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Comparison of benefit rate from facet joint injection therapy in smokers and non-smokers with chronic low back pain

Turana Rasulova[1], Muhammet Mustafa Sulak[2], Sehend Debbag[2], Nalan Çelebi[2]

[1]Department of Anesthesiology and Reanimation, Badam Medical Center, Bakü, Azerbaycan

[2]Department of Anestesiology and Reanimation, Faculty of Medicine, Hacettepe University, Ankara, Turkiye

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ABSTRACT

Aims: In pain clinics, facet joint injections are routinely performed for therapeutic purposes in patients with facet joint-related low back pain. In this study, we aimed to compare smokers and non-smokers in terms of the frequency of benefit from facet joint injection.

Methods: Patients older than 18 years of age who underwent facet joint injection in the pain management operating room between January 1, 2019, and December 31, 2019 were included in the study. After scanning patient files for demographic data and pain scores, the patients were contacted to record their pre-procedure and post-procedure 6-month Numerical Rating Scale (NRS) scores and smoking history.

Results: A total of 234 patients with a median age of 60.6 (min: 20, max: 90) were included. Facet joint injections demonstrated a significant decrease in pain scores. There was no relationship between smoking status and pre-procedural pain (p=0.976) or post-procedure NRS scores (p=0.649).

Conclusion: Our results showed that smoking status was unassociated with pre- and post-procedural pain scores.

Keywords: Facet joint, lumbarsacral spondylosis, low back pain, tobacco smoking, intraarticular injection

INTRODUCTION

The incidence and prevalence of low back pain has increased by 50% in the last 20 years, particularly in aging populations. Current projections suggest that a further 40% increase is likely until the year 2050, in parallel with the increase in elderly population.[1-3] Only 15% of low back pain cases are associated with specific causes such as trauma, infection, rheumatoid arthritis, tumor, and vasculopathy; whereas 75% of cases with low back pain cannot be attributed to organic causes.[4] Risk factors for chronic low back pain include psychosocial factors (depression, anxiety, job dissatisfaction, lifestyle), health conditions (obesity, abdominal fat), harmful habits (heavy lifting, smoking and alcohol use) and genetic and environmental factors (diet, vitamin D deficiency).[5-9] Low back pain originating from the facet joint is treated with conservative and interventional techniques,[10] including facet joint injections which are used for the diagnosis and treatment of chronic low back pain caused by lumbar facet syndrome.[11,12]

Zvolensky et al.[13] analyzed data from a national survey of 9,282 adults with chronic back pain, low back pain, or medically unexplained chronic pain anywhere in the body. They reported that chronic pain, particularly back or low back pain, was systematically associated with nicotine dependence, even after adjusting for pain-related anxiety and mood disorders. As one of the potential mechanisms of chronic pain in smokers, it has been suggested that desensitization and upregulation of nicotinic acetylcholine receptors (nAchR) alter the neuroplasticity of pain pathways and neuroendocrine changes related to pain have been shown.[14-17] Smoking may also trigger pain by increasing sympathetic outflow and carboxyhemoglobin levels and impairing oxygen delivery to tissues.[18,19] Apart from nicotine, cigarette has more than 3000 components that may also be associated with pain formation. Chronic carbon monoxide exposure increases heme-oxygenase levels[20,21] which leads to activation of neuropathic pain-related cellular processes such as inflammation, oxidative stress and apoptosis.[22,23] In addition to changes in pain perception, smoking causes structural changes in other systems and predisposes patients to painful conditions, including osteoporosis,[7] lumbar disc herniation and impaired bone healing.[15,24-26]

Although the relationship between chronic pain and smoking is known, there are limited studies investigating the effect of smoking on the treatment process in patients who have undergone algological intervention. The few studies investigating chronic pain and recurrence of chronic pain after facet joint injection in smokers and non-smokers have reported

Corresponding Author: Turana Rasulova, turana.igiday@gmail.com

smoking as an independent risk factor for pain recurrence after smoking.[27,28] However, data are limited on comparing post-intervention pain levels and differences in pain relief in these groups. In addition, in these studies examining the effect of smoking on recovery after facet joint injection, the patient population was insufficient and other parameters were primarily examined. Therefore, this study was planned with a larger patient group to examine the relationship between pain palliation after facet joint injection and smoking.

