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ORIGINAL ARTICLE

The effect of transnasal sphenopalatine ganglion blockade on pain, functional capacity, sleep, and depression in patients with fibromyalgia

Transnazal sphenopalatine ganglion blokajının fibromiyalji hastalarındaki ağrı, fonksiyonel kapasite, uyku ve depresyon üzerindeki etkisi

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Summary

Objectives: The Sphenopalatine Ganglion (SPG) is the target of interventional procedures in musculoskeletal pain, especially headaches, due to its role in the autonomic nervous system. Our study aimed to investigate the effect of transnasal sphenopalatine ganglion blockade (SPGB) on pain, functional capacity, sleep, and depression in fibromyalgia patients.

Methods: The hospital records of fibromyalgia patients who applied to the Algology outpatient clinic between January and May 2021, unresponsive to standard medical treatments, and underwent six sessions of bilateral transnasal SPGB at 10-day intervals were analyzed retrospectively. Numerical Rating Scale (NRS), functional capacity Fibromyalgia Impact Questionnaire (FIQ), sleep status Pittsburgh Sleep Quality Index (PSQI), and depression severity Beck Depression Inventory (BDI) data were collected during the treatment process.

Results: The mean NRS score of the patients before the treatment was 8.1852±1.71053, compared with 6.2593±2.29703 after the treatment. The mean FIQ score of the patients before the treatment was 73.0359±13.55302, compared with 54.2507±16.1906 after the treatment. After the treatment, the pain score, functional capacity, sleep quality, and depression of the patients were statistically significantly different than pretreatment ($p<0.001$).

Conclusion: SPGB has been found to positively affect pain, functional capacity, sleep disorders, and depression in patients with fibromyalgia.

Keywords: Fibromyalgia; pterygopalatine; sphenopalatine ganglion blockade.

Özet

Amaç: Pterigopalatin fossada yer alan Sphenopalatine Ganglion (SPG) otonomik sinir sistemindeki rolü gereği baş ağrıları başta olmak üzere kas iskelet sistemi ağrılarında da girişimsel işlemlerin hedefi olmaktadır. Çalışmamız, fibromiyalji hastalarında transnazal sphenopalatine ganglion blokajının (SPGB) ağrı, fonksiyonel kapasite, uyku ve depresyon üzerindeki etkisini araştırmayı amaçlamaktadır.

Gereç ve Yöntem: Standart tıbbi tedavilere yanıt vermeyen ve 10 günlük aralıklarla altı seans bilateral transnazal SPGB geçiren fibromiyalji hastalarının Ocak-Mayıs 2021 arasında Algoloji polikliniğine başvuran hastane kayıtları retrospektif olarak incelendi. Numerical Rating Skala (NRS), fonksiyonel kapasite Fibromiyalji Etki Anketi (FIQ), uyku durumu Pittsburgh Uyku Kalitesi İndeksi (PSQI) ve depresyon şiddeti Beck Depresyon Envanteri (BDI) verileri tedavi sürecinde toplandı.

Bulgular: Tedavi öncesinde hastaların ortalama NRS skoru 8.1852±1.71053 iken, tedaviden sonra 6.2593±2.29703 idi. Tedavi öncesi hastaların ortalama FIQ skoru 73.0359±13.55302 iken, tedaviden sonra 54.2507±16.1906 idi. Tedavi sonrasında, hastaların ağrı skoru, fonksiyonel kapasite, uyku kalitesi ve depresyonu tedavi öncesi ile istatistiksel olarak önemli farklılık gösterdi ($p<0.001$).

Sonuç: SPGB'nin, fibromiyalji hastalarında ağrı, fonksiyonel kapasite, uyku bozuklukları ve depresyonu olumlu yönde etkilediği bulunmuştur.

Anahtar sözcükler: Fibromiyalji; pterigopalatin; sphenopalatin ganglion blokajı.

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Introduction

Fibromyalgia is one of the most common causes of widespread chronic pain.[1] It is a chronic pain syndrome of unknown etiology that causes widespread musculoskeletal pain, usually accompanied by fatigue and concentration problems. Patients find it difficult to perform their daily tasks due to chronic pain.[2] Since its pathophysiology is not known precisely, a complete cure cannot be provided for its treatment, and there is no objective criterion for diagnosis. The diagnosis of fibromyalgia is made by questioning the patient's symptoms, pain severity scale, widespread pain index, and widespread pain in at least 4 of the five regions.[3]

