of US-guided and landmark-guided SSNB techniques in addition to home exercise on pain, quality of life, functionality, and sleep quality in patients with chronic shoulder pain in this study.

Methods

This study was conducted with 72 patients who required local injection therapy according to physician examination (61 women and 11 men). The study population consisted of patients who were referred to a physical medicine and rehabilitation outpatient clinic due to shoulder pain for longer than 3 months and aged 18 years or over, and were informed about the nerve block techniques after the requisite clinical, laboratory, and radiologic evaluations and then receiving blind or US-guided SSNB. Patients were randomized by one physician with a computer randomization program and evaluated at each control. Another physician conducted the injections. Patients receiving physical therapy for the shoulder region in the previous 6 months, local injection to the shoulder in the previous 3 months, with uncontrolled diabetes and hypertension, with shoulder infection or a history of shoulder surgery, with septic/tuberculosis arthritis of the shoulder, or using anticoagulants were excluded. Sociodemographic and clinical data were recorded on the case report form.

All patients were given preinjection Codman exercises, self-stretching exercises, active range of motion (ROM) exercises with stick assistance and finger ladders. The exercise program was showed by a physiotherapist, and all patients were given an exercise brochure that described the exercises in detail. Preinjection, initial, and postinjection week 1, and months 1 and 3 control data were obtained. Pain levels were evaluated in the form of the Visual Analog Scale (VAS) scores during sleep, rest, and activity. Shoulder functions were evaluated using the Shoulder Pain and Disability Index (SPADI) and quality of life using the Health Assessment Questionnaire (HAQ). Patients' baseline, first, and third month scores were recorded. Informed consent was obtained from all individual patients included in this study.

SSNB Procedures

In our study, landmark-guided SSNB was performed using the method described by Shanahan et al (16). In this method, with the patient in a sitting position, the intersection point is identified by drawing a line perpendicular to the scapula spiral from the inferior aspect of the scapula. The injection is applied 2 cm laterally (in the upper-outer quadrant of the scapula) to the intersection point. Under sterile conditions, the procedure is performed at a depth of approximately 2.5 cm using an injector with a 21-gauge

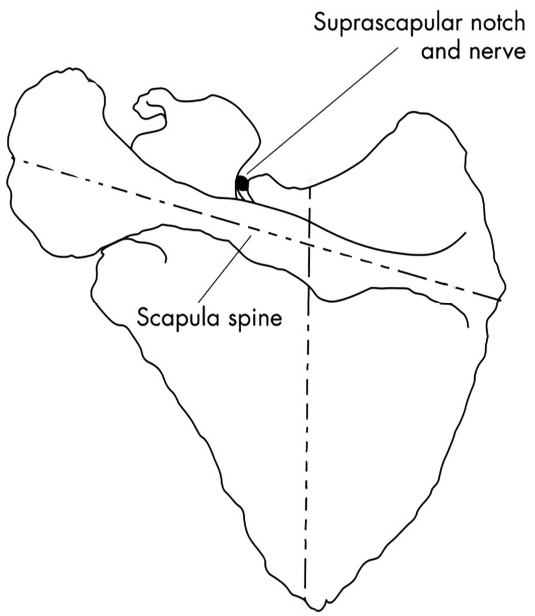

Fig 1. *Suprascapular nerve block technique by identification of anatomical landmarks.*

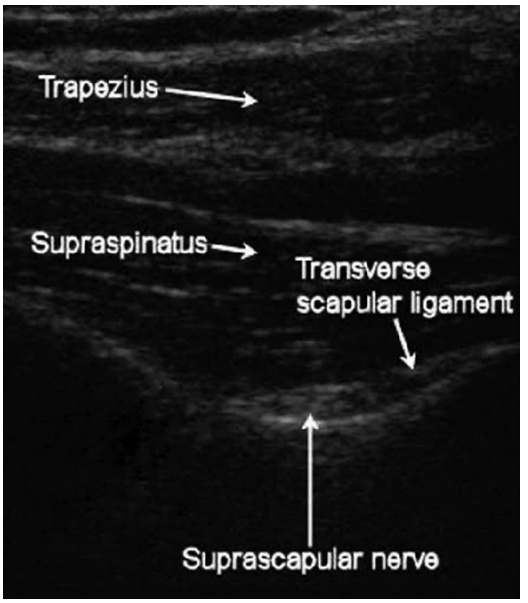

Fig 2. *Sonoanatomy of suprascapular nerve.*

x 38-mm needle tip and with an aspiration check from the injection point. The patients received 4 mL 2% lidocaine and 40 mg methylprednisolone acetate (1 mL) for SSNB (Fig. 1).