METHODS

For our study, approval was obtained from the Hacettepe University Non-interventional Clinical Researches Ethics Committee (Date: 20.04.2021, Decision No: 2021/09-49). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Patients older than 18 years of age who underwent facet joint injection for the treatment of chronic low back pain between January 1, 2019 and December 31, 2019 at the Algology Department of Hacettepe University were included consecutively. In our clinic, patients who would routinely undergo facet joint injection were determined by the algologist as follows: physical examination findings such as decreasing pain with flexion, increasing pain with extension-rotation-side flexion, pain starting from the waist area and not going below the knee, increasing pain in the facet joints with palpation and presence of facet joint changes in MRI findings. Apart from facet syndrome, other diseases that could cause low back pain, such as sacroiliac joint diseases, intradiscal pathologies, coupeman nodules and paraspinal myofascial pain were excluded by physical examination and lumbar MRI. Cancer patients, those with serious comorbid diseases, those with bleeding disorders, those with infections, those with additional painful conditions such as ankylosing spondylitis, fibromyalgia, and those with neuromuscular diseases were excluded from the study as well.

In our clinic, facet median branch blockages are performed under sedation and with the patient in the prone position, by entering the facet median branch transition points (according to the scotty-dog sign) with a 22-Gauge Quince needle under fluoroscopic guidance, and by local anesthesia (0.5% bupivacaine) and corticosteroid (dexamethasone) injection.

Six months after the procedure, patients were contacted by phone. Informed consent was obtained by voice recording of phone calls. Patients were called and were explained that the call was being recorded. The purpose of the study and all contents of the consent form were read to the patients, and they were informed that they were free to choose to refuse or accept participation, and if they accepted, that the voice recording would be kept as proof of informed consent for study participation. Participation in the study was entirely voluntary. Patients who refused to provide verbal consent, whose files were lost, who did not attend control examination, those who died or could not be reached were excluded from the study.

After obtaining proof of informed consent from patients approving participation, demographic data and baseline pain scores were recorded. Pain was measured with the Numerical Rating Scale (NRS) as follows: patients were asked to evaluate their pain levels before and after the procedure in 5 categories, from 0 to 10, with 0-2 (category 1) meaning no pain or (sometimes) very mild pain, 3-4 (category 2) meaning mild pain, 5-6 (category 3) meaning moderate pain, 7-8 (category 4) meaning very severe pain, and 9-10 (category 5) meaning very severe and sometimes unbearable pain. All patients were contacted at 6-month follow-up and their post-procedure NRS scores and smoking histories were collected. Those who smoked less than half a pack of cigarettes per day were excluded from the study.

Statistical Analysis

Statistical evaluation was done using the statistical package for social sciences (SPSS v. 20.0) software for the Windows (IBM SPSS Inc., Chicago, IL, USA). The analysis of categorical dependent variables according to NRS scores before and after the procedure was performed with the marginal homogeneity test, and the effectiveness of the procedure was evaluated. The relationship between pre-procedural pain score and smoking status was analyzed using the Fisher-Freeman-Halton test. The relationship between post-procedural pain scores and smoking history was analyzed with the Pearson chi-square test. Normality assumption of numerical variables was evaluated with the Shapiro-Wilk test. Chi-square, Kruskal-Wallis and ANOVA tests were used to evaluate the relationship between age, sex and pain scores. p values of <0.05 were considered to demonstrate statistical significance.

RESULTS

A total of 234 patients were included in the analyses. When we look at the age distribution of the patients, the youngest patient who had the procedure was 20 years old, the oldest was 90 years old, and the median age group was 60.6. Age was found to be unassociated with pre-procedural pain scores (p=0.605) and post-procedural pain scores (p=0.709) (Figure 1).

