

The Impact of Smoking on the Success of Root Canal Treatment: A Retrospective Analysis

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ABSTRACT

Background: Smoking is known to have detrimental effects on oral health, including delayed wound healing and increased risk of periodontal disease. The influence of smoking on the success of root canal treatment remains unclear. This retrospective analysis aims to investigate the impact of smoking on the outcomes of root canal treatment and provide evidence-based insights for clinical decision-making.

Methods: Patient records from a dental clinic were retrospectively reviewed for individuals who underwent root canal treatment. The sample size was determined using a power analysis, and a total of 184 patients were included. Treatment outcomes, including success rates and postoperative complications, were analyzed and compared between smokers and non-smokers using appropriate statistical tests.

Results: Among the 92 smokers included in the study, 65 (70.7%) had successful root canal treatment, 20 (21.7%) experienced treatment failure, and 7 (7.6%) had uncertain treatment outcomes. In contrast, among the 92 non-smokers, 82 (89.1%) had successful treatment, 7 (7.6%) experienced treatment failure, and 3 (3.3%) had uncertain treatment outcomes. The association analysis revealed a significant association between smoking and treatment success ($p < 0.001$), with non-smokers having 4.17 times higher odds of treatment success compared to smokers (odds ratio = 0.24; 95% confidence interval: 0.11-0.54).

Conclusion: This retrospective analysis demonstrates that smoking has a negative impact on the success of root canal treatment. Smokers exhibited lower treatment success rates compared to non-smokers. The findings suggest that smoking cessation and oral health promotion are crucial in improving the outcomes of root canal treatment. Clinicians should consider the influence of smoking when counseling patients and planning treatment strategies for root canal procedures.

Keywords: smoking, root canal treatment, treatment outcomes, success rates, retrospective analysis.

INTRODUCTION

Root canal treatment is a commonly performed endodontic procedure aimed at preserving natural teeth by removing infected pulp tissue and sealing the root canals. Despite advancements in techniques and materials, the success of root canal treatment can be influenced by various

factors, including patient-related and procedural factors (1). One such patient-related factor is smoking, which has been recognized as a potential risk factor for compromised treatment outcomes in various dental procedures (2). Understanding the impact of smoking on the success of root canal treatment is of clinical significance, as

it can aid in treatment planning and improve treatment outcomes.

Smoking is a widespread habit that affects oral health and has been associated with a range of dental problems, including periodontal disease, dental caries, and compromised wound healing. The detrimental effects of smoking on oral health are primarily attributed to the numerous toxic chemicals present in tobacco smoke, such as nicotine, carbon monoxide, and tar. These chemicals have been shown to impair blood flow, reduce oxygen delivery, and compromise the immune response, thereby hindering the healing process (3).

Several studies have investigated the association between smoking and the outcomes of dental procedures, including implant placement, periodontal therapy, and oral surgery (2,4). However, limited research has focused specifically on the impact of smoking on root canal treatment outcomes. Understanding the influence of smoking on the success of root canal treatment is essential for clinicians to optimize treatment planning and improve patient outcomes (5,6).

Therefore, the aim of this retrospective analysis is to evaluate the impact of smoking on the success of root canal treatment. By examining a large sample of patients who underwent root canal treatment, we aim to assess whether smoking has a significant effect on treatment outcomes, including the incidence of treatment failure and complications. This study will contribute to the existing literature by providing valuable insights into the association between smoking and the success of root canal treatment.

To the best of our knowledge, this is one of the first studies to comprehensively investigate the influence of smoking on the outcomes of root canal treatment. The findings of this study will help in raising awareness among patients and dental professionals regarding the potential risks associated with smoking and its impact on treatment success. Furthermore, the results

may aid in the development of personalized treatment plans and strategies to improve the outcomes of root canal treatment in smokers.

METHODOLOGY

A retrospective analysis was conducted using patient records from a dental clinic to investigate the impact of smoking on the outcomes of root canal treatment. The study design involved reviewing the records of individuals who had undergone root canal treatment, with a total of 184 patients included in the analysis.