US-guided SSNB was performed with the patient in sitting position and arm by the side. The US probe was placed in the coronal plane over the suprascapular fossa with slight anterior tilt. A MyLab60 model (Esaote, Genova, Italy), a high resolution 7- to 12-MHz linear probe ultrasonography device, was used by the same experienced physician. The suprascapular nerve runs an oblique course between the suprascapular notch and the spinoglenoid notch, therefore the transducer was placed oblique to the spine of the scapula in the supraspinous fossa. The solution was injected in a mediolateral direction at an angle of 30° to 45° to the vertical, under the guidance of US. Injected solution and needle type were the same with blind injection technique (Fig. 2).

Statistical Analysis

The power of the study was calculated using the NCSS-PASS 20097 program (Number Cruncher Statistical System Statistical Software, Utah, USA)to determine the minimum number of patients to be included in our study population within 90% confidence (α = 0.05). A sample size of 26 patients per group was required to achieve a statistically and clinically difference between the 2 groups.

Statistical analyses were performed on IBM SPSS Statistics 22 (IBM SPSS, Istanbul, Turkey) software. The normal distribution fitness of the parameters was determined using the Shapiro-Wilks test. Descriptive statistics (mean, standard deviation, and frequency) were used for the calculations. The Student t-test and the Mann-Whitney U test were used to compare normally distributed quantitative data between the 2 groups. ANOVA was used for repeated measures and the Bonferroni test to determine the time interval representing the source of differences. The Friedman test was used in evaluating parameters without normal distribution in the repeated measures, and the Wilcoxon signed-rank test was used to determine the time interval representing the source of differences. The χ^2 test, continuity (Yates) correction, and the Fisher exact test were used in the analysis of qualitative data. Significance was set at $P < 0.05$ for all tests.

Results

The study involved 72 patients: 61 women and 11 men. The results of the demographic data analyses are shown in Table 1. Patients' ages ranged from 28 to 74

years, with a mean age of 50.80 ± 11.01 years. Various clinical data for shoulder pathology are shown in Table 2. There was no statistically significant difference between the 2 groups in terms of distribution of sociodemographic characteristics and various clinical features of shoulder pathology, including physical characteristics such as height, weight and body mass index (BMI), shoulder pain duration, affected side, dominant hand, and history of repetitive/compulsive shoulder activity (Table 3). There was also no significant difference between the groups in terms of initial VAS or HAQ values. Preinjection (onset), and postinjection week 1, months 1 and 3 evaluations were recorded. At 3 months postinjection significant decreases in VAS scores were observed in both SSNB groups. The VAS for pain at activity decreased from 7.80 ± 2.17 before the injection to 3.33 ± 2.12 at 3 months after the nerve block in the blind nerve block group ($P < 0.01$) and from 3.33 ± 2.12 to 3.13 ± 1.96, respectively, in the US-guided group ($P < 0.01$) (Table 4; Fig. 3). When HAQ scores were evaluated after injection, significant improvement in quality of life was observed at the first week and first month compared with baseline in both groups, with

Table 1. *Demographic data*.

	Minimum-Maximum	Mean ± SD
Age (years)	28–74	52.80 ± 11.01
Gender n%		
Female	61	85.0%
Male	11	15.0%
Height (cm)	150–185	163.08 ± 7.52
Weight (kg)	50–130	75.80 ± 14.38
BMI (kg/m^2)	18.92–50.78	28.54 ± 5.29

SD, standard deviation.

Table 2. *Clinical features and findings*.

		Minimum-Maximum	Mean ± SD
		N	%
Shoulder pain duration (months)		4–150	27.09 ± 26.00
*Comorbid diseases	Comorbidity	31	51.7%
	Diabetes	9	15%
	Thyroid disease	5	8.3%
	Pulmonary disease	4	6.7%
	Hypertension	13	21.7%
	Rheumatoid arthritis	4	6.7%
	Ankylosing spondylitis	5	8.3%
*MRI findings	Impingement	18	30%
	Glenohumeral degeneration	17	28.3%
	Acromioclavicular degeneration	21	35%
	Supraspinatus tendinosis	31	51.7%
	Supraspinatus tear	16	26.7%
	Infraspinatus tendinosis	1	1.7%
	Bursitis	13	21.7%
	Effusion	10	16.7%
	Bicipital tendinitis	6	10%

*More than one option may apply. SD, standard deviation.