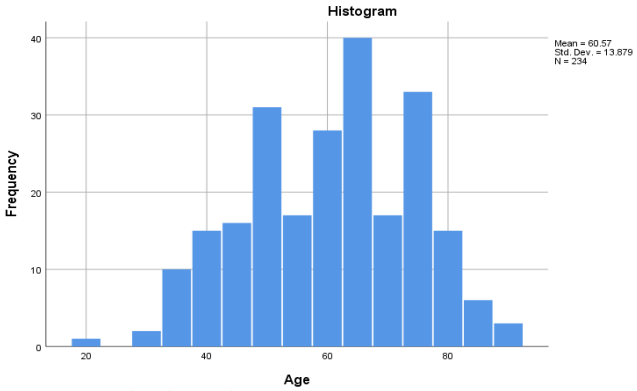

Figure 1. Age distribution histogram

Overall, 184 of the 234 (78.63%) patients were females and 50 (21.37%) were males. There was a significant relationship between smoking status and sex. The value of the Yates corrected chi-square test was 18,161 (p=0.00). 113 women with a pre-procedural NRS categorical value of 5 constituted 61.4% of the total female patients. 29 patients with a pre-procedural NRS categorical value of 5 constituted 58% of the total male patients (Figure 2).

Comparison of pre-injection and post-injection scores demonstrated a significant reduction in pain category with facet injection (p<0.01) (Table 1).

Smoking history was not found to be associated with pre-procedural pain levels (p=0.976) (Table 2).

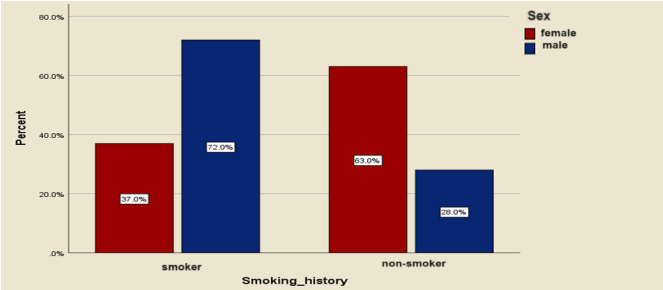

Figure 2. Percentages of male and female smoking

When we compared the rates of benefit from facet joint injection, there was no relationship between smoking history and NRS scores at the sixth month after the procedure (p=0.649). (Table 3).

DISCUSSION

When evaluated in general, it was observed that the patients included in this study benefited significantly from facet joint injection performed for facet joint-related chronic low back pain, as demonstrated by the significant decreases in

Table 1. Pre- and post-procedural NRS scores of categorical variables

		Post-procedure NRS score categorical variables					
		Category 1	Category 2	Category 3	Category 4	Category 5	Total number of patients
Pre-procedural NRS score categorical variables	Category 1	0	0	0	1	1	2
	Category 2	0	1	0	0	0	1
	Category 3	2	3	3	1	0	9
	Category 4	34	22	4	18	2	80
	Category 5	57	46	17	9	13	142
Total number of patients		93	72	24	29	16	234

NRS: Numerical Rating Scale

Table 2. Pre-procedure NRS scores of categorical variables in smokers and non-smokers

			Smoking history			
			Smoker	Non-smoker	Total	p-value
Pre-procedur NRS	Category 1	Count	1	1	2	p=0.976
		% of total	0.4%	0.4%	0.9%	
	Category 2	Count	0	1	1	
		% of total	0.0%	0.4%	0.4%	
	Category 3	Count	4	5	9	
		% of total	1.7%	2.1%	3.8%	
	Category 4	Count	34	46	80	
		% of Total	14,5%	19,7%	34,2%	
	Category 5	Count	65	77	142	
		% of total	27.8%	32.9%	60.7%	
Total		Count	104	130	234	
		% of total	44.4%	55.6%	100.0%	

NRS: Numerical Rating Scale

Table 3. Post-procedure NRS scores of categorical variables in smokers and non-smokers

