Udaljenost glavnih i pomoćnih otvora od vrha mezijalnog i distalnog korena prvog donjeg stalnog molara

SGS YU ISSN 0039-1743-
COBISS. SR-ID 8417026

The distance of the main and auxiliary openings from the top of medial and distal root of the first lower permanent molar

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ORIGINALNI RAD (OR)
ORIGINAL ARTICLE

KRATAK SADRŽAJ

Poznavanje morfoloških karakteristika korenskog kanalskog sistema, a posebno njegove apeksne trećine, predstavlja osnovni preduslov za uspešno lečenje obolele pulpe i apeksnog parondodoncijuma.

***Cilj** ovog rada je bio da odredi tačnu udaljenost glavnih i pomoćnih otvora od vrha mezijalnih i distalnih korenova prvih donjih stalnih molara.*

***Metod rada:** Kao materijal u istraživanju korišćeno je 100 ekstrahovanih prvih donjih molara, osoba oba pola, podeljenih u tri strarosne kategorije. Analiza apeksne trećine uzoraka je uradjena uz pomoć binokularne lupe i digitalnom rendgenografskom analizom polovine uzoraka koja je ispunjena kapilarnim kontrastom.*

***Rezultati**: Dobijeni rezultati su pokazali da je najveća prosečna udaljenost glavnih otvora od vrha mezijalnog korena iznosila 0,84mm, a najmanja 0,61mm; dok je za distalni koren najveća prosečna udaljenost iznosila 0,89mm a najmanja 0,62mm. Maksimalna udaljenost pomoćnih otvora od vrha mezijalnog korena u prvoj grupi je iznosila 3,5mm,a maksimalna udaljenost pomoćnih otvora od vrha distalnog korena je iznosila 2,5mm.*

Rezultati dobijeni digitalnom rengenografijom ukazuju da je najveća prosečna udaljenost glavnog otvora od vrha mezijalnog korena uočena u drugoj strarosnoj grupi (0,91mm) potom u prvoj (0,83 mm) i najmanja u trećoj starosnoj grupi (0,71mm); dok je za distalni koren najveća prosečna udaljenost glavnog otvora od vrha korena uočena u trećoj strarosnoj grupi (0,95mm) potom u prvoj (0,90 mm) i najmanja u drugoj starosnoj grupi (0,89mm).

***Zaključak** Udaljenost glavnih i pomoćnih otvora od vrha mezijalnog i distalnog korena korena prvog donjeg molara varira u opsegu od 0 do 3,5mm i u zavisnosti je od starosne kategorije zuba.*

Ključne reči : prvi donji molar, glavni otvor, pomoćni otvor

SUMMARY

The main prerequisite for a successful treatment of pulp disease in apex periodontium is knowledge of morphological characteristics of root canal system, especially one third of his apex.

***The aim** of this work was to define the exact distance of the main and auxiliary openings from the top of medial and distal roots of the first lower permanent molars.*

***Methods**: as a research material it was used a hundred extracted first lower molars of the patients of both gender, divided into three age groups. The analysis of the one third of apex was done with the help of binocular magnifying glass and digital roentgenography analysis half of the samples, which were filed with capillary contrast.*

***Results**: The results obtained showed that the longest average distance of the main opening from the top of medial root was 0.84mm, and the shortest was 0.61mm; while for the distal root the longest average distance was 0.89mm, and the shortest was 0.62mm. Maximum distance of the auxiliary openings from the top of medial root in the first group was 3.5mm, and the maximum distance of the auxiliary openings from the top of distal root was 2, 5 mm.*

The results obtained with digital rentgenography showed that the longest average distance of the main opening from the top of medial root was the one noticed in the second age group (0.91mm) then the one from the first group (0,83), and the shortest one in the third age group (0,71mm); as for the distal root: the longest average distance of the main opening from the top of the root was noticed in the third age group (0,95mm) then in the first (0,90mm) and than shortest in the second age group (0,89mm).

