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Uticaj pušenja na resorpciju alveolarne kosti
Effect of smoking on alveolar bone resorption

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Effect of smoking on alveolar bone resorption

Jelena Računica[1], Vesna Ivetić[2], Nada Naumović[2], Milanko Đurić[3]
[1]Dom Zdravlja »Novi Sad«
[2] Medicinski fakultet Novi Sad, Zavod za fiziologiju
[3]Medicinski fakultet Novi Sad, Klinika za stomatologiju

[1]Haus of Health „Novi Sad“
[2]School of medicine, Novi Sad, Institute of phisiology
[3]School of medicine, Novi Sad, Clinic of dentistry

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ORIGINAL ARTICLE

KRATAK SADRŽAJ

***Uvod**: Parodontopatije se svrstavaju u jedno od najčešćih oboljenja kod odraslih. Iako je uzročnik parodontopatije bakterijska infekcija iz dentalnog plaka, stepen oštećenja parodoncijuma zavisi i od faktora rizika, od kojih se pušenje smatra jednim od najznačajnijih.*
***Cilj:** Cilj ovog istraživanja bio je utvrđivanje stepena resorpcije alveolarne kosti kod pušača.*
***Materijal i metode:** Rendgensko snimanje svih prisutnih zuba obavljeno je kod 30 pušača (12 muškaraca i 18 žena) i 30 nepušača (13 muškaraca i 17 žena, kontrolna grupa) starosti od 20 do 60 godina. Podaci o pušačkim navikama, dužini pušačkog staža i broju popušenih cigareta na dan, dobijeni su putem upitnika. Stepen resorpcije alveolarne kosti utvrđen je na retroalveolarnim rendgenskim snimcima, merenjem rastojanja od gleđno-cementne granice do nivoa očuvane kosti sa mezijalne i distalne strane svakog prisutnog zuba.*
***Rezultati:** Kod pušača su utvrđene statistički značajno (p=0.00002) veće vrednosti resorpcije alveolarne kosti (3.16 ± 2.07 mm) u odnosu na kontrolnu grupu (1.72 ± 1.02 mm). Kod osoba koje puše duže od 15 godina utvrđena je statistički značajno veća resorpcija alveolarne kosti u odnosu na pušače koji puše 15 i manje godina (p=0.00028). Unakrsni odnos pokazuje da pušači imaju 2.98 puta veći rizik (95% CI 1.04–8.52) za prosečnu vrednost resorpcije alveolarne kosti veću od 2 mm u odnosu na nepušače.*
***Zaključak:** Rezultati ovog istraživanja pokazuju da pušenje pospešuje resorpciju alveolarne kosti, kao i da dužina pušačkog staža utiče na stepen resorpcije.*

Ključne reči: parodontopatija; pušenje; gubitak alveolarne kosti

SUMMARY

***Introduction:** Periodontal disease is one of the most common diseases in adults. Although the cause of periodontal disease is bacterial infection from the dental plaque, the level of destruction of periodontal tissues depends on risk factors, and smoking is one of the most important ones.*
***Aim:** The aim of the present study was to determine the level of alveolar bone resorption in smokers.*
***Materials and Methods:** Radiographic examination of all present teeth was conducted in 30 smokers (12 men and 18 women) and 30 non-smokers (13 men and 17 women, control group), 20-60 years of age. Data on smoking habits, smoking period and the number of cigarettes a day were obtained using a questionnaire. The level of alveolar bone resorption was determined on retroalveolar X-rays, by measuring the distance from the amelo-cemental junction to the bone level on mesial and distal sides of each present tooth.*
***Results:** In smokers, significantly higher (p=0.00002) values of alveolar bone resorption (3.16 ± 2.07 mm) were found compared to the control group (1.72 ± 1.02 mm). In people who had been smoking for more than 15 years, significantly greater bone resorption was observed compared to those smoking for 15 years or less (p=0.00028). The interceptive relationship showed that smokers were at 2.98x greater risk (95% CI 1.04-8.52) for the mean value of alveolar bone resorption of > 2 mm compared to non-smokers.*
***Conclusion:** The present results have shown that smoking increases alveolar bone resorption and that the period of smoking affects the level of resorption.*

Keywords: periodontal disease; smoking; alveolar bone loss

Uvod

Parodontopatije se svrstavaju u jedno od najčešćih oboljenja kod odraslih. Epidemiološke studije procenjuju da preko 90% populacije razvijenih zemalja ima neku od formi parodontopatije (1,2).