			Smoking history			
			Smoker	Non-smoker	Total	p-value
Post-procedur NRS	Category 1	Count	45	48	93	p=0.649
		% of total	19.2%	20.5%	39.7%	
	Category 2	Count	37	35	72	
		% of total	15.8%	15.0%	30.8%	
	Category 3	Count	10	14	24	
		% of total	4.3%	6.0%	10.3%	
	Category 4	Count	7	22	29	
		% of total	3.0%	9.4%	12.4%	
	Category 5	Count	5	11	16	
		% of total	2.1%	4.7%	6.8%	
Total		Count	104	130	234	
		% of total	44.4%	55.6%	100.0%	

NRS: Numerical Rating Scale

categorically-evaluated NRS scores. In our study, it was concluded that smoking was unassociated with pre-procedural pain levels. When we compared smoking history and its effect on post-procedure pain, there was again no relationship.

In the United States of America, many centers encourage patients to quit smoking before invasive treatment for facet joint-related chronic low back pain.[29]

In the study of Manchikanti et al.[30] which investigated the effects of smoking, sex, and occupational injuries on chronic low back pain originating from the facet joints, it was concluded that smoking and sex were not significantly associated with low back pain originating from the facet joint, whereas occupational injuries had a significant effect. Similarly, in our study, no relation was found between smoking and sex and low back pain originating from facet joint. In the study by Kwon et al.[31] including 772 patients in which factors associated with low back pain were evaluated, a significant relationship was observed between the education level of patients and low back pain, but no significant relationship was found between smoking, stress level, age, and BMI. In our study, no significant correlation was found between age or smoking and low back pain levels, neither before nor after the procedure.

According to the results of a systematic literature review of 47 epidemiological studies and 41 journal articles investigating the relationship between smoking and low back pain, smoking was identified as a weak risk indicator, but not a cause of low back pain.[14] The limited effect (or lack thereof) of smoking on low back pain was also shown in a study by Altınel et al.,[32] in which the frequency of low back pain in adults and the factors affecting it were investigated. The study included 2035 individuals, and found that depression (p=0.016) and BMI (p=0.000) increased the risk of low back pain; whereas, smoking, hypertension and diabetes history were unassociated with low back pain. The results of our study are also similar with previous studies.

In Khurana's[33] study investigating the side effects of smoking in spine and spinal surgery, while smoking causes local hypoxia, inflammation, proteolysis and cell loss, it accelerates spondylosis by impairing spinal tissue vascular supply through atherosclerosis and thrombosis, thus disc, cartilage, synovium, bone and bone tissue loss. It was concluded that it can compromise blood vessels, leading to early surgery, delayed wound healing, increased surgical site infection, failed fusion, more reoperations, and chronic spinal pain.[33] There is ample evidence to support surgeons' refusal to operate on chronic smokers.[34] In our study, we compared before and after the 6th month facet joint intra-articular facet joint injection NRS scores. It is considered that longer-term prospective studies are needed to investigate the benefit rates of smoking in the 1st and 2nd years after the procedure.

Limitations

There is a positive relationship between depression and chronic pain, just as there is a positive relationship between smoking and depression. It has also been observed that smokers smoke more when they are depressed. Although smoking and facet joint pain were examined in our study, the depression levels of the patients could not be examined. In addition, no measure of how much the patients smoked (pack-years) or nicotine dependence (Fagerstrom nicotine dependence test) was used in our study. Another limitation of our study was that the patients' analgesic consumption before and after the procedure was not recorded.

CONCLUSION

According to the results of our study, facet joint injections significantly reduce low back pain among patients, demonstrating its efficacy in patients with indications. Although some prior studies suggested possible relationships between recurrence of pain after injection and smoking in patients with facet joint-related low back pain, our results show that age and smoking are unassociated with the degree and frequency of benefit from injections with 6 months of follow-up. Further studies are needed to assess this possible relationship, especially with regard to recurrence.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Hacettepe University Non-interventional Clinical Researches Ethics Committee (Date: 20.04.2021, Decision No: 2021/09-49).

Informed Consent

Informed consent was obtained from all patients participating in the study by voice recording during telephone interviews.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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