Table 3. *Comparison of demographic and clinical data between groups*.

	Landmark-Guided SSNB Group	US-Guided SSNB Group	*P*
	Mean ± SD (median)	Mean ± SD (median)	
Age (years)	51.80 ± 10.55	53.80 ± 11.54	0.486[1]
Gender n.%			
Female	29	32	0.472[2]
Male	7	4	
Height (cm)	162.97 ± 8.64	163.20 ± 6.36	0.906[1]
Weight (kg)	75.70 ± 17.12	75.90 ± 11.31	0.958[1]
BMI (kg/m^2)	28.47 ± 5.97	28.61 ± 4.60	0.921[1]
Dominant hand %			
Right	83.3%	86.7%	1.000[2]
Left	16.7%	13.3%	
Affected shoulder %			
Right	73.3%	70%	1.000[2]
Left	26.7%	30%	
Shoulder pain duration (months)	25.16 ± 15.62	29.03 ± 21.72	0.429[1]
History of repetitive/compulsive shoulder activity %			
(+)	36.7%	33.3%	1.000[2]
(-)	63.3%	66.7%	

[1]Student t-test; [2]χ^2 test, Yates χ^2 test, Fisher exact test; SD, standard deviation; Mean ± SD (median)

Table 4. *Intra- and intergroup evaluation of rest, activity, and nocturnal VAS scores.*

VAS		Landmark-Guided SSNB Group	US-Guided SSNB Group	[1]*P*
Rest	Baseline	3.10 ± 3.47 (2)	3.37 ± 3.15 (3.5)	0.718
	1st week	1.20 ± 2.27 (0)	0.80 ± 1.52 (0)	0.662
	1st month	0.87 ± 1.70 (0)	0.77 ± 1.65 (0)	0.774
	3rd month	0.90 ± 1.71 (0)	0.60 ± 1.45 (0)	0.377
	[2]*P*	0.001*	0.001*	
Activity	Baseline	7.80 ± 2.17 (8)	7.80 ± 1.79 (8)	0.781
	1st week	4.87 ± 2.39 (5)	4.00 ± 1.97 (3.5)	0.104
	1st month	3.47 ± 2.16 (3)	3.63 ± 2.14 (3)	0.799
	3rd month	3.33 ± 2.12 (3)	3.13 ± 1.96 (3)	0.994
	[2]*P*	0.001*	0.001*	
Nocturnal	Baseline	4.87 ± 3.79 (5)	5.20 ± 3.59 (5)	0.804
	1st week	2.40 ± 3.49 (0)	1.60 ± 2.44 (0)	0.477
	1st month	1.90 ± 2.87 (0)	1.33 ± 1.83 (0)	0.741
	3rd month	1.60 ± 2.58 (0)	1.27 ± 1.74 (0)	0.993
	[2]*P*	0.001*	0.001*	

[1]Mann-Whitney U test; [2]Friedman test; *$P < 0.01$; SD, standard deviation; Mean ± SD (median)

no significant difference between the groups ($P < 0.01$) (Table 5; Fig. 4). There was a significant improvement in shoulder functions based on SPADI in both groups during follow-up. The SPADI score decreased from 67.99 ± 22.46 before nerve block to 26.66 ± 21.77 at 3 months after the nerve block in the landmark-guided group ($P < 0.01$), and from 57.02 ± 17.95 before the nerve block to 22.45 ± 14.77 after the nerve block in the US-guided group ($P < 0.01$) (Fig. 5). The initial and follow-up results are shown in Table 5. There were no losses or exclusions after randomization for each group, and no adverse effect was observed in either group related to nerve block.