***Conclusion**: The distance of the main and auxiliary openings from the top of medial and distal root of the first lower molar varies in the range from 0 to 3,5mm and it depends on the tooth age.*

Key words: lower first molar, main opening, auxiliary opening

Uspeh endodontskog tretmana može se očekivati samo posle pravilno postavljene dijagnoze, poznavanja morfoloških karakteristika kanala korena zuba,(posebno anatomskih karakteristika vrha korena) i sprovedene adekvatne endodontske procedure, odnosno pravilne biomehaničke obrade kanala korena zuba.[1-3] Činjenica je takođe, da je kanalski sistem molarnih zuba vrlo komplikovan i da je u endodontskoj proceduri najveći problem upravo apeksna trećina korena. Mnogi istraživači su proučavajući morfologiju korenskog kanala uočili da cementni deo kanala najčešće ne prati put dentinskog kanala nego čak skreće pod određenim uglom.[1,4-7] Ove morfološke promene su rezultat adaptacije zuba na funkcionalne nadražaje kao što su: pritisak jezika, okluzalne sile i tendencija mezijalnog kretanja zuba. Po mišljenju Seltzer-a devijacija cementnog kanala uzrokovana je produkcijom sekundarnog tj. tercijarnog dentina i konstantnim deponovanjem sekundarnog cementa na vrhu korena zuba.[8] Ovim procesima se menja pozicija apeksnog foramena postavljajući ga konstantno dalje od anatomskog vrha zuba.[9-11] I nalazi Orban-a takođe ukazuju da postoje različite varijacije ne samo u broju već i u obliku i lokalizaciji apikalnih foramena i da su glavni i pomoćni otvori retko lokalizovani na samom vrhu korena.[11]

Cilj

Cilj ovog rada je bio da se uz pomoć binokularne lupe i digitalne rendgenografije prouče karakteristike vrha korena prvog donjeg molara, odnosno da se utvrdi lokalizacija i udaljenost glavnih i pomoćnih otvora od vrha mezijalnog i distalnog korena u zuba različitih starosnih kategorija.

Materijal i metod

Kao materijal u istraživanju korišćeno je 100 ekstrahovanih prvih mandibularnih molara, osoba oba pola, različitih indikacija za ekstrakciju. Svi zubi su podeljeni u tri starosne kategorije:

I grupa – 18-25 godina (30 zuba)
II grupa – 26-50 godina (40 zuba)
III grupa – preko 51 godine starosti (30 zuba)

Zubi su nakon ekstrakcije čuvani u 4% rastvoru formalina. Nakon detaljnog debridmana krunične i korenske spoljašnje površine zuba od čvrstih i mekih tkiva, uzorci su držani u fiziološkom rastvoru do početka eksperimenta.

Prvi deo eksperimenta obuhvatao je proučavanje apeksne trećine zuba pod binokularnom lupom. Analiza

The success of endodontic treatment could be expected only after the diagnose is correctly made, a good knowledge of morphological characteristics of root canal system of teeth (especially anatomic characteristics of the root top) and adequate endodontic procedure, i.e. the correct bio-mechanical procession on the root canal of a tooth.[1-3] The fact is that the root canal system of the molars is very complicated and that the biggest problem in endodontic procedure is the one third of root apex. A lot of researchers noticed, studying the morphology of the root canal, that the cement part of the root most often doesn't follow the route of the dental channel but even deviates a little at a certain angle.[1,4-7] Those morphological changes are the result of the adaptation of teeth to the functional stimulations like: tongue pressure, occlusal forces and the tendencies of the medial movements of the teeth. According to Seltzer, deviation of the cement root canal is caused by a production of secondary, i.e. tertiary dentin and constant deposition of the secondary cement on the tooth root top.[8] Those processes change the position of the apex foramen placing it constantly further from the anatomic tooth top.[9-11] Orban's discoveries are, too, showed that there are different variations not only according to the number but also according to the shape and localization of apical foramen and that the main and auxiliary openings rarely localized at the very top of the root.

The Aim

The aim of this work was to study, with the help of binocular microscope and digital roentgenography, characteristics of the root top of the first lower molar, more exactly, to establish localization and the distance of the main and auxiliary openings from the top of medial and distal root of the teeth in different age groups.

Material and method

As a material in the research it was used a hundred extracted first mandible molars, from the patients of different gender, with different indication for extraction. All of the teeth were divided into three categories according to age:

1st group - samples from 18 to25 years of age (30 teeth)
2nd group - samples from 25 to 50 years of age (40 teeth)
3rd group - samples from over 51 years of age (30 teeth)

The teeth were kept in 4% of formalin solution after the extraction. After detailed debridement of the crown and outer surface of the teeth from hard and soft tissues, the samples were kept in physiological saline till the beginning of the experiment.

The first part of the experiment included studying one third of root apex under binocular microscope. Analysis

je obuhvatila celokupan ekspermentalni uzorak. Radi lakšeg uočavanja i lokalizacije glavnih i pomoćnih otvora na vrhu korena, apeksna trećina korena je potapana u plavi vosak i potom brisana papirnim ubrusom. Uzorci su zatim pomoću voska fiksirani za predmetno staklo, što je olakšavalo manipulaciju na mikroskopskom stočiću. U analizi je korišćeno uvećenje od dvadeset puta a udaljenost glavnih i pomoćnih otvora od vrha korena zuba izračunata je pomoću merne skale prethodno montirane na objektiv.Osnovni kriterijum za razlikovanje glavnih od pomoćnih otvora bila je njihova veličina, tj. glavni otvori su bili svi otvori veći od 100 mikrometara.