The Sphenopalatine Ganglion (SPG) is also called the pterygopalatine ganglion. It is the sizeable extracranial ganglion containing numerous (autonomic, sensory, and motor) neural roots. It is located on both sides of the midface in the pterygopalatine fossa. It has been shown to play an essential role in various pain syndromes such as headaches, trigeminal and sphenopalatine neuralgia, atypical facial pain, vasomotor rhinitis, and herpes infection. Clinical studies have shown that sphenopalatine ganglion blockade can effectively manage these pain disorders.[4]

Modern theories of pain chronification integrate concepts from neurophysiology and cognitive neuroscience. The disorder in fibromyalgia is not due to a single biological or psychological cause. Contributing factors need to be identified at various levels. According to the new definition of nociplastic pain, in the absence of diseases causing nociceptive or neuropathic pain, pain is assumed to be determined by maladaptive changes in central pain pathways.[5] Fibromyalgia is defined as central sensitivity syndrome. It is a complex disease accompanied by widespread chronic pain, cognitive dysfunction, sleep disorders, anxiety, fatigue, and depressive episodes.[6] Increases in inactivation of the secondary somatosensory cortex, insula, and anterior cingulate cortex were detected in these patients. These areas are pain-sensitive areas.[7] This may offer more multimodal treatment options instead of single-choice treatment.[5] Autonomic nervous system dysfunction is also thought to be involved in its etiopathogenesis. İt is believed that more neuronal activity, extreme pain responses to experimental stimuli, changes in brain morphology, dysregulation of peripheral or central receptors, and changes in pain-related neuropeptide-neurotransmitters in brain regions with process pain might play a role in the fibromyalgia symptoms.

SPG is the ganglion of the sensory, sympathetic, and parasympathetic nervous systems. Parasympathetic preganglionic fibers are in the pons in the superior salivator nucleus. Parasympathetic and sympathetic fibers are carried to the SPG via the vidian nerve formed by the more extensive and profound petrosal nerves. Preganglionic parasympathetic fibers synapse in the SPG. Postganglionic parasympathetic fibers travel from the SPG to target organs.[8] Parasympathetic efferents and synapses in the SPG innervate the meningeal trigeminal nociceptors.

This study aimed to evaluate the effectiveness of bilateral transnasal sphenopalatine ganglion blockade on pain, functional capacity, sleep, and psychological state in patients with treatment-resistant fibromyalgia.

Material and Methods

Approval of the University Clinical Research Ethics Committee (no: 2021/273) was present. The study was conducted in accordance with the principles set out in the Declaration of Helsinki. The records of fibromyalgia patients who applied to the algology outpatient clinic between January and May 2021, were resistant to medical treatments, and underwent sphenopalatine ganglion blockade were analyzed retrospectively. The diagnosis of fibromyalgia was made according to the ACR (American College of Rheumatology) 2016 revised diagnostic criteria. Inclusion criteria included being between 18 and 66 years of age, meeting the ACR 2016 diagnostic criteria for fibromyalgia, having an inadequate response to medical treatment for at least three months, and being literate and cooperative. Exclusion criteria were cleft lip and palate, nasal septal deformities such as choanal atresia, atrophic rhinitis, septal perforation, history of nasal/midface trauma or operation in the last three months, a history of bleeding disorders such as hemophilia, bupivacaine allergy, pregnant or lactating women, patients using anticoagulants, or those who do not accept the procedure.

Consent was received from every patient before the blockade. The neck was slightly extended in the

Table 1. Demographic and clinical characteristics of the patients (n=27)

Demographic data	n	%
Age (y), Mean±SD	47.6±10.4	
Gender		
Female	25	92.6
Male	2	7.4
Smoking	7	25.9
Comorbidities		
Asthma	2	7.4
Thyroid disorder	3	11.1
Diabetes mellitus	5	18.5
Hypertension	2	7.4
Medication used		
Duloksetin	5	18.5
Gabapentin	1	3.7
Pregabalin	4	14.8

SD: Standard deviation.

supine position, and cotton-tipped swabs impregnated with bupivacaine 0.5% were placed in the bilateral SPG transnasally for 15 minutes. Then, 0.5 mL bupivacaine 0.5% was added to each of the ends of the inserted cotton swabs for 15 minutes, and the swabs were removed (Fig. 1). The procedure was applied every ten days for six sessions. The same physician performed all blockades.

Patients were evaluated for demographic data, sex, age, weight, height, smoking state, and disease history, and medications they were using for fibromyalgia were recorded. Pain severity, functional capacity, sleep state, psychological state, and quality of life were assessed. The Numerical Rating Scale (NRS) was used for pain severity, Fibromyalgia Impact Questionnaire (FIQ) was used to determine functional capacity, Pittsburgh Sleep Quality Index (PSQI) was used to evaluate sleep quality, and Beck Depression Inventory (BDI) was used to assess depression severity. Fibromyalgia Impact Questionnaire (FIQ), Pittsburgh Sleep Quality Index (PSQI), Beck Depression Inventory (BDI), and NRS scores were recorded before treatment and every ten days.