U toku parodontopatije dolazi do ireverzibilnog gubitka alveolarne kosti (3). Iako je uzročnik ovog oboljenja bakterijska infekcija iz dentalnog plaka, stepen oštećenja parodoncijuma zavisi i od genetskog nasleđa osobe i faktora rizika (4).

Identifikacija faktora rizika je od velikog značaja kako za prevenciju, tako i za terapiju oboljenja. Mnoge studije su potvrdile tezu da je pušenje cigareta jedan od glavnih faktora rizika u nastanku parodontopatije (5-8). Rezultati kliničkih istraživanja ukazuju na to da su prevalencija i stepen oštećenja parodoncijuma signifikantno veći kod pušača nego kod nepušača (9,10). Rizik za nastanak obimnijih oštećenja parodoncijuma je pet do sedam puta veći kod dugogodišnjih pušača nego kod osoba koje nikad nisu pušile (11). Isto tako, 80–90% neuspelih terapija parodontopatije se javlja kod pušača (12).

Rezultati većeg broja longitudinalnih istraživanja ukazuju da je resorpcija alveolarnog nastavka u desetogodišnjem periodu statistički značajno veća u grupi pušača nego u grupi nepušača (13-15). Pušači imaju 3.7 puta veći rizik za gubitak alveolarne kosti veći od 0.5 mm u desetogodišnjem periodu u odnosu na nepušače (14).

Bergström i sar. (16) nalaze da pušači sa dobrom oralnom higijenom imaju statistički značajno veću resorpciju alveolarne kosti u odnosu na nepušače istog stepena oralne higijene, što ukazuje na mogućnost da pušenje ima direktno dejstvo na alveolarnu kost, nezavisno od dentalnog plaka. Isti autori su utvrdili i signifikantnu pozitivnu korelaciju između stepena resorpcije alveolarne kosti i broja popušenih cigareta na dan.

Persson i sar. (17) su merenjem resorpcije alveolarne kosti na intraoralnim rendgenskim snimcima 10 282 zuba utvrdili da je pušenje statistički najznačajniji faktor odgovoran za resorpciju alveolarne kosti, zatim godine starosti i, na kraju, pol.

Cilj ovog istraživanja bio je utvrđivanje stepena resorpcije alveolarne kosti u grupi pušača i nepušača, kao i resorpcije alveolarne kosti u odnosu na dužinu pušačkog staža i broj popušenih cigareta na dan.

Introduction

Periodontal disease is one of the most common diseases in adults. Epidemiological studies have estimated that more than 90% of the population in developed countries have some form of periodontal disease.[1,2]

There is an irreversible alveolar bone loss during the progression of periodontal disease.[3] Although the cause of periodontal disease is bacterial infection from the dental plaque, the level of destruction of periodontal tissues depends on genetic background and risk factors.[4]

Identification of risk factors is of great importance for the prevention as well as the treatment of this disease. Many studies have confirmed the hypothesis that smoking cigarettes is one of the main risk factors in the development of periodontal disease.[5-8] Clinical studies have suggested that the prevalence and the level of periodontal tissue destruction are significantly higher in smokers than non-smokers.[9,10] The risk for larger destructions is 5-7 times greater in long-term smokers than non-smokers.[11] Furthermore, 80-90% of unsuccessful treatments of periodontal disease occur in smokers.[12]

Numerous longitudinal studies have shown that alveolar bone resorption over a 10-year period was significantly greater in smokers than non-smokers.[13-15] Smokers were at 3.7x greater risk for the loss of alveolar bone of > 0.5 mm over this period compared to non-smokers.[14]

Bergström et al.[16] found that smokers with good oral hygiene had significantly greater resorption of the alveolar bone than non-smokers with the same level of oral hygiene, which implied that smoking had a direct effect on the alveolar bone, irrespective of dental plaque. The same authors reported significant positive correlation between the level of bone resorption and the daily number of cigarettes.

By measuring alveolar bone resorption on intraoral X-rays of 10282 teeth, Persson et al.[17] determined that smoking was statistically the most important factor for bone resorption, followed by age and sex.

The **aim** of the present study was to determine the level of alveolar bone resorption in smokers and non-smokers as well as bone resorption with regard to the period of smoking and the daily number of cigarettes.

