



Aydın Dental Journal

Journal homepage: <http://dergipark.ulakbim.gov.tr/adj>



The Effect of Smoking on Postoperative Period of Extraction of Impacted Mandibular Third Molars

DergiPark
AKADEMİK

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ABSTRACT

Objective: The aim of this study was to evaluate the effect of cigarette smoking on the post-operative severity of pain, swelling and limitation of mouth opening after impacted mandibular third molar surgery.

Materials and Methods: This prospective comparative study was conducted for 147 cases in two groups of patients, smokers (n=31) and non-smokers (n= 116) who undergoes surgical extractions of impacted third molars. The patients' pre- and intra-operative findings of the study group were recorded. The patients were asked to fill out a form to record the findings of postoperative pain, swelling and mouth opening limitation for 6 days. Pain was recorded on a visual analog scale from 1 to 10 and swelling was recorded as mild, moderate and severe. The limitation of mouth opening was evaluated by the patient during the postoperative 6 days and was recorded as yes or no. One way ANOVA with $f=1;145$ significance level was used as statistical analysis.

Results: The mean age of the smokers was $27,75\pm 9,15$ (20-55) while non-smokers was $25,7\pm 6,9$ (20-55). No significant difference was found at the post-operative period regarding the severity of pain, swelling and mouth opening.

Conclusion: Smoking did not considerably made difference in terms of postoperative symptoms followed by third molar surgery. However further studies need to be conducted with including larger sample size.

Keywords: *smoking, tooth extraction, third molars, pain, post-operative*

ÖZET

Amaç: Bu çalışmanın amacı sigara kullanımının gömülü diş çekiminden sonra ağrı, şişlik ve ağız açıklığında kısıtlılığa etkisinin değerlendirilmesidir.

Gereç ve Yöntem: Bu prospektif çalışmada cerrahi olarak gömülü 3. Molar diş çekimi yapılacak 147 hasta sigara içen (n=31) ve sigara içmeyen (n= 116) olarak iki gruba ayrılmıştır. Hastaların operasyon öncesi ve operasyonla ilgili bilgileri kaydedilmiş ve hastalardan operasyon sonrasında 6 gün süre ile şişlik, ağrı ve ağız açıklıklarında kısıtlılığı kaydedecekleri bir form doldurmaları istenmiştir. Ağrı Görsel Analog Skala ile 1-10 arasında, şişlik az orta ve şiddetli olarak değerlendirilmiştir. Ağız açıklığındaki kısıtlılık hastalar tarafından değerlendirilmiş ve evet/hayır olarak kaydedilmiştir. İstatistiksel olarak $f=1;145$ hata düzeyinde Tek-Yönlü ANOVA kullanılmıştır.

Sonuçlar: Sigara içen hastaların ortalama yaşı $27,75\pm 9,15$ (20-55), sigara içmeyenlerin $25,7\pm 6,9$ (20-55)'dir. Sigara içen ve içmeyen grupta operasyon sonrası dönemde ağrı, şişlik ve ağız açıklığında kısıtlılık açısından anlamlı bir farklılık saptanmamıştır.

Sonuç: Üçüncü molar cerrahisi sonrası sigara içilmesi ile semptomlar arasında herhangi anlamlı bir ilişki yoktur. Ancak, örneklem büyüklüğü geniş olan daha ileri çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: *sigara, diş çekimi, üçüncü molar dişler, ağrı, operasyon sonrası*

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INTRODUCTION

Lower third molar extraction is one of the most common surgical procedure in oral surgery practice. Several authors have described different patient and surgery related factors that may influence the postoperative course of patients.¹⁻⁴ The age of the patient, cigarette smoking, bad oral hygiene and oral contraceptive use at the time of surgery are some of the patient related factors affecting outcome in third molar surgery.⁵

Smoking exerts a series of systemic effects upon the heart, blood vessels, central nervous system and endocrine glands, reducing pulmonary capacity and inducing peripheral vasoconstriction. It has also been associated with birth defects and fetal complications.⁶ Among these general actions, fibrinolytic activity has been shown to decrease in smokers compared with nonsmokers, with a delay in wound healing.⁷ Smoking exerts a negative influence upon wound healing, since it has been shown to impair polymorphonuclear cell function.⁸