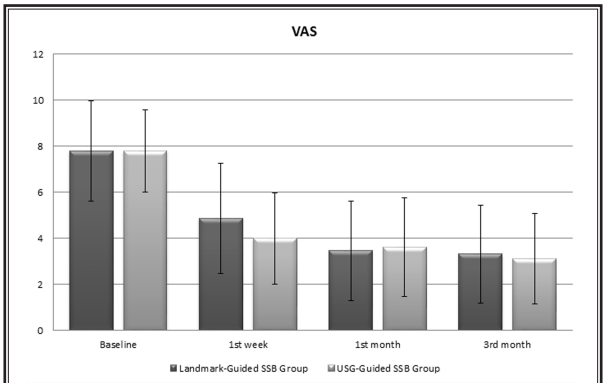

Fig 3. *Comparison of activity VAS scores between groups.*

Discussion

Chronic shoulder pain is a medical condition that can cause socioeconomic problems due to disability and productivity losses. Pain persists in the first 6 months in 50% of patients, whereas 10% of patients recover in the next 6 months (17). In this context, it is important to establish an effective conservative treatment program modification. SSNB is an option that can be employed in patients who do not respond to exercise and medical treatment because of the side-effects of NSAIDs, the need for the patient to set time aside for physical therapy, the limited capacities of physical therapy centers, and late commencement of rehabilitation.

SSNB is a reliable and effective treatment according to previous research of shoulder pain control. Some studies on shoulder disorders have examined the approach of SSNB, but literature remains insufficient to compare the efficacy of US-guided and landmark-guided SSNB, and there is a limited number of studies on this comparison as mentioned later.

Kamal et al (18) conducted a study to compare the effectiveness of SSNB under ultrasonographic guidance and landmark-guided in a total of 50 patients with chronic shoulder pain. Patients were randomly divided into 2 groups. The landmark-guided injection technique was performed using the anatomic landmark technique

Table 5. *Intra- and intergroup evaluation of HAQ and SPADI scores.*

		Landmark-Guided SSNB Group	US-Guided SSNB Group	*P*
HAQ	Baseline	1.14 ± 0.71	0.96 ± 0.52	0.274[1]
	1st week	0.76 ± 0.62	0.55 ± 0.39	0.135[1]
	1st month	0.56 ± 0.57	0.47 ± 0.37	0.496[1]
	3rd month	0.52 ± 0.57	0.45 ± 0.37	0.575[1]
	P[2]	0.001**	0.001**	
SPADI	Baseline	67.99 ± 22.46	57.02 ± 17.95	0.041[1]*
	1st week	40.59 ± 23.91	30.28 ± 14.83	0.049[1]*
	1st month	29.04 ± 21.71	25.15 ± 15.61	0.429[1]
	3rd month	26.66 ± 21.77	22.45 ± 14.77	0.384[1]
	P[2]	0.001**	0.001**	

[1]Student t-test; [2]ANOVA test; *$P < 0.05$; **$P < 0.01$; SD, standard deviation; Mean ± SD (median)

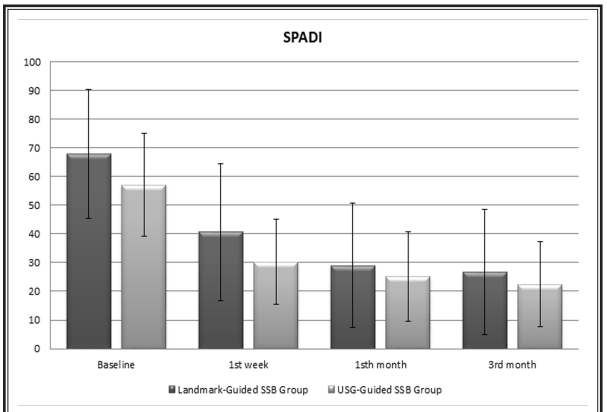

Fig 5. *Comparison of SPADI scores between groups.*

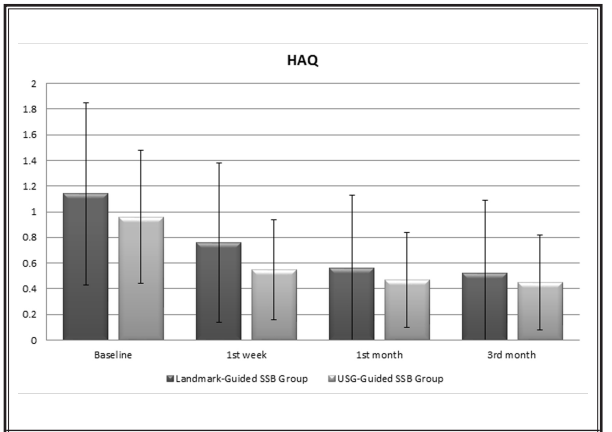

Fig 4. *Comparison of HAQ scores between groups.*

described by Dangoisse et al (15). A combination of 5 mL 0.25% bupivacaine and 40 mg methylprednisolone was preferred for both groups. Similar to our findings, they observed a statistically similar improvement of VAS, ROM, and SPADI in both groups at the end of 4-week follow-up ($P > 0.05$) (18).