Materijal i metod

U istraživanje su bile uključene osobe oba pola, dobrog opšteg zdravstvenog stanja, starosti od 20 do 60 godina. Bivši pušači i osobe koje povremeno puše nisu bili uključeni u istraživanje.

Ispitivanu grupu, grupu pušača, činilo je 30 pacijenata, 12 muškaraca i 18 žena, prosečne starosti 41.5 ± 9.29 godina. U vreme ispitivanja, prosečan broj popušenih cigareta na dan iznosio je 19.9 ± 9.2, a dužina pušačkog staža 20.3 ± 9.6 godina. Kontrolnu grupu, grupu nepušača, činilo je 30 po starosti i polu komparabilnih pacijenata (13 muškaraca i 17 žena, prosečna starost iznosila je 40.6 ± 12.32 godina).

Podela ispitanika u odnosu na starost, pol i pušenje prikazana je u tabeli 1. Ispitanici su prema godinama starosti podeljeni na: 1) ispitanike *mlađe* životne dobi –mlađi od 40 godina (n=27); 2) ispitanike *srednje* životne dobi– starosti od 40 i više godina (n=33).

Prema dužini pušačkog staža, ispitanici su podeljeni na one koji puše: 1) *15 ili manje godina* (n=12); 2) *duže od 15 godina* (n=18). Na osnovu broja dnevno popušenih cigareta, podeljeni su na one koji puše: 1) *manje od 20 cigareta na dan* (n=12); 2) *20 i više cigareta na dan* (n=18).

Stanje oralne higijene utvrđeno je pomoću indeksa dentalnog plaka Silness–Löe.

Stanje alveolarne kosti utvrđeno je na retroalveolarnim rendgenskim snimcima pomoću milimetarske skale, merenjem rastojanja od gleđno-cementne granice do nivoa očuvane kosti sa mezijalne i distalne strane svakog prisutnog zuba. Ukoliko je resorpcija alveolarne kosti vertikalnog tipa, mereno je rastojanje od gleđno-cementne granice do najvišeg nivoa očuvanog interdentalnog septuma i od gleđno-cementne granice do najnižeg nivoa, a izmerene vrednosti su potom sabrane i podeljene sa dva. Prosečna vrednost resorpcije alveolarne kosti osobe je dobijena sabiranjem izmerenih vrednosti resorpcije za svaki interdentalni septum i deljenjem tog zbira sa brojem interdentalnih septuma koji su mereni. Ukupan broj interdentalnih septuma čija je resorpcija izmerena iznosi 865 za pušače (prosečna vrednost po osobi iznosi 28.8), a 826 za nepušače (prosečna vrednost po osobi iznosi 27.5).

Značajnost razlika u dobijenim rezultatima testirana je pomoću: χ^2 testa, z-testa i neparametarskog Mann–Whitney testa. Za resorpciju alveolarne kosti i faktore rizika (pušenje, godine starosti i plak) izračunati su unakrsni odnosi (UO) i za njih određeni 95% intervali poverenja. Kada je prosečna vrednost resorpcije alveolarne kosti bila do 2 mm stanje je smatrano za fiziološko, dok su vrednosti iznad 2 mm smatrane pokazateljem patologije.

Materials and methods

Patients, 20 to 60 years old, of both sexes were included in the study. Former and occasional smokers were not included.

The study group of smokers consisted of 30 patients, 12 men and 18 women (average age 41.5±9.29 years). At the time of the study, the average daily number of cigarettes was 19.9±9.2 with the smoking period of 20.3±9.6 years. The control group of non-smokers consisted of 30 patients of comparable age and sex (13 men and 17 women, average age 40.6±12.32 years).

The distribution of patients according to age, sex and smoking is presented in Table 1. According to age, the patients were considered as: 1) patients of *younger* age – less than 40 years old (n=27); 2) patients of *middle* age – 40 years old and above (n=33).

According to the smoking period, the patients were allocated to two groups: 1) 15 years or less (n=12); 2) more than 15 years (n=18). According to the daily number of cigarettes, they were allocated to: 1) less than 20 cigarettes a day (n=12); 2) 20 and more cigarettes (n=18).

Oral hygiene status was evaluated using the Silness-Löe plaque index.