In addition, it has been suggested that the vasoconstrictor effect of nicotine reduces the alveolar blood supply and increases pain.⁹ Removal of third molars is predictably associated with postoperative pain and swelling of variable duration, which delay return to normal activities. Several studies have evaluated the influence of oral hygiene and smoking on the post-operative period of third molar surgery.^{1,4,5} Some investigators reported more pain in smokers after the extraction of third molars¹⁰ ; however, others found no relationship between smoking and pain and swelling.^{11,12} Al-Belasy¹³ found that an increased smoking frequency and smoking on the day of surgery significantly increased the incidence of dry socket.

The objective of the present study was to evaluate the effect of cigarette smoking on the postoperative severity of pain, swelling and limitation of mouth opening after impacted mandibular third molar surgery.

MATERIALS AND METHODS

The experiment protocol of this study was approved by the Ethical Committee of Clinical Research of Ondokuz Mayıs University. This prospective comparative study was performed in two separate centers from September 2013 to January 2014 obtained from the patients referred A total of 147 cases, referred to the centers for management of impacted third molars, included to the study as smokers (n=31), and non-smokers (n=116). The smokers group consist of who smokes twenty or more per day.

The following inclusion and exclusion criteria were applied.

Inclusion criteria:

- Healthy volunteers over age 18 years and requiring surgical third molar extraction
- Absence of systemic disease (ASA I)
- The patients who had no difficulties in understanding and following through with the study
- The impacted third molars without any signs of infection

Exclusion criteria:

- Volunteers with systemic pathology
- Patients who could not fill out the forms
- Patients who had a limited intelligence, some physiological disorder or mental condition and had difficulties in language comprehension.

Before all operations, panoramic radiograph examinations were carried out to assess the anatomical structures adjacent to the third

molars, and the patients' pre- and intra-operative findings were recorded. Only one tooth was removed at each operation and all teeth were completely impacted. The position of impacted mandibular third molars were classified as Winter's classification (Table 1).

Table 1. The classification of third molars included the study.

WINTER'S CLASSIFICATION	SMOKERS (N = 31)	NON-SMOKERS (N = 116)
Vertical position	42%	52%
Mesioangular position	35%	40%
Distoangular position	6%	3%
Horizontal position	16%	6%

A total of three surgeons with more than 5 years' dentoalveolar training, assisted by training surgeons, performed the surgeries. Any preoperative medication was given. Each patient had similar surgical procedures, in the similar operating room and under similar conditions, using mepivacaine 2% with epinephrine 1:100.000 as local anesthetic (2% Carbocaine; AstraZeneca, Milan, Italy). No concomitant medication was used during surgery other than the local anesthetic. Access to the third molars was achieved from the buccal aspect and the bone was removed with a round burr in a straight hand piece under continuous irrigation with sterile saline solution. If necessary, sectioning of crown and

<p>Postoperative 1st Day</p> <p>Pain: Q_1 2 3 4 5 6 7 8 9 10</p> <p>Swelling: Mild...Moderate Severe</p> <p>Presence of limitation of mouth opening: Yes...No</p>	<p>Postoperative 2nd Day</p> <p>Pain: Q_1 2 3 4 5 6 7 8 9 10</p> <p>Swelling: Mild...Moderate Severe</p> <p>Presence of limitation of mouth opening: Yes...No</p>
<p>Postoperative 3rd Day</p> <p>Pain: Q_1 2 3 4 5 6 7 8 9 10</p> <p>Swelling: Mild...Moderate Severe</p> <p>Presence of limitation of mouth opening: Yes...No</p>	<p>Postoperative 4th Day</p> <p>Pain: Q_1 2 3 4 5 6 7 8 9 10</p> <p>Swelling: Mild...Moderate Severe</p> <p>Presence of limitation of mouth opening: Yes...No</p>
<p>Postoperative 5th Day</p> <p>Pain: Q_1 2 3 4 5 6 7 8 9 10</p> <p>Swelling: Mild...Moderate Severe</p> <p>Presence of limitation of mouth opening: Yes...No</p>	<p>Postoperative 6th Day</p> <p>Pain: Q_1 2 3 4 5 6 7 8 9 10</p> <p>Swelling: Mild...Moderate Severe</p> <p>Presence of limitation of mouth opening: Yes...No</p>