Polovina svih uzoraka (15 uzoraka iz prve starosne grupe, 20 iz druge i 15 iz treće grupe uzoraka), podvrgnuta je eksperimentu primenom kapilarnog kontrasta. Pomoću šprica i intradermalne igle aplikovan je kapilarni kontrast (telebriks) u kanalikularni sistem ispitivanih zuba. Da bi kontrast dospeo do svih delova kanalskog sistema korišćen je vibrator koji se inače koristi za bolje izlivanje gipsanih modela. Uzorci su potom snimani digitalnim rendgenografskim aparatom (Trophy) iz dva pravca. Prvi pravac snimanja je bio vestibulo – oralni a drugi meziobukalni – distolingvalni ugao). Analiza je obuhvatila merenje udaljenosti otvora od vrha mezijalnog i distalnog korena prvog donjeg molara primenom kompjuterskog programa Photoshop CS.

Rezultati

Rezultati istraživanja binokularnom lupom prikazani su na grafikonima 1,2,3 i 4.Dobijeni rezultati su pokazali da je prosečna udaljenost glavnog otvora od vrha mezijalnog korena iznosila od 0,25 do 3,51mm (grafikon 1). U prvoj starosnoj grupi maksimalna udaljenost je iznosila 3,5 mm u drugoj 3,51mm i 2,5mm u trećoj starosnoj kategoriji. Najčešća udaljenost glavnog otvora od vrha mezijalnig korena u prvoj grupi je bila u rasponu od 0,51mm do 1,0mm (12 uzoraka), u drugoj grupi od 0 do 0,25mm (24 uzorka) i u trećoj takođe od 0 do 0,25 mm(16 uzoraka).Statistički značajnih razlika u rezultatima udaljenosti glavnih otvora od vrha mezijalnog korena između uzoraka starosnih grupa nije bilo. (grafikon 1)

Dobijeni rezultati su pokazali da je prosečna udaljenost glavnih otvora od vrha distalnog korena iznosila od 0,3mm do 3,5mm (grafikon 2). Najčešća udaljenost glavnog otvora od vrha korena u sve tri starosne kategorije je bila u rasponu od 0 do 0,3mm (po 10 uzoraka u prvoj i trećoj grupi i 15 u drugoj). Statistički značajnih razlika u rezultatima udaljenosti glavnih otvora od vrha distalnog korena između uzoraka starosnih grupa nije bilo. (grafikon 2)

Udaljenost pomoćnih otvora od vrha mezijalnog korena je zabeležena u rasponu od 0,25mm do 3,5mm u prvoj starosnoj grupi, od 0,25mm do 1,3mm u drugoj dok

included the entire experimental sample. Because of the easiest observation and localization of the main and auxiliary openings on the root top, one third of root apex was dipped into blue vex and then dried with the paper towel. The samples were, then, fixed with vex for the glass slide, which made the manipulation on the microscopic stage easier. During the analysis it was used twenty times magnification, and the distance of the main and auxiliary openings from the root top was measured with the use of the measuring scale previously installed on the lens. The base criteria for the distinction of the main from the auxiliary openings were their size.

Half of all the samples (15 from the first age group, 20 from the second, and 15 from the third age group of samples) were exposed to an experiment by using capillary contrast. With the use of hypodermic syringe and interdermal needle the capillary contrast (telebrix) was applied into the root canal system of experimental teeth. The vibrator is used to apply contrast into the all parts of root canal system, which is usually used for better casting of the plaster models. The samples were x-rayed with the digital roentgenography apparatus (Trophy) from two directions. The first direction was vestibule – oral, and the other one was mediobuccal – distolingval angle. The analysis included measuring the distance of the opening from the top of medial and distal root of the first lower molar applying computer program PhotoShop CS.

Results

The results of the research, which was made with binocular microscope, are shown on the graphs 1, 2, 3 and 4. The results achieved showed that the average distance of the main opening from medial root top was 0.25 to 3.51mm (graph 1). In the first age group maximal distance was 3.5mm, in the second 3.51mm and 2.5mm in the third age group. The most often distance of the main opening from medial root top in the first age group, was in the range from 0.51mm to 1.0mm (12 samples), in the second from 0 to 0.25mm (24 samples) and in the third from 0 to 0.25mm, too (16 samples). Statistically, there were no important differences in the results that dealt with the distance of the main opening from medial root top in the age group samples.