Alveolar bone status was evaluated on retroalveolar X-rays using a millimetre scale by measuring the distance from the amelo-cemental junction to the bone level on mesial and distal sides of each present tooth. In case of vertical alveolar bone resorption, the distance from the amelo-cemental junction to the most prominent point of the interdental septum was measured as well as from the amelo-cemental junction to the lowest point. Afterwards, these two numbers were added and divided by 2. The mean value of bone resorption for each patient was calculated by adding the values for each interdental septum and dividing by the number of septi. The total number of measured interdental septi was 865 for smokers (28.8 on average per person) and 826 for non-smokers (27.5 on average per person).

The significance of differences was tested using χ^2 test, z-test and non-parametric Mann-Whitney test. For alveolar bone resorption and risk factors (smoking, age and plaque), the interceptive relationship values were calculated with 95% confidence intervals. When the mean value of bone resorption was less than 2 mm, the condition was considered physiological whereas values above 2 mm were considered as the sign of pathology.

Rezultati

Rezultati ovog istraživanja pokazuju veće vrednosti plak indeksa u grupi pušača u odnosu na kontrolnu grupu, međutim razlika nije bila statistički značajna (tabela 2).

Results

The present results showed higher values for the plaque index in the study group compared to the control but the difference was not significant (Table 2).

Starosne grupe (godine)	Pušači				Nepušači	
	n	Pol M Ž	Broj cigareta na dan ($\overline{X}$ ± SD)	Dužina pušačkog staža (godine) ($\overline{X}$ ± SD)	n	Pol M Ž
< 40	12	7 5	18.6 ± 10.27	12.8 ± 5.43	15	8 7
≥ 40	18	5 13	21.3 ± 8.03	25.3 ± 8.52	15	5 10
Ukupno	30	12 18	19.9 ± 9.2	20.3 ± 9.6	30	13 17

Tabela 1. *Podela ispitanika u odnosu na starost, pol i pušenje*

Starosne grupe (godine)	Pušači ($\overline{X}$ ± SD)	Nepušači ($\overline{X}$ ± SD)	p
< 40	1.9 ± 0.8	1.63 ± 0.68	0.24
≥ 40	1.98 ± 0.77	1.59 ± 0.62	0.14
Ukupno	1.95 ± 0.78	1.61 ± 0.64	0.058

Tabela 2. *Prosečne vrednosti plak indeksa kod pušača i nepušača u odnosu na godine starosti*

U ispitivanoj grupi pušača utvrđene su veće vrednosti resorpcije alveolarne kosti (tabela 3) i one se visokosignifikantno razlikuju u odnosu na kontrolnu grupu (p=0.00002).

In the study group, significantly greater alveolar bone resorption was observed (Table 3) than in the control group of non-smokers (p=0.00002).

	$\overline{X}$ ± SD	p
Pušači (n=30)	3.16 ± 2.07	0.00002
Nepušači (n=30)	1.72 ± 1.02	

Tabela 3. *Prosečne vrednosti resorpcije alveolarne kosti (mm) kod pušača i nepušača*

U grupi ispitanika mlađe životne dobi pušači su imali veće vrednosti resorpcije alveolarne kosti (grafikon 1) u odnosu na nepušače, međutim razlika nije bila statistički značajna (p=0.1). U grupi ispitanika srednje životne dobi pušači su imali statistički značajno veću resorpciju alveolarne kosti u odnosu na nepušače (p=0.01). Resorpcija alveolarne kosti kod pušača srednje životne dobi je bila veća i visokosignifikantno se razlikovala u odnosu na resorpciju alveolarne kosti kod pušača mlađe životne dobi (p=0.0007). Resorpcija alveolarne kosti kod nepušača srednje životne dobi je bila veća i visokosignifikantno se razlikovala u odnosu na resorpciju alveolarne kosti kod nepušača mlađe životne dobi (p=0.0005).

In younger patients, smokers had higher values of bone resorption (Graph 1) than non-smokers, but the difference was not significant (p=0.1). In middle-aged patients, smokers had significantly greater alveolar bone resorption than non-smokers (p=0.01). Bone resorption in middle-aged smokers was significantly greater than in younger smokers (p=0.0007). In middle-aged non-smokers, bone resorption was significantly greater than in younger non-smokers (p=0.0005).

		n	$\overline{X}$ ± SD	p
Dužina pušačkog staža	≤ 15 > 15	12 18	1.4 ± 0.66 4.33 ± 1.85	0.00028
Broj cigareta na dan	< 20 ≥ 20	12 18	2.71 ± 2.39 3.47 ± 1.84	0.12