Figure 1. The required form of postoperative findings.

roots was performed with a fissure burr. After tooth extraction, the alveolus was inspected, curetted for granulation tissue removal, and irrigated with sterile saline solution. A 4/0 silk suture was used to close the wound without tension. Immediately after the operation, details of the procedure were recorded, including the duration of surgery in minutes (from the first incision to insertion of the last suture). An ice pack was then applied to the patient's face for 20 minutes. Postoperatively, amoxicillin and clavulonic acid combination (Augmentin BID 1000 mg) and flurbiprofen (Majezik 100 mg) every 12 hours twice per day were prescribed for all patients. All patients used the prescribed medications as ordered. Patients were instructed to rinse their mouth twice daily with 0.2% chlorhexidine mouthwash. The patients were asked to fill out a form to record the findings of postoperative pain, swelling and mouth opening limitation for 6 days (Figure 1). All patients returned at 7th day after the operation to have their sutures removed: the examiner was the same as the one who assessed them preoperatively. The patient's pain level were assessed with a 10-point visual analog scale anchored by the verbal descriptors "mild pain" (point 1) and "very severe pain (point 10). Patients were asked to enter their pain level and the time at which the analgesic was taken, and then make no further recordings. The limitation of mouth opening was evaluated by the patient during the postoperative 6 days and were recorded as yes (point 1) or no (point 0). The swelling also was evaluated by the patient's answer with a 3-point scale attached by the verbal descriptors 'mild', 'moderate' and 'severe'. The results were evaluated statistically and One way ANOVA with $\alpha=0.05$ significance level was used as statistical analysis.

RESULTS

The 147 subjects were included to the study. Of these; 21,088 % were smokers and 78,911% were nonsmokers. The mean age of the smokers was $27,75\pm 9,15$ (20-55) and non-smokers $25,7\pm 6,9$ (20-55). No significant differences of age was recorded between smokers and nonsmokers ($f=1,698$). Table 2 presents postoperative pain intensity, facial swelling and limitation of mouth opening on post-operative days in both groups. The greatest pain levels appeared at 12 and 24 hours post-operatively in both groups. The rate of pain was greater in smokers than nonsmokers in all days during a week. However there was not a significant difference between two groups' pain score ($f= 0,614$). The swelling increased progressively after surgery, reaching a maximum at 24 hours. Between two groups there was no statistically significant difference of the swelling during the post-operative first week ($f=1,297$). When the two groups were compared, mouth opening values were similar to swelling and pain scores. The significant difference between smokers and nonsmokers were recorded in pain values ($f=0,015$). The severity of pain, swelling measurement and limitation of mouth opening in smoking group were higher than the non-smoking group.

DISCUSSION

It has been scientifically and medically proven that smoking is the cause of different crucial, deadly illnesses and diseases^{14,15} among them tooth decay.^{16,17} In addition, the tobacco use is known to impair wound healing.¹⁸ Researches were shown that smokers are more likely to suffer complications during and following general surgery.^{19,20}

In relation to its local effects, smoking has been described as an etiological factor in different oral disorders such as potentially cancerous

Table 2. The statistical analyses of groups with regard to postoperative pain, swelling and limitation of mouth opening of patients.

