

# Smoking Cessation Related to Improved Patient-Reported Pain Scores Following Spinal Care in Geriatric Patients

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## Abstract

**Introduction:** We examined rates of smoking cessation and the effect of smoking cessation on pain and disability scores in a geriatric patient population. **Methods:** Prospectively maintained database records of 6779 patients treated for painful spinal disorders were examined. The mean duration of care was 8 months. Multivariate statistical analysis was performed with independent variables including smoking status, secondary gain status, gender, treatment type, depression, and age. **Results:** Of the patients seeking care for painful spinal disorders, 8.9% over the age of 55 smoked compared with 23.9% of those under 55 years of age. Rates of smoking cessation did not differ for those older than 55 years (25.1%) and younger patients (26.1%). Current smokers in both age-groups reported greater pain than those who had never smoked in all pain ratings ( $P < .001$ ). Mean improvement in reported pain over the course of treatment was significantly different in nonsmokers and current smokers in both age-groups ( $P < .001$ ). Those who quit smoking during the course of care reported greater improvement in pain than those who continued to smoke. The mean improvement in pain ratings was clinically significant in patients in all 3 groups of nonsmokers whereas those who continued to smoke had no clinically significant improvement in reported pain. **Conclusion:** The results support the need for smoking cessation programs, given a strong association between improved patient-reported pain and smoking cessation. Fewer older patients smoke but they are equally likely to quit.

## Keywords

anesthesia, biomechanics, economics of medicine, fragility fractures, geriatric medicine, nonoperative spine, spine surgery

## Introduction

In 1990, low back pain accounted for 15 million medical visits in the United States, which is the equivalent of 2.5% of all office visits, and this rate remained essentially unchanged until 2002.<sup>1,2</sup> Katz estimated the total annual expenditures related to low back pain at US\$100 to US\$200 billion per year.<sup>3</sup> These include both the costs of management of the disease (direct costs) and the indirect costs due to loss of wages, reduced productivity at work, additional caregiving, and the like.

Between 2005 and 2012, the total number of cigarette smokers in the United States decreased significantly from 20.9% in 2005 (95% confidence interval 20.3-21.5) to 18.1% in 2012 (95% confidence interval 17.5-18.7).<sup>4</sup> At the same time, the percentage of people who had smoked at least 100 cigarettes in their lives (ever smokers) increased significantly from 50.7% to 55.0%.<sup>4</sup> Quit ratios were highest in the group of over 65-year-olds and lowest among the 18- to 24-year-olds.<sup>4</sup>

Smoking is a way of delivering nicotine, which has been reported to have analgesic properties,<sup>5,6</sup> probably both through its effect at central and peripheral nicotine acetylcholine receptors.<sup>7</sup> An increased prevalence of back pain,<sup>8-11</sup> disk degeneration, and

discectomy<sup>12,13</sup> among smokers has been well established. The relationship, however, is complex, and causality is difficult to prove. It is not clear whether smoking itself is a risk factor for back pain or whether it is a marker for other lifestyle or socioeconomic traits that predispose to back pain.

A retrospective review of 357 patients showed that smokers who quit and underwent spinal arthrodesis had higher patient satisfaction scores, better fusion rates, and returned to work

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**Table 1.** Patient Demographics and Characteristics.

	Never (N = 2678)	Prior (N = 1558)	Current (N = 932)	Quit (N = 259)
Age, mean (SD)	51.5 (18.3)	59.3 (14.8)	45.2 (13.3)	46.9 (13.5)
Female	1626	781	451	109
Male	1052	777	481	150
BMI	28.6 (6.3)	29.6 (6.7)	27.2 (6.5)	27.6 (6.9)
ODI	29.7 (17.3)	39.1 (17.6)	39.1 (18.1)	36.9 (18.1)

Abbreviations: Never, patients who never smoked; Prior, smokers who quit prior to their baseline examination; Current, smokers who kept on smoking until their last visit; Quit, smokers who quit during the study; BMI, body mass index; ODI, Oswestry Disability Index; SD, standard deviation.

earlier.<sup>14</sup> The Oswestry Disability Index showed greater improvement with the procedure in people who never smoked than in people who currently smoke or used to smoke.<sup>15</sup>

In the present study, we examined rates of smoking cessation and the effect of smoking cessation on pain and disability in patients undergoing treatment for axial or radicular pain specifically looking at the older population. Our study's hypothesis was that smoking cessation would be less likely in older patients and have less interaction with patient-reported pain.