Tabela 4. *Prosečne vrednosti resorpcije alveolarne kosti (mm) u odnosu na dužinu pušačkog staža (godine) i broj cigareta na dan*

U tabeli 4. je prikazana zavisnost resorpcije alveolarne kosti od dužine pušačkog staža i broja cigareta na dan. Ispitanici koji puše duže od 15 godina su imali statistički značajno veću prosečnu vrednost resorpcije alveolarne kosti u odnosu na one koji puše 15 i manje godina (p=0.00028). Ispitanici koji puše 20 i više cigareta na dan su takođe imali veću resorpciju alveolarne kosti u odnosu na one koji puše manje od 20 cigareta na dan, ali razlika nije bila statistički značajna (p=0.12).

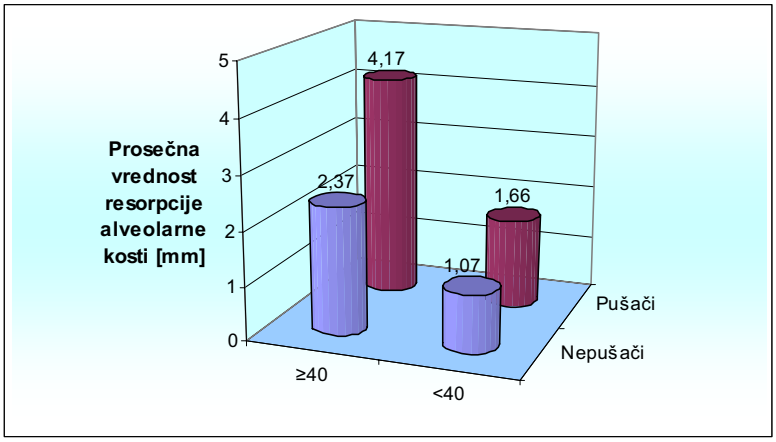
Table 4 presents the correlation between alveolar bone resorption and the smoking period and between resorption and the daily number of cigarettes. Patients smoking for more than 15 years had significantly greater resorption than those smoking for 15 years or less (p=0.00028). Those who smoked 20 or more cigarettes a day also had greater resorption than those smoking less than 20 cigarettes but the difference was not significant (p=0.12).

	Prosečna vrednost resorpcije alveolarne kosti ≤ 2 mm n	Prosečna vrednost resorpcije alveolarne kosti > 2 mm n	OR	95% CI
Nepušači	19	11	2.98	1.04-8.52
Pušači	11	19		
Starosne grupe				
< 40	20	7	6.57	2.1-20.48
≥ 40	10	23		
Plak indeks				
PI ≤ 2	19	15	1.73	0.62-4.84
PI > 2	11	15		

Tabela 5. *Unakrsni odnos (OR) sa 95% intervalom poverenja (95% CI) za prosečnu vrednost resorpcije alveolarne kosti > 2 mm*

Unakrsni odnos (tabela 5) pokazuje da pušači imaju 2,98 puta veći rizik (95% CI 1.04–8.52) za prosečnu vrednost resorpcije alveolarne kosti iznad 2 mm u odnosu na nepušače. Ispitanici srednje životne dobi imaju 6.57 puta veći rizik (95% CI 2.1–20.48) za prosečnu vrednost resorpcije alveolarne kosti iznad 2 mm u odnosu na ispitanike mlađe životne dobi. Ispitanici čija je prosečna vrednost plak indeksa veća od 2 imaju 1.73 puta veći rizik (95% CI 0.62–4.84) za prosečnu vrednost resorpcije alveolarne kosti iznad 2 mm u odnosu na ispitanike čija prosečna vrednost plak indeksa iznosi 2 i manje.

The interceptive relationship (Table 5) shows that smokers were at 2.98x greater risk (95% CI 1.04-8.52) to have more than 2 mm of bone resorption than non-smokers. Middle-aged patients were at 6.57x greater risk (95% CI 2.1-20.48) for > 2 mm bone resorption than younger patients. Those with the mean plaque index > 2 had 1.73x greater chance of bone resorption > 2 mm than those with the mean plaque index ≤ 2.