The sample was evenly divided between smokers and non-smokers, with 92 patients in each group. Relevant data, such as age, gender, smoking status, and treatment outcomes, were extracted from the records for analysis. Statistical tests, including chi-square test, were employed to compare treatment outcomes between smokers and non-smokers. An association analysis was performed to determine the relationship between smoking and treatment success, using odds ratios and 95% confidence intervals. Additionally, subgroup analyses by tooth type were conducted to explore the association between smoking and treatment success for different types of teeth. Ethical considerations were addressed, and patient confidentiality was ensured throughout the study.

RESULTS

The demographic characteristics of the study population, including age and gender distribution, were analyzed. The mean age of the smokers group (n=92) was 45.8 years (± 6.2), while the mean age of the non-smokers group (n=92) was 43.2 years (± 5.9). In terms of gender distribution, there were 55 male smokers (59.8%) and 57 male non-smokers (62.0%), while the female smokers accounted for 37 (40.2%) and female non-smokers accounted for 35 (38.0%) (Table 1).

The treatment outcomes of root canal treatment were analyzed for both smokers and non-smokers. Among the smokers, 65

patients (70.7%) had successful treatment, 20 patients (21.7%) experienced treatment failure, and 7 patients (7.6%) had uncertain treatment outcomes. In contrast, among the non-smokers, 82 patients (89.1%) had successful treatment, 7 patients (7.6%) experienced treatment failure, and 3 patients (3.3%) had uncertain treatment outcomes (Table 2).

An association analysis was performed to determine the relationship between smoking and treatment success. The odds ratio (OR) with a 95% confidence interval (CI) was calculated. The results revealed a significant association between smoking and treatment success ($p < 0.001$). The odds of treatment success in non-smokers were 4.17 times higher compared to smokers (OR = 0.24; 95% CI: 0.11-0.54) (Table 3).

Table 4 displays the distribution of tooth types in the study population, showing the number of each tooth type in both the smokers and non-smokers groups. Incisors were the most prevalent tooth type in both groups, followed by canines, premolars, and molars.

Table 5 presents the success rates of root canal treatment by tooth type for both smokers and non-smokers. The highest success rates were observed in premolars for both groups, while molars had the lowest success rates. Non-smokers generally had higher success rates across all tooth types compared to smokers.

Table 6 provides the association between smoking and treatment success by tooth type. Odds ratios and p-values are reported for each tooth type, with the "Yes" category representing treatment success and the "No" category representing treatment failure. The analysis revealed significant associations between smoking and treatment failure in incisors ($p = 0.015$), canines ($p = 0.007$), and premolars ($p = 0.008$), suggesting that smoking may have a detrimental effect on treatment success in these tooth types. Although not statistically significant ($p = 0.091$), a trend towards lower success rates in smokers was observed in molars as well.

Table 1: Demographic Characteristics of the Study Population

Variables	Smokers (n=92)	Non-Smokers (n=92)
Age (mean±SD)	45.8±6.2	43.2±5.9
Gender		
- Male	55 (59.8%)	57 (62.0%)
- Female	37 (40.2%)	35 (38.0%)

Table 2: Treatment Outcomes of Root Canal Treatment

Treatment Outcome	Smokers (n=92)	Non-Smokers (n=92)
Success	65 (70.7%)	82 (89.1%)
Failure	20 (21.7%)	7 (7.6%)
Uncertain	7 (7.6%)	3 (3.3%)

Table 3: Association between Smoking and Treatment Success

	Treatment Success	Odds Ratio (95% CI)	p-value
Group	Yes	Reference	
	No	0.24 (0.11-0.54)	<0.001

Note: CI = Confidence Interval.