Shanahan et al (19) compared anatomic landmark approach of SSNB versus computed tomography (CT)-guided SSNB for patients with degenerative joint RC disease. The patients were examined at 1, 4, and 12 weeks after injection. Both techniques have produced comparable relief of pain, patient satisfaction scores, improvement in shoulder movement and shoulder functions at each control through 12 weeks. The study concluded that CT-guided and landmark-guided SSNBs result in similar significant reductions of pain and disability and both techniques are safe. In this present study, we also did not determine any complication due to nerve block in both groups (19).

In another study, Gorthi et al (20) compared the efficacy of SSNB under US guidance and landmark-guided injection technique as described by Moore. Fifty patients with perishoulder pain was enrolled into this prospective randomized case–control study. In contrast to our results, they observed that the US-guided group showed better clinical improvement with regard to VAS and constant shoulder scores than the control groups at 1-month follow-up ($P < 0.05$). The result of this study may be linked to the Moore technique, which aims to block the nerve in the suprascapular notch not the supraspinatus fossa (20).

There is no consensus in the literature about the ideal local anesthetic, corticosteroid, if used, or the required quantity of fluids for SSNB. A cadaveric study, with the purpose of evaluating the optimal quantity of fluid to infiltrate supraspinatus fossa, 2 different volumes were used: 10 and 5 mL. This research was administered under 3-dimensional CT and the conclusion was that 5-mL volume would be enough to fill in lateral half of supraspinatus fossa (21). Similar to this study, we used a total of 5 mL volume for SSNB in our study. In another study, physicians injected different volumes of local anesthetics combined with a contrast medium (1, 2, 3, 4, 5 and 10 mL) and investigated patients after SSNB. They reported that 10 mL would be more than enough to block suprascapular nerve (22).

There are a number of limitations to our study. The absence of a completely untreated control group due to ethical concerns made it difficult to determine the effectiveness of nerve blocks in isolation. The injections were not performed on a single disease group responsible for shoulder pain. RC diseases were present in the majority of patients. Despite these limitations, the injection groups were similar in terms of almost all sociodemographic characteristics and clinical parameters prior to treatment in our prospective randomized study. Before initiation of this study, we performed a power analysis to achieve the required number of patients throughout the study and to obtain significant results in correlation analyses between data that increased the power of our study. The sample size was larger than previous studies in this topic. In addition, patient assessments and injection procedures were performed by 2 different clinicians under equivalent circumstances for each patient and frequent evaluations were carried out, at 1 week, and 1 and 3 months after injection.

SSNB has been found effective and safe to treat pain in chronic diseases that affect the shoulder. However, it is recommended that local injections for analgesic purposes should be performed optimally with imaging. However, according to our results, it can be considered that SSNB approaches applied by anatomic points can also be effective for the treatment of shoulder pain and it can be preferred when US devices are not available.

Conclusions

SSNB is a practical, inexpensive, and efficacious method, with a low risk of complications, and that elicits rapid responses from the first week in the treatment of chronic shoulder pain. Both landmark-guided and US-guided injection techniques may be selected and combined with other treatment modalities, as required.

Acknowledgments

Author contributions: Drs. Gonca Sağlam and Dilek Çetinkaya Alişar had full access to all the data in the study, take responsibility for the integrity of the data and the accuracy of the data analyses, and designed the study protocol. Dr. Gonca Sağlam managed the literature searches and summaries of previous related work and wrote the first draft of the manuscript. All authors provided revision for intellectual content and final approval of the manuscript.