Grafikon 1: *Prosečne vrednosi resorpcije alveolarne kosti (mm) kod pušača i nepušača u odnosu na godine starosti*

Rezultati dosadašnjih istraživanja pokazuju da pušenje utiče na stepen resorpcije alveolarne kosti, ali tačan mehanizam još uvek nije poznat. Tako Al-Wahadni i sar. (18) izveštavaju o značajno većoj resorpciji alveolarne kosti kod pušača nego kod nepušača iste životne dobi. Pušači koje su ispitivali navedeni autori imali su značajno lošiju oralnu higijenu u odnosu na nepušače. Međutim, i Bergström (13) je ispitujući stepen resorpcije alveolarne kosti kod pušača sa dobrom oralnom higijenom utvrdio statistički značajno veću resorpciju alveolarne kosti nego kod nepušača sa istim stepenom oralne higijene.

Rezultati ovog istraživanja takođe pokazuju statistički značajno veću resorpciju alveolarne kosti kod pušača u odnosu na kontrolnu grupu nepušača. Prosečna vrednost resorpcije alveolarne kosti u grupi pušača iznosila je 3.16 mm, a u grupi nepušača 1.72 mm, dok je istovremeno oralna higijena bila gotovo podjednako loša u obe grupe ispitanika. Ovakvi rezultati mogli bi ići u prilog tezi da pušenje ima direktno dejstvo na alveolarnu kost, nezavisno od dentalnog plaka. Poznato je da pušenje dovodi do smanjenja mineralne komponente kostiju (19). Takođe, *in vitro* studije pokazuju da gingivalni fibroblasti pod uticajem nikotina produkuju interleukin-6 koji ima bitnu ulogu u resorpciji alveolarne kosti, kao i da nikotin suprimira proliferaciju osteoblasta, a stimuliše aktivnost alkalne fosfataze (20,21).

U ovom istraživanju je utvrđeno da se statistički značajna razlika u resorpciji alveolarne kosti između pušača i nepušača javlja samo kod ispitanika srednje životne dobi. Prosečna dužina pušačkog staža kod ispitanika srednje životne dobi iznosila je 25.3 godine, a kod ispitanika mlađe životne dobi 12.8 godina, što ukazuje na prilično dugačak vremenski period koji je potreban da bi efekat pušenja postao uočljiv na rendgenskom snimku. Obe starosne grupe ispitanika pušile su približno jednu kutiju cigareta na dan. Navedeni rezultati su u saglasnosti sa rezultatima Bergströma i sar. (22), koji su utvrdili da se statistički značajna razlika u resorpciji alveolarne kosti javlja kod ispitanika tek u srednjem životnom dobu.

Previous results have suggested that smoking affects the level of alveolar bone resorption but the exact mechanism is not yet known. Al-Wahadni et al.[18] reported on greater bone resorption in smokers than non-smokers of the same age. In their study, smokers had significantly worse oral hygiene than non-smokers. However, Bergström et al.[13] found significantly greater resorption in smokers than non-smokers having the same level of oral hygiene.

The present study also shows significantly greater resorption in smokers than non-smokers. The mean value in the group of smokers was 3.16 mm and in the group of non-smokers was 1.72 mm, with the comparable level of oral hygiene in both groups. These results could account for the direct effect of smoking on the alveolar bone, irrespective of the dental plaque. It is known that smoking results in the decrease of bone mineral component.[19] Furthermore, *in vitro* studies have shown that, influenced by nicotine, gingival fibroblasts produce interleukin-6 which has an important role in alveolar bone resorption. Also, nicotine was found to suppress osteoblast proliferation and stimulate the activity of alkaline phosphatase.[20,21]

The present study has confirmed significant differences in bone resorption between middle-aged smokers and non-smokers. The average period of smoking was 25.3 years in middle-aged patients and 12.8 years in younger ones. This implies that a long period of smoking is required for the effect of smoking to occur on an X-ray. Both groups of patients were smoking about one package of cigarettes a day. These results are in agreement with Bergström et al.[22] who suggested that significant differences in bone resorption occur in middle-aged patients.

Nadalje, dobijeni rezultati pokazuju da dužina pušačkog staža značajno utiče na stepen resorpcije alveolarne kosti što je u saglasnosti sa rezultatima drugih autora (13,16,22). Takođe je utvrđeno da su ispitanici koji puše 20 i više cigareta na dan imali veću resorpciju alveolarne kosti u odnosu na one koji puše manje od 20 cigareta na dan, međutim razlika nije bila statistički značajna.