The obtained results showed that the average distance of the main opening from distal root was from 0.3mm to 3.5mm (graph 2). The most often distance of the main opening from the root top in all three age group was in the range from 0 to 0.3mm (10 samples in the first and the third group and 15 in the second age group). Statistically, there were no important differences in the results that dealt with the distance of the main opening from distal root top in the age group samples. (Graph 2)

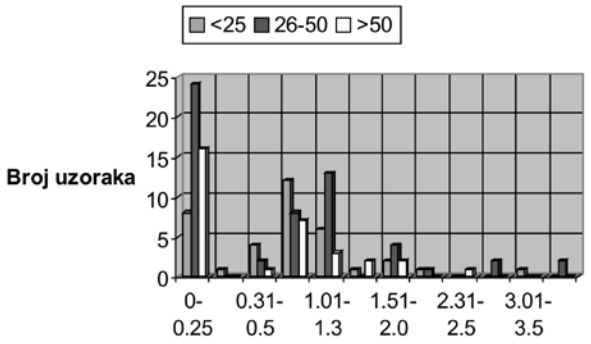
The distance of the auxiliary opening from medial root top was in the range from 0.25mm to 3.5mm in the first age group,

u trećoj starosnoj grupi nije zapažen niti jedan pomoćni otvor (grafikon 3). Najveći broj pomoćnih otvora u prvoj grupi bio je udaljen do 0,25mm (9 uzoraka), potom, od 0,31mm do 0,5mm, odnosno, od 0,51mm do 1,0mm (po 6 uzoraka). U drugoj grupi najveći broj pomoćnih kanala bio je udaljen do 0,25mm(4 uzorka) i od 1,0mm do 1,3mm (4 uzorka), potom od 0,51mm do 1,0mm(2 uzorka) itd. (grafikon 3)

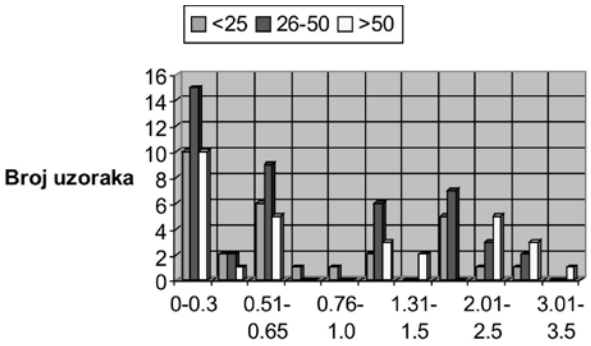
Udaljenost pomoćnih otvora od vrha distalnog korena je bila u rasponu od 0,25mm do 2,0mm u prvoj starosnoj grupi, 0,25mm do 2,5mm u drugoj i u trećoj grupi od 0,51mm do 0,65mm (grafikon 4). Najveći broj pomoćnih otvora u prvoj grupi bio je udaljen do 0,3mm (7 uzoraka), potom, od 0,51mm do 0,65mm, odnosno, od 1,0mm do 1,3mm (po 5 uzoraka). U drugoj grupi najveći broj pomoćnih kanala bio je udaljen od 1,0mm do 1,3mm (4 uzorka), potom od 0 do 0,3mm i od 1,5mm do 2,0mm kao i od 2,0mm do 2,5mm (po 3 uzorka).U trećoj grupi registrovan je samo jedan pomoćni kanal udaljen 0,65mm od vrha distalnog korena. (grafikon 4)

while in the second and the third group there were no openings at all. (Graph 3) The largest number of the auxiliary openings in the first group were in the distance of 0.25mm (9 samples), then, from 0.31mm to 0.5mm, i.e., from 0.51mm to 1.0mm (6 samples each). In the second group the largest number of the auxiliary canals were in the distance from 0.25mm (4 samples) and from 1.0mm to 1.3mm (4 samples), then from 0.51mm to 1.0mm (2 samples) etc. (graph 3).