	1st day		2nd day		3rd day		4th day		5th day		6th day	
	Smoker (N = 31)	Non-smoker (N = 116)	Smoker (N = 31)	Non-smoker (N = 116)	Smoker (N = 31)	Non-smoker (N = 116)	Smoker (N = 31)	Non-smoker (N = 116)	Smoker (N = 31)	Non-smoker (N = 116)	Smoker (N = 31)	Non-smoker (N = 116)
PAIN (VAS)	6,06 ± 2,93	5,48 ± 2,77	4,35 ± 2,81	4,32 ± 2,71	3,58 ± 2,42	3,46 ± 2,28	2,94 ± 2,61	2,66 ± 2,14	2,10 ± 2,39	1,78 ± 1,92	1,61 ± 2,25	1,34 ± 1,86
f value (1;145)	1,048<3,91 / p< 0,05		0,004<3,91 / p< 0,05		0,070<3,91 / p< 0,05		0,382<3,91 / p< 0,05		0,614<3,91 / p< 0,05		0,493<3,91 / p< 0,05	
SWELLING	1,84 ± 0,82	1,72 ± 0,78	1,65 ± 0,91	1,72 ± 0,81	1,55 ± 0,89	1,49 ± 0,82	1,06 ± 0,81	1,21 ± 0,73	0,94 ± 0,73	0,93 ± 0,63	0,68 ± 0,54	0,80 ± 0,55
f value (1;145)	0,519<3,91 / p< 0,05		0,220<3,91 / p< 0,05		0,114<3,91 / p< 0,05		0,883<3,91 / p< 0,05		0,001<3,91 / p< 0,05		1,297<3,91 / p< 0,05	
TRISMUS	0,81 ± 0,40	0,78 ± 0,42	0,76 ± 0,43	0,76 ± 0,43	0,74 ± 0,44	0,73 ± 0,44	0,58 ± 0,50	0,59 ± 0,49	0,39 ± 0,50	0,38 ± 0,49	0,29 ± 0,46	0,30 ± 0,46
f value(1;145)	0,133<3,91 / p< 0,05		0,032<3,91 / p< 0,05		0,010<3,91 / p< 0,05		0,003<3,91 / p< 0,05		0,006<3,91 / p< 0,05		0,015<3,91 / p< 0,05	

lesions and oral cancer. Smokers have a higher prevalence of leukoplakia than nonsmokers, with a positive dose-response relation. Cases of leukoplakia with areas of erythroplakia or associated with Candida infection are more frequent among smokers, and an increased risk of malignant transformation has been reported in such situations – with a direct relationship between dose and exposure time.¹⁶

Squamous cell carcinoma (SCC) is the most common oral malignancy, representing over 90% of all cases. Oliver et al., in 92 cases of SCC, found smoking to be the most relevant etiological factor (80% of the affected patients were smokers).¹⁷

Studies have been made of many effects of tobacco smoke upon different cell types. In this sense, Pabst et al.²¹ have found smoking to produce deleterious effects upon the host immune system, including neutrophil and macrophage function. In effect, nicotine affects the phagocytic activity of these cells, thereby increasing the risk of bacterial colonization.²² Based on the above effects and considering that smoking can affect local vascularization, the host defense mechanisms and cell lines, it may be postulated that such actions could have some extent influence the postoperative course of patients subjected to oral surgery. On the other hand, although

lower third molar surgery is one of the most frequent interventions in oral surgery, the relationship between tobacco smoking and the postoperative complications in such patients has not been sufficiently investigated to date.

The surgical removal of impacted third molar is the daily procedure that is performed by oral and maxillofacial surgeons which involve many post-operative complications, the most common postoperative signs and symptoms of complications are pain, swelling and trismus.²³ Although many articles have been published on the effect of smoking on dry socket, smoking as a risk factor for the pain, swelling and trismus is still a debatable issue.

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In some studies, smoking was associated with an increase in postoperative pain after exodontias, and was more intense in heavy smokers (more than 20 cigarettes daily).^{10,28,29} It has been suggested that the vasoconstrictor effect of nicotine reduces the alveolar blood supply and increases pain.⁷ Capuzzi et al found no significant influence of smoking on postoperative pain and swelling after impacted third molar surgery.¹² There is currently no consensus regarding the postoperative healing after third molar surgery and smoking. In our study, no statistically significant differences have been recorded in terms of pain, swelling

and limitation of mouth opening after surgical removal of lower third molar. Our results were in accordance with the previous report of Carriches et al. who concluded that smoking did not influence wound condition and postoperative symptoms.³⁰ The limitations of this study was not to evaluate the relationship between the degree of smoking and postoperative findings. The subjective symptoms were considered to evaluate postoperative symptoms. Although we found no correlation between smoking and postoperative symptoms of third molar surgery, we strongly suggest further studies including larger samples. Different results may be found if only heavy smokers include to the studies.

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