Kao moguće objašnjenje prethodno navedenih rezultata može da posluži istraživanje Gonzalesa i sar. (23) koji su utvrdili da nivo kotinina (glavnog metabolita nikotina) u serumu varira za isti broj popušenih cigareta na dan naveden u upitniku. Interesantno je da su najveće varijacije u nivou kotinina u serumu (100–1 100 ng/mL) utvrđene kod ispitanika koji su naveli da puše jednu kutiju cigareta na dan, što je, verovatno zbog jednostavnosti, vrlo čest odgovor u upitnicima.

U ovom istraživanju je nešto više od trećine pušača (33.3%) izjavilo da puši jednu kutiju cigareta na dan. Smatra se da je različit nivo kotinina u serumu posledica razlike u koncentraciji nikotina između pojedinih vrsta cigareta, zatim različitog stepena absorpcije i metabolizma ispitanika, ali i činjenice da popularnost pušenja drastično opada u društvu, što sigurno utiče na tačnost dobijenih podataka putem upitnika .

Analizom multiple regresije između resorpcije alveolarne kosti i poznatih faktora rizika, Bergström i sar. (22) su utvrdili da resorpcija alveolarne kosti u najvećoj meri zavisi od godina starosti i pušenja. I u ovom istraživanju je analizom unakrsnog odnosa utvrđeno da je za resorpciju alveolarne kosti starost pacijenata najznačajniji faktor rizika (OR=6.57, 95% CI 2.1–20.48), zatim sledi pušenje (OR=2.98, 95% CI 1.04–8.52), dok se za plak kao faktor rizika, zbog donje granice intervala poverenja manje od 1, ne može sa sigurnošću tvrditi da utiče na resorpciju alveolarne kosti (OR=1.73, 95% CI 0.62–4.84).

Zaključak

Rezultati ovog istraživanja pokazuju da pušenje pospešuje resorpciju alveolarne kosti i da na stepen resorpcije utiču dužina pušačkog staža i broj popušenih cigareta na dan, s tim da je dužina pušačkog staža pouzdaniji pokazatelj uticaja pušenja na resorpciju alveolarne kosti. Statistički značajna razlika u resorpciji alveolarne kosti između pušača i nepušača se javlja u srednjem životnom dobu. Za resorpciju alveolarne kosti starost ispitanika predstavlja najznačajniji faktor rizika, zatim sledi pušenje, dok se za plak kao faktor rizika ne može sa sigurnošću tvrditi da utiče na resorpciju alveolarne kosti.

Moreover, the present results have shown that the period of smoking significantly affects the level of alveolar bone resorption, which is in agreement with previous reports.[13,16,22] It has also been observed that patients smoking 20 or more cigarettes a day had greater resorption than those smoking less, but the difference was not statistically significant. A possible explanation may be found in the study by Gonzales et al.[23] who found that serum cotinine level (the primary metabolite of nicotine) varied for the same number of cigarettes a day. Interestingly, the greatest variations (100-1000 ng/mL) were found in patients who said they were smoking one package of cigarettes a day, probably because this was the most common and easiest answer in questionnaires.

In the present study, about one third of smokers (33.3%) reported they were smoking one package a day. It is believed that different levels of cotinine in the serum are due to differences in nicotine concentrations in various types of cigarettes, variable resorption and metabolism rates but also the fact that smoking is less popular in the society which probably affects patients' answers.[24]

Using multiple regression analysis for alveolar bone resorption and risk factors, Bergström et al.[22] found that resorption was mostly affected by age and smoking. In the present study, the interceptive relationship analysis confirmed that the most important risk factor for alveolar bone resorption was age (OR=6.57, 95% CI 2.1–20.48), followed by smoking (OR=2.98, 95% CI 1.04–8.52), whereas the effect of plaque could not be confirmed due to the lower CI value below 1 (OR=1.73, 95% CI 0.62–4.84).

Conclusion

The present results have confirmed that smoking enhances alveolar bone resorption and that the smoking period and the daily number of cigarettes affect the level of resorption. The smoking period is a more reliable marker of the effect of smoking on alveolar bone resorption. A statistically significant difference in bone resorption was found between middle-aged smokers and non-smokers. For alveolar bone resorption, patients' age is the most important risk factor, followed by smoking whereas it cannot be claimed that plaque has an effect on resorption.

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Adresa za korespondenciju
Jelena Računica,
Mileve Marić 15,
21000 Novi Sad
063/519-256
jracunica@yahoo.com

Address for correspondence
Jelena Računica,
Mileve Maric 15 street,
21.000 Novi Sad
063/519-256
jracunica@yahoo.com