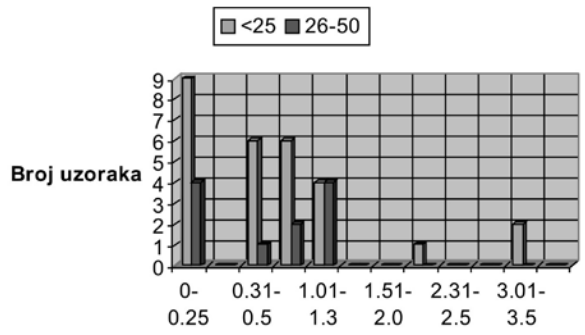
The distance of the auxiliary opening from distal root top was in the range from 0.25mm to 2.0mm in the first age group, from 0.25mm to 2.5mm in the second, and in the third age group from 0.51mm to 0.65mm. (Graph 4). The largest number of the auxiliary openings in the first group were in the distance up to 0.3mm (7 samples), then, from 0.51mm to 0.65mm, that is from 1.0mm to 1.3mm (5 samples each). In the second group the largest number of the auxiliary canals were in the distance from 1.0mm to 1.3mm (4 samples), then from 0 to 0.3mm and from 1.5mm to 2.0mm , and from 2.0mm to 2.5mm (3 samples each). In the third group it was registered only one auxiliary opening in the distance of 0.65mm from distal root top. (Graph 4).



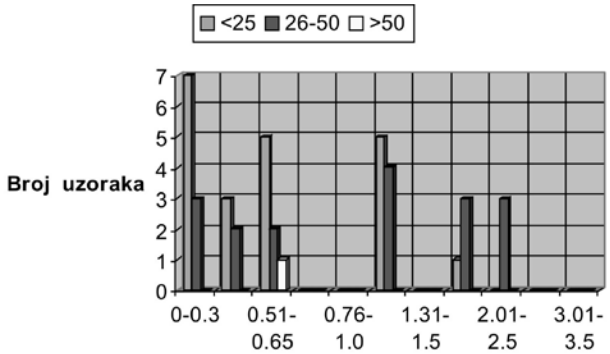
Grafikon 1. Udaljenost glavnih otvora od vrha mezijalnog korena zuba
Graph 1. The distance of the main openings from the top of the medial root of the tooth



Grafikon 2. Udaljenost glavnih otvora od vrha distalnog korena zuba
Graph 2. The distance of the main openings from the top of the distal root of the tooth



Grafikon 3. Udaljenost pomoćnih otvora od vrha mezijalnog korena
Graph 3. The distance of the auxiliary openings from the top of the medial root of the tooth



Grafikon 4. Udaljenost pomoćnih otvora od vrha distalnog korena
Graph 4. The distance of the auxiliary openings from the top of the distal root of the tooth

Rezultati dobijeni pomoći rendgenografske digitalne analize udaljenosti glavnih otvora u odnosu na rendgenografski vrh korena dati su u tabeli 1.Analizirajući udaljenost glavnih otvora u odnosu na rendgenografski vrh korena, utvrđeno je da se kod mezijalnog korena u grupi do 25 godina prosečna udaljenost kreće u intervalu 0,83±0,39mm, u grupi od 26 do 50 godina u intervalu 0,91±0,28mm, a u grupi preko 51 godine, prosečna udaljenost se kreće u intervalu 0,71±0,35mm. Na osnovu statističke obrade dobijenih rezultata uočeno je da nema statistički značajnih razlika između analiziranih starosnih grupa mezijalnog korena (ANOVA-Kruskal Wallis: x^2=2,823; p>0,05).

Na osnovu dobijenih rezultata i analize udaljenosti glavnih otvora u odnosu na rendgenografski vrh korena, utvrdjeno je da se kod distalnog korena (u grupi do 25 godina) prosečna udaljenost kreće u intervalu 0,90±0,26mm, u drugoj od 0,89±0,38mm, dok se u trećoj starosnoj grupi prosečna udaljenost kreće u intervalu 0,95±0,23mm. Na osnovu statističke obrade dobijenih rezultata zapaženo je da izmedju starosnih grupa na distalnom korenu nije bilo statistički značajnih razlika kada je u pitanju udaljenost glavnih otvora od rendgenografskog apeksa (ANOVA-Kruskal Wallis: x^2=0.612; p>0.05) .(tabela 1)

Tabela 1. Udaljenost glavnih otvora u odnosu na rendgenografski vrh mezijalnih I distalnih korenova prvih donjih stalnih molara (mm)

Mezijalni koren	
Digitalna rendgenografija	binokularna lupa
I grupa 0.83	I grupa 0.71
II grupa 0.91	II grupa 0.84
III grupa 0.71	III grupa 0.61
Distalni koren	
I grupa 0.90	I grupa 0.81
II grupa 0.89	II grupa 0.89
III grupa 0.95	III grupa 0.114

Upoređujući udaljenost glavnih otvora na mezijalnom i distalnom korenu za pojedine starosne grupacije utvrđeno je da postoji statistički značajna razlika samo između grupa 25-50 godina i grupa preko 51 godine (*p<0,05*).