## Methods

Approval was obtained from our institutional review board to conduct a study of patients undergoing spinal care with examination of smoking status and outcomes. A prospectively maintained database record of 6779 patients who underwent treatment for painful spinal disorders was examined with regard to smoking history, age, and the patients' assessment of pain on visual analog scales (VASs) during the course of treatment. A total of 5427 patients had complete records of their smoking status and had greater than 1-month follow-up. All patients had a final clinical examination. Patients who noted satisfactory resolution of their symptoms could elect no further follow-up. A few patients were seen within 4 to 6 weeks of their initial presentation and reported satisfactory resolution of symptoms with initial treatment and elected no further follow-up unless they reported returning symptoms. Patient characteristics and demographics are summarized in Table 1. Confounding factors including secondary gain, body mass index, and comorbid depression were also examined. Patients were categorized into 4 different groups according to their smoking status: (1) never smokers: patients who did not smoke during the study and who had never smoked cigarettes before, (2) prior smokers: smokers who had smoked in the past but who had quit smoking before their initial visit, (3) current smokers: patients currently smoking cigarettes, and (4) quit: patients who quit smoking cigarettes during the study. The term secondary gain was assigned to patients who reported malpractice claims, litigation, or who strived after workers' compensation based on their spinal disorder.

The mean duration of care was 8 months with a minimum of 1-month follow-up. Multivariate statistical analysis was performed

**Table 2.** Rates of Smoking and Smoking Cessation for Patients Aged More or Less Than 55 Years.

Age, years	< 55	> 55
Smoking rates	23.9%	8.9%
Smoking cessation rates	26.1%	25.1%

with independent variables including smoking status, secondary gain status, gender, treatment type, depression, and age. In the present study, patients were categorized into 2 groups, one older ( $n = 2426$ ) and the other younger ( $n = 3001$ ) than 55 years.

Statistical analysis was performed using SPSS Statistics 20 (IBM, Chicago, Illinois) software for descriptive statistics and multivariate statistical analysis using a general linear model. The level of significance was set at  $P < .05$ . When appropriate, post hoc analysis was performed with the use of the Bonferroni correction.

## Results

A total of 5427 patients who sought care in an ambulatory setting for painful spinal disorders were included in this study and 2.4% of these patients underwent surgery. Their demographic features are summarized in Table 1. Calculated smoking rates for patients over the age of 55 years were 8.9% and 23.9% for patients under 55 years of age, respectively. The mean reported difference in the pain scores assessed with the VAS at the baseline and final examination is depicted in Table 2.

Patients were categorized into 4 groups: (1) patients who did not smoke during the study and who had not smoked before, (2) smokers who had quit before their initial visit, (3) patients currently smoking, and (4) patients who quit smoking during the study. There was no significant difference in the smoking cessation rates between patients older than 55 years (25.1%) and patients younger than 55 years (26.1%). Current smokers in both age-groups reported greater pain than those who had never smoked in all VAS pain ratings ( $P < .001$ ).

Mean improvement in reported pain over the course of treatment was significantly different in nonsmokers and current smokers in both age-groups ( $P < .001$ ). Those who quit smoking during the course of care reported greater improvement in pain than those who continued to smoke in VAS ratings for worst ( $P < .009$ ) and current pain ( $P < .01$ ) for both age-groups (Table 3). What were the quit rates, specifically comparing young versus old?

The mean improvement in VAS pain ratings was clinically significant in patients in all 3 groups of nonsmokers for worst pain. As a group, those who continued smoking during treatment had no clinically significant improvement in reported pain regardless of age.