References

1. Holmes RE, Barfield WR, Woolf SK. Clinical evaluation of nonarthritic shoulder pain: Diagnosis and treatment. *Phys Sportsmed* 2015; 43:262-268.
2. Marinko LN, Chacko JM, Dalton D, Chacko CC. The effectiveness of therapeutic exercise for painful shoulder conditions: A meta anlysis. *J Shoulder Elbow Surg* 2011; 20:1351-1359.
3. Croft P, Pope D, Silman A. The clinical course of shoulder pain: Prospective cohort study in primary care. Primary Care Rheumatology Society Shoulder Study Group. *Br Med J* 1996; 313:601-602.
4. Sarpel T. Omuz Ağrısı nedenleri ve muayenesi. Beyazova M, Gökçe Kutsal Y (eds). *Physical Therapy and Rehabilitation*. Ankara, Güneş Kitabevi: 2011.pp 1437-1447.
5. Burbank KM, Stevenson JH, Czarnecki GR, Dorfman J. Chronic shoulder pain: Part II. Treatment. *Am Fam Physician* 2008; 77:493-497.
6. Andrews JR. Diagnosis and treatment of chronic painful shoulder: Review of nonsurgical interventions. *Arthroscopy* 2005; 21:333-347.
7. Martin DS, Thornill TS. Shoulder pain. In: Haris E, Flrestein G, Budd RC (eds). *Kelley's Textbook of Rheumatology*. 7th ed. Philadelphia, Elsevier, 2005: pp. 537-580.
8. Allen ZA, Shanahan EM, Crotty M. Does suprascapular nerve block reduce shoulder pain following stroke: A double-blind randomised controlled trial with masked outcome assessment. *BMC Neurol* 2010; 10:83.
9. Cummins CA, Messer TM, Nuber GW. Suprascapular nerve entrapment. *J Bone Joint Surg* 2000; 82-A:415-424.
10. Brue S, Valentin A, Forssblad M, Werner S, Mikkelsen C, Cerulli G. Idiopathic adhesive capsulitis of the shoulder: A review. *Knee Surg Sports Traumatol Arthrosc* 2007; 15:1048-1054.
11. Fernandes MR, Barbosa MA, Sousa AL, Ramos GC. Suprascapular nerve block: Important procedure in clinical practice. Part II. *Revista Brasileira de Reumatologia* 2012; 52:616-622.
12. Tan N, Agnew NM, Scawn ND, Pennefather SH, Chetser M, Russel GN. Suprascapular nerve block for ipsilateral shoulder pain after thoracotomy with thoracic epidural analgesia: A double-blind comparison of 0.5% bupivacaine and 0.9% saline. *Anesth Analg* 2002; 94:199-202.
13. Wertheim HM, Rovenstine EA. Suprascapular nerve block. Anesthesiology: *The Journal of the American Society of Anesthesiologists*, 1941, 2.5: 541-545.
14. Meier G, Bauereis C, Maurer H. The modified technique of continuous suprascapular nerve block. A safe technique in the treatment of shoulder pain. *Anaesthesist* 2002; 51:747-753.
15. Dangoisse MJ, Wilson DJ, Glynn CJ. MRI and clinical study of an easy and safe technique of suprascapular nerve blockage. *Acta Anaesthesiol Belg* 1994; 45:49-54.
16. 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.

17. Pribicevic M. The epidemiology of shoulder pain: A narrative review of the literature. *Pain in Perspective, Subhamay Ghosh, IntechOpen*, DOI:10.5772/52931. Available from: https://www.intechopen.com/books/pain-in-perspective/the-epidemiology-of-shoulder-pain-a-narrative-review-of-the-literature.
18. Kamal K, Dahiya N, Singh R, Saini S, Taxak S, Kapoor S. Comparative study of anatomical landmark-guided versus ultrasound-guided suprascapular nerve block in chronic shoulder pain. *Saudi J Anaesth* 2018; 12:22.
19. Shanahan EM, Smith MD, Wetherall M, et al. Suprascapular nerve block in chronic shoulder pain: Are the radiologists better? *Ann Rheum Dis* 2004; 63:1035-1040.
20. Gorthi V, Moon YL, Kang JH. The effectiveness of ultrasonography-guided suprascapular nerve block for perishoulder pain. *Orthopedics* 2010; 33:238-241.
21. Feigl GC, Anderhuber F, Dorn C, et al. Modified lateral block of the suprascapular nerve: A safe approach and how much to inject? A morphological study. *Reg Anesth Pain Med* 2007; 32:488-494.
22. Jerosch J, Saad M, Greig M, Filler T. Suprascapular nerve block as a method of preemptive pain control in shoulder surgery. *Knee Surg Sports Traumatol Arthrosc* 2008; 16:602-607.