Komparacija prosečnih udaljenosti glavnih otvora mezijalnih i distalnih korenova prvog donjeg stalnog molara dobijenih binokularnom mikroskopijom i digitalnom rendgenografijom predočena je u tabeli 1. Poredeći ove rezultate primećeno je da su zabeležene veće vrednosti udaljenja u metodi digitalne rendgenografije, osim u trećoj starosnoj grupi na distalnom korenu gde su veće vrednosti zabeležene u istraživanjima binokularnom lupom .

The results obtained with the digital roentgenography analysis of the distance of the main openings according to roentgenographic root top are given in table 1. Analyzing the distance of the main openings according to roentgenographic root top, it was established that in the case of medial root in the age group up to 25 years, an average distance was in the range of 0.83±0.39mm, in the group of 26 to 50 in the range of 0.91±0.28mm, and in the group of over 51 years of age, the average distance was in the range of 0.71±0.35. On the base of statistic data processing it is noticed that there are no important differences among analyzed medial root age groups (ANOVA- Kruskal Wallis; x^2 = 2.823; p >0.05)

On the base of the obtained results and analysis of the distance of the main openings according to roentgenographic root top, it is established that in the case of distal root (in the age group to 25 years) the average distance is in the range of 0.90±0.26mm, in the second age group from 0.89±0.38mm, while in the third age group the average distance is in the range of 0.95±0.23mm. On the base of statistic data processing of the obtained results it is noticed that there were no important statistics differences among analyzed distal root age groups in the case of the distance of the main openings from roentgenographic apex (ANOVA- Kruskal Wallis; x^2 = 0.612; p > 0.05). (Table 1)

Table 1. The distance of the main and auxiliary openings from the top of medial and distal root of the first lower permanent molar

Medial root	
Digital roentgenography	Binocular microscope
I group 0.83	I group 0.71
II group 0.91	II group 0.84
III group 0.71	III group 0.61
Distal root	
I group 0.90	I group 0.81
II group 0.89	II group 0.89
III group 0.95	III group 0.114

Comparing the distance of the main opening of the medial and distal root at the specific age groups it is concluded that there is statistically significant difference between the age group from 25-50 years to the age group over 51 years. (p < 0.05)

The comparison of the average distance of the main openings of the medial and distal root of the first lower permanent molar obtained with binocular microscope and digital roentgenography is shown in the table 1. Comparing those results it is observed that the largest values of distances were noted with the method of digital roentgenography, except in the third age group on the distal root in which case the largest values are noted with the method of binocular microscope.

Diskusija

Analizirajući rezultate dobijene binokularnom mikroskopijom u pogledu udaljenosti glavnog otvora od vrha mezijalnog korena ustanovljeno je da je u prvoj i drugoj starosnoj grupi najveće udaljenje od vrha korena iznosilo 3,0mm a u trećoj kategoriji 3,5mm. Rezultati ove studije na ovaj način potvrđuju teoriju o smanjenju proliferativne sposobnosti cementa koje nastaje sa godinama. Po ovoj hipotezi intenzitet apozicije cementa opada posle 50. godine života što naravno utiče i na udaljenost samog otvora od vrha korena zuba.[12]

Slični rezultati dobijeni su i u nalazima drugih istraživača, tako da je u morfološkoj studiji Green-a prosečna udaljenost glavnog otvora u odnosu na anatomski vrh zuba je iznosila 0,3mm.[10] Prateći ovaj parametar u različitim starosnim grupama Kuttler je zapazio da se sa godinama glavni otvor udaljava od vrha korena; u grupi od 18 do 25 godina ovo rastojanje je prosečno 0,495mm dok je u grupi preko 55 godina starosti prosečno 0,607mm.[10] U prilog ovoj hipotezi su i istraživanja Staina-a i Corcoran-a, koji konstatuju da je u mlađoj kategoriji prosečna udaljenost glavnog otvora od vrha korena 0,476mm a u starijoj 0,552mm.[9]

Analizirajući rezultate dobijene binokularnom mikroskopijom nije primećeno veliko odstupanje u prvoj i drugoj starosnoj grupi po pitanju udaljenosti otvora od vrha distalnog korena zuba. U prvoj i drugoj starosnoj grupi najveće udaljenje od vrha korena je iznosilo 3,5mm a prosečna udaljenost je bila 0,81 mm za prvu grupu, odnosno 0,89 mm u drugoj grupaciji. Uočena je razlika kod zuba u uzrastu do 50 i preko 51 godine starosti (prva i druga starosna grupa u odnosu na treću) gde je maksimalna udaljenost glavnog otvora od vrha korena zuba 2,5mm. Ovi nalazi potvrđuju teoriju o konstantnom udaljavanju glavnog otvora u odnosu na vrh korena zuba koje nastaje sa godinama.[1, 7-9]