## Discussion and Conclusion

Smoking is associated with decreased quality and quantity of life. Smoking cessation, however, has been shown to have smoking-associated mortality when smoking is stopped before

**Table 3.** Change in Reported Worst Pain on the Visual Analog Scale Last Versus First Visit.

Age, years	< 55		> 55	
	Mean $\Delta$ VAS	SD	Mean $\Delta$ VAS	SD
Never	-1.46	0.08	-1.54	0.11
Prior	-1.13	0.12	-1.34	0.08
Current	-0.71	0.11	-0.69	0.24
Quit	-1.33	0.22	-2.16	0.36

Abbreviations: Mean  $\Delta$ VAS, mean difference of pain on the visual analog scale between the first and last visit; SD, standard deviation; Never, patients who never smoked; Prior, smokers who quit prior to their baseline examination; current, smokers who kept on smoking until their last visit; Quit, smokers who quit during the study.

the age of 50. When smoking is stopped by the age of 30, the risk of death can be diminished to the level of nonsmokers.<sup>16</sup> Turan et al determined that the odds of postsurgical 30-day mortality are increased by 40% in noncardiac surgical patients who smoke compared to nonsmokers. The odds for morbidity such as surgical site infections, pneumonia, or septic shock are elevated by even 30% to 100%.<sup>17,18</sup> A recent report from Sweden demonstrated that smoking cessation as short as 4 weeks before undergoing elective surgery is enough to significantly reduce the risk of postoperative complications within 30 days after surgery. Although suggested,<sup>19</sup> cessation shortly before surgery does not increase the risk of postsurgical complication rates.<sup>20-22</sup>

Symptomatic spine surgical patients who quit smoking during care had a significantly greater decrease in axial or radicular pain on VASs compared to patients who continued to smoke.<sup>15</sup> Another group showed that the risk of nonunion after lumbar fusion is doubled in smokers but can be lowered to the risk of nonsmokers if tobacco use is ceased.<sup>23</sup> Current smokers reported greater pain than those who had never smoked in all VASs pain ratings ( $P < .001$ ). Our present investigation showed that patients regardless of age who continued smoking had no clinically significant improvement in reported pain despite treatment.

Current smoking surveys in the United States show that 21.6% of the general population aged 25 to 44 years smoke, whereas only 8.9% of the at least 65-year-olds smoke.<sup>4</sup> This article confirmed the age dependence of smoking behavior in a population of patients with orthopedic spine who were categorized as either more (8.9%) or less (23.9%) than 55-year-olds.

The definition when old age begins varies from country to country and depends on the zeitgeist. According to many definitions, retirement age seems to be critical which was described as between the ages of 45 and 55 years for women and between the ages of 55 and 75 years for men.<sup>24</sup> Since smoking rates for women increased drastically in the 1930s to 1960s<sup>25</sup> and since lung cancer/smoking surpassed breast cancer as the number one cause of cancer death in US women,<sup>26</sup> this study intended to choose an age cutoff which flanks both sex groups and which appropriately represents both the male and the female gender.

A survey on smoking among adults in the United States published by the Center for Disease Control in 2014 defined quit

ratios as the ratio of former smokers to ever smokers. Overall, the quit ratio rose from 50.7% in 2005 to 55.0% in 2012. These rates were lowest in the group of 18- to 24-year-olds and highest among the over 65-year-olds. The same analysis found the most significant increase in quit ratio from 22.7% to 26.5% ( $P < .05$ ) among adults aged 18 to 24 years.<sup>4</sup> Our study investigated the likelihood to quit smoking among people of 2 different age-groups while they were followed up. We showed that patients older than 55 years are as likely as younger patients to give up cigarette smoking during care for spinal disorders producing axial or radicular pain. In addition, they were equally likely to report improved pain on VASs pain scales based on the number of patients available in this study. Given the strong association between improved patient-reported pain and smoking cessation in older and younger patients, the above-presented data support the need for smoking cessation programs regardless of age.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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