Statistical Analysis

Our study's data analysis was performed using the "Statistical Package for Social Sciences" (SPSS) software for Windows Version 22.0. The distribution was checked using the Chi-Square Test for comparing qualitative data and the Fisher exact test for comparing measured data. Student t-test was used for normal distribution.

Figure 1. Sphenopalatine ganglion blockage intervention.

Results

A total of 27 patients (25 females and two males) were included in the study. Demographic data, sex, age, weight, height, smoking state, comorbidities, and medications used were presented in (Table 1). The mean NRS score of the patients before the treatment was 8.1±1.1, while it was 6.1±2.2 after the treatment. A significant difference was found between the NRS values before and after six blockades ($p<0.001$) (Fig. 2). The mean FIQ score of the patients was 73.03±13.55 before the treatment and 54.25±16.19 after the treatment, with a significant difference ($p<0.001$) (Fig. 3). There was a significant difference between PSQI values before and after completing all six procedures (11±3.32 before, 10.11±3.46 after treatment) ($p<0.001$) (Fig. 4). A significant difference was observed between BDI values; 23.62±10.04 before and 13.81±7.75 after the procedures ($p<0.001$) (Fig. 5). No severe side effects were observed except short-lasting mild nosebleeds, sneezing, coughing, and discomfort.

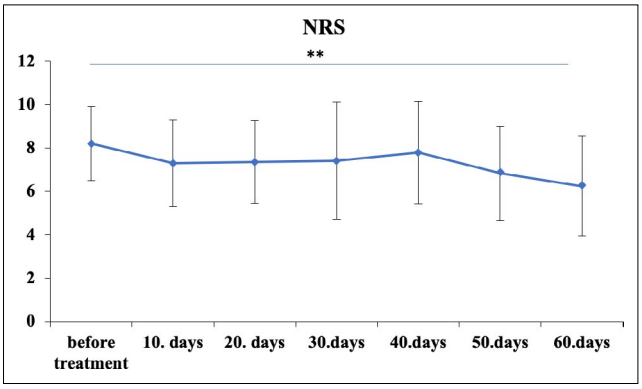

Figure 2. A significant decrease in pain score compared to baseline in every ten-day SPGB application.

NRS: Numerical Rating Scale; SPG: Sphenopalatine ganglion blockade; **: P<0.01.

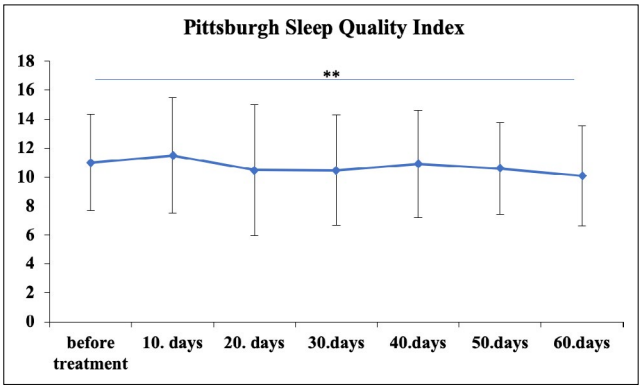

Figure 4. Each ten-day SPGB application was found to decrease the Pittsburgh Sleep Quality Index score compared to the baseline significantly.

SPG: Sphenopalatine ganglion blockade; **: P<0.01.

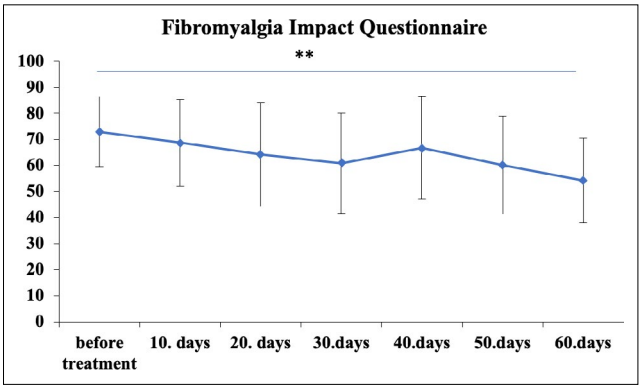

Figure 3. A significant decrease in Fibromyalgia Impact Questionnaire (FIQ) score was found compared to the baseline in every ten-day SPGB application.