Druga interesantna istraživanja pokazuju da se najveće devijacije apeksnog foramena dešavaju na korenu gde zubi formiraju mastikatorne centre (meziobukalni koren gornjeg prvog molara i distalni koren donjeg prvog molara). Ovi korenovi apsorbuju najveći mastikatorni pritisak tako da cementna akumulacija predstavlja proces velike adaptibilne sposobnosti na funkcionalne i fiziološke stresove.[5] Razlike u udaljenosti otvora od vrha korena zuba koje postoje između mezijalnog i distalnog korena se objašnjavaju značajnom ulogom distalnog korena u funkciji mastikacije.[5]

Prosečna udaljenost pomoćnih otvora od vrha mezijalnog korena u prvoj grupi je iznosila 0,76mm, a u drugoj grupi 0,67 mm Prosečno udaljenje pomoćnih otvora od vrha distalnog korena u prvoj starosnoj grupi je iznosilo 0,62mm, a u drugoj 1,22mm. Ovakav nalaz potvrđuje teorije o konstantnoj depoziciji cementnog konusa a samim tim i kompletne apikalne delte.[1, 5-7, 9]

Discussion

Analyzing the results obtained with binocular microscope concerning the distance of the main opening from the medial root top it is obtained that the largest distance from the root top, in the first and the second age group, was 3.0mm, and in the third category it was 3.5mm.The results of this study in this way confirm the theory about the proliferative ability of the cement which appears with aging. According to this hypothesis intensity of the apposition of the cement is declining after 50 years of life, what of course influences on the distance of the very opening from the root top of the tooth.[12]

The similar results were gained in the findings of the other researches, so in the Green's morphological study, the average distance of the main opening in regard to the anatomic tooth top was 0.3mm.[10] Following this parameter in different age group, Kuttler noticed that with aging, the main opening is moving further from the root top; in the age group from 18 to25 this distance is in average of 0.495mm, while in the age group over 55 the distance is in average of 0.607mm.[10] The researches of Stain and Corcoran speak in favor of this hypothesis when stated that in the young age group the average distance from the main opening from the root top is 0.476mm and in the old age group is 0.552 mm.[9]

Analyzing the results obtained with binocular microscope there wasn't noticeable exception in the first and second age group according to the distance of the main opening from the distal root top of the teeth. In the first age group the largest distance from the root top was 3.5mm. And the average distance was 0.81mm for the first, i.e. 0.89mm for the second age group. The distance was noticed on the teeth in the age of 50 and over 51 years of age (the first and the second age group comparing to the third), where the maximal distance of the main opening from the root top was 2.5mm. These findings confirm the theory about the constant removal of the main opening in regard oft the root top with the aging.[1, 5-7, 9]

The other interesting researches show that the largest deviation of the apex foramen is happening on the root where teeth formed masticatory centers (mediobuccal root of the first lower molar and distal root of the first lower molar). Those roots absorb the greatest masticatory pressure so that the cement accumulation presents the process of great adaptable abilities to functional and physiological stresses.[5] The differences in the distance of the opening from the distal root top, which exist between medial and distal root, is explained with an important role of the distal root in the function of mastication.[5]

The average distance of the auxiliary openings from the medial root top in the first group was 0.76mm, and in the second group it was 0.67mm. The average distance of the auxiliary openings from the distal root top in the first age group was 0.62mm, and in the second 1.22mm. Those findings confirm the theory about the constant deposition of the cement cone, and according to that, apical delta itself.

Svrha istraživanja apeksne trećine korena prvog donjeg molara primenom kapilarnog kontrasta i njegovom kasnijom digitalnom rendgenografijom je da se utvrdi tj. komparira verodostojnost rendgenografije kao najčešće metode pri određivanju krajnje tačke kanalne preparacije, odnosno preciznost pri određivanju lokalizacije glavnog otvora i njegove udaljenosti od vrha zuba.