Table 4: Distribution of Tooth Types in the Study Population

Tooth Type	Smokers (n=92)	Non-Smokers (n=92)
Incisors	18	20
Canines	24	25
Premolars	30	30
Molars	20	17

Table 5: Success Rates of Root Canal Treatment by Tooth Type

Tooth Type	Smokers (n=92)	Non-Smokers (n=92)
Incisors	12 (66.7%)	18 (90.0%)
Canines	20 (83.3%)	24 (96.0%)
Premolars	26 (86.7%)	29 (96.7%)
Molars	7 (35.0%)	11 (64.7%)

Table 6: Association between Smoking and Treatment Success by Tooth Type

Tooth Type	Treatment Success	Odds Ratio (95% CI)	p-value
Incisors	Yes	Reference	
	No	0.23 (0.07-0.76)	0.015
Canines	Yes	Reference	
	No	0.19 (0.06-0.62)	0.007
Premolars	Yes	Reference	
	No	0.21 (0.07-0.65)	0.008
Molars	Yes	Reference	
	No	0.43 (0.16-1.15)	0.091

Note: CI = Confidence Interval.

DISCUSSION

Root canal treatment is a common endodontic procedure aimed at preserving the natural dentition and alleviating dental pain and infection. It involves the removal of infected dental pulp and subsequent cleaning, shaping, and obturation of the root canal system (7,8). Despite advancements in techniques and materials, the success of root canal treatment can be influenced by various factors, including patient-related factors, treatment modalities, and systemic conditions (9).

One such factor that has been suggested to impact treatment outcomes is smoking (10). Smoking is a prevalent habit with detrimental effects on oral health, including an increased risk of periodontal disease, tooth loss, and delayed wound healing (11). The potential influence of smoking on the success of root canal treatment has been a topic of interest, as it may affect the long-term prognosis of treated teeth.

The findings of this retrospective analysis provide important insights into the impact of smoking on the success of root canal treatment. Our study revealed a significant association between smoking and treatment outcomes, with smokers exhibiting lower treatment success rates compared to non-smokers.

Our results are consistent with previous research that has demonstrated the adverse effects of smoking on dental procedures, including root canal treatment. A study by Johnson and Guthmiller (12) reported a higher prevalence of periodontal disease and poorer treatment outcomes among smokers. Similarly, Sanari et al. (13) found that smoking was associated with an increased risk of complications following tooth extraction. These studies, along with our findings, underscore the detrimental effects of smoking on oral health and the need for targeted interventions.

The lower success rate observed in smokers can be attributed to several factors. Firstly, smoking has been shown to impede wound healing, which is crucial for the successful outcome of root canal treatment. The toxins present in tobacco smoke can impair vasoconstriction, leading to reduced blood supply to the affected area and delayed healing (14,15). Moreover, smoking adversely affects the immune system, compromising the body's ability to combat infection (16). As a result, smokers may be more susceptible to post-treatment infections, which can negatively impact the success of root canal treatment.

The odds ratio analysis in our study revealed that non-smokers had 4.17 times higher odds of treatment success compared

to smokers. This finding highlights the importance of smoking cessation interventions in improving the outcomes of root canal treatment. Smoking cessation not only reduces the risk of complications but also enhances overall oral health and healing capacity.

However, it is important to acknowledge the limitations of our study. Firstly, the retrospective design relied on existing patient records, which may have introduced biases and limitations in terms of data accuracy and completeness. Additionally, the study was conducted in a specific dental clinic, which may limit the generalizability of the findings to other populations or settings. Future research should consider prospective designs and larger sample sizes to validate our findings and obtain a more representative understanding of the relationship between smoking and treatment outcomes.

Furthermore, the duration and intensity of smoking habits, as well as other potential confounding factors such as oral hygiene practices and comorbidities, were not fully accounted for in our analysis. Future studies should aim to collect more comprehensive data to control for these variables and explore the underlying mechanisms through which smoking influences treatment outcomes in root canal procedures.

CONCLUSION

Our study provides evidence supporting a negative impact of smoking on the success of root canal treatment. Smokers exhibited lower treatment success rates compared to non-smokers, emphasizing the need for smoking cessation interventions in dental practice. Dental practitioners should actively promote smoking cessation and educate patients about the detrimental effects of smoking on oral health. By quitting smoking, patients can significantly improve their chances of successful root canal treatment and enhance their overall oral health and well-being.

Declaration by Authors

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