SPG: Sphenopalatine ganglion blockade; **: P<0.01.

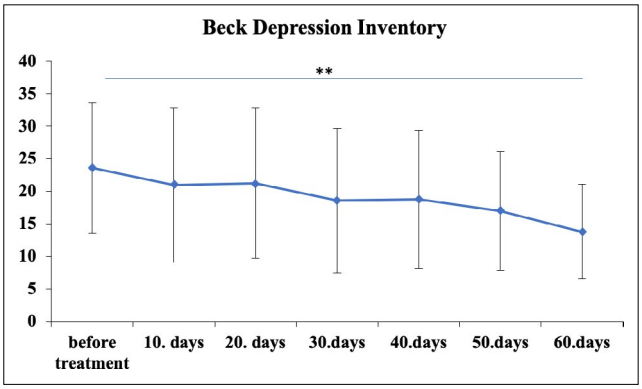

Figure 5. Each ten-day SPGB application was found to decrease the Beck Depression Inventory score compared to the baseline significantly.

SPG: Sphenopalatine ganglion blockade; **: P<0.01.

Discussion

In this study, transnasal SPGB with 0.5% bupivacaine in fibromyalgia patients significantly decreased pain severity, and treated sleep disorders and depression. The SPG can be blocked in several ways. Transnasal administration is the simplest, easiest, and probably best-tolerated approach. Therefore, transnasal SPGB can be used as a treatment option in treatment-resistant fibromyalgia patients due to its ease of administration without severe side effects and complications.

The upper cervical roots connect to the superior cervical ganglion via the sympathetic trunk. Since this ganglion connects to the SPG via the deep petrosal nerve, this may be the mechanism for relieving head, face, neck, and back pain.[4] Therefore, SPG treats head, face, neck, and muscle pain resistant to conventional therapy.[9] SPGB was applied to patients with myofascial and facial pain. Marbach et al.[10] found changes in the patient's mood and pain scores. The improvement was found more significant in patients with 40% cocaine blockade than in the 4% lidocaine group. In another study, SPGB was applied with 4% Xylocaine to patients diagnosed with fibromyalgia and myofascial pain syndrome, but they didn't observe any reduction in pain scores and headaches.[11] In the study of Yamashita et al.,[12] similar to our study, selective β2-autonomic blockers were shown to prevent the development of pain-like behavior in mouse models of fibromyalgia. Our study found significant decreases in pain scores after treatment. Treatment of patients lasted two months. Bupivacaine was preferred instead of lidocaine because of its prolonged duration of action.

Inhibition of the autonomic nervous system with SPG ganglion blockade is beneficial in relieving pain and autonomic system-related symptoms such as sleep, fatigue, and anxiety.[13] It was found that depression and anxiety scores improved after SPGB in patients with chronic muscle pain.[9] Depression scores were better after SPGB in chronic daily headache patients.[14] Similarly, significant mood and

functional capacity improvement were reported with SPGB with bupivacaine in patients with hemicrania continua.[15] It has been shown that a 6-month aerobic exercise program in women with fibromyalgia affects the autonomic nervous system as a result of vagal modulation and improves anxiety and depression.[16] It has been shown that pyridostigmine, an acetylcholine esterase inhibitor, regulates sleep in patients with fibromyalgia by stimulating the release of growth hormone. In addition, it has been reported to reduce anxiety by regulating heart rate variability, which is an important marker of the autonomic nervous system.[17] In our study, a significant decrease in depression scores was found after treatment, which also caused a substantial improvement in sleep and functional capacity impairment scores. This may be due to the activation of regulation mechanisms after blocking autonomic system hyperactivation.

The limitations of our study are the sample size and retrospective design without long-term follow-up. Although the role of SPGB in headaches is accepted today, it can also be considered an option for musculoskeletal and fibromyalgia pain. In this study, pain severity and depression scores were decreased, while functional capacity and sleep quality were increased after SPGB in patients with fibromyalgia; still, long-term results and an ideal number of sessions are unknown. Transnasal SPGB is a simple, low-risk, easy-to-perform procedure with minor side effects. In addition to improvement in pain, sleep, and functional capacity, it can also contribute to a patient's quality of life. The fact that the pathogenesis of fibromyalgia is not known precisely and that patients have mood changes due to pain also supports multiple involvements of cortical and subcortical areas. We think inhibition of subcortical and cortical communication by SPG blockade contributes to this process. Performing SPGB as an adjunctive treatment method in these patients will increase patient quality of life.

Ethics Committee Approval: The Balıkesir University Clinical Research Ethics Committee granted approval for this study (date: 08.12.2021, number: 2021/273).

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