Iako rendgenografski snimak najčešće predstavlja jedino oruđe u kliničkoj endodontskoj praksi neki faktori mogu imati direktan uticaj na kvalitet i tačnost ovog načina određivanja granice obrade kanala i tačne lokalizacije otvora glavnog kanala. To su stanje filma, položaj tubusa, vreme ekspozicije i proces razvijanja.[13] Na kvalitet filma takođe utiču klinički faktori, nestručnost, senzitivna reakcija pacijenta, makroglosia, plitak pod usta i kliničari moraju biti svesni ovih nedostataka tokom radiografske interpretacije.[13]

Možda je ipak najznačajniji nedostatak dentalne rendgengrafije upravo činjenica da dobijamo dvodimenzionlni prikaz trodimenzionalne strukture. Šta više, superpozicija normalnih anatomskih struktura ili prikazivanje patoloških struktura na korenskom apeksu često može uticati na pravilnu interpretaciju promena na izloženom filmu.[13-14] To može dovesti do loše određene radne dužine,do mehaničke iritacije periapeksnog tkiva i njegovog prepunjavanja što opet može uzrokovati pojavu postoperativnog bola, inflamacije i neuspeha reparacije.[1-3,14-17]

Analizirajući rezultate o udaljenosti glavnih otvora od rendgenografskog vrha korena dobijene pomoću digitalne rendgenografije utvrđeno je da u prvoj starosnoj grupi ono prosečno iznosi 0,83mm(mezijalni koren) tj. 0,90mm (distalni koren); u drugoj je 0,91mm (mezijalni koren) ili 0,89mm (distalni koren); dok je za treću starosnu grupu prosečno udaljenje iznosilo 0,71mm (mezijalni koren) odnosno 0,95mm (distalni koren).

Poredeći ove rezultate sa rezultatima dobijenim binokularnom lupom primećeno je da su zabeležene veće vrednosti udaljenja metodom digitalne rendgenografije, osim u trećoj starosnoj kategoriji (na distalnom korenu) gde su veće vrednosti zabeležene u istraživanjima binokularnom lupom. Može se pretpostaviti da su uzroci ovih razlika nastali zbog same metodologije i teškoća pri aplikaciji kontrasta, usled komplikovanih i uskih kanala korenova prvog donjeg molara. Mogućnost širenja rendgenografske slike, različiti uglovi snimanja, takodje mogu biti uzrok ovih razlika. Dakle, za praktičare je neobično važno da se sve ove mogućnosti uzmu u obzir pri rendgenografskom odredjivanju apeksnog stopera u endodontskoj terapiji,da bi se izbegle komplikacije. Iz ovih nalaza sledi da prepunjavanje korenskog kanala i prebacivanje opturacionih materijala u periapeks može

The purpose of conducting the research of the one third of apex of the root of the first lower molar with the application of capillary contrast and their later digital rentgenography, is to establish, i.e, to compare credibility of roentgenography as the most often method when establishing the furthest spot of the root penetration, or precision during the definition of the localization of the main opening and their distance from the tooth top.

Although the x-ray is frequently the only device in clinical endodontic practice, some factors may have a direct influence on the quality and the precision of their way of defining the borders of the processing the root canal and the exact localization of the opening of the main canal. These are the state of the film, the position of the tube, time of exposition and the process of the film development.[13] The clinical factors, non-professional work, and sensitive reaction of the patient, micro-glossy, shallow mouth floor may influence the quality of the film, and the clinic doctors have to be aware of those shortages during radiographic interpretation.[13]

Maybe the most important defect of dental rentenography is the very fact that we get two-dimensional picture of three-dimensional structure. Even more, the superimposition of normal anatomic structures or presentation of pathological structures on the root apex often influence the correct interpretation of the changes shown on the film.[13,14] It could lead to incorrect definition of the working length, to mechanical irritation per-apex tissue and its overstuffing which could lead to the postoperative pain, inflammation and reparation failure.

Analyzing the results of the distance of the main openings from roentgenographic root top obtained with the digital roentgenography it is established that the average distance in the first age group is 0.83mm (medial root) that is 0.90mm (distal root); in the second age group it is 0.91mm (medial root) or 0.89mm (distal root); while in the third age group the average distance is 0.71mm (medial root) or 0.95mm (distal root).

Comparing these results with the results got with the binocular microscope it is noticed that the largest values of distances were noted with the method of digital roentenography, except in the third age group (on the distal root) where the larger values of distances were noted with the method of binocular microscope. It could be assumed that the cause for this differences lie in the very methodology and the difficulties in contrast application, or because of the complicated and narrow roots of the first lower molars. The possibility of widening the roentenographic picture, different angles of the x-ray, could also be the cause for these differences. So for the practitioners it is very important o consider all those possibilities while roentgenographically defining the apex stopper in endodontic therapy, to avoid complications. The conclusion from these findings is that overstuffing of the root canal and exceeding of filling material into per-apex could occur much often as a complication if only roentgenography findings are

biti mnogo češća komplikacija ukoliko se prate samo rendgenografski nalazi.[2,3,14,15] Za pravilno odredjenu krajnju tačku kanalne instrumentacije i opturacije treba ispoštovati Langeland-ovo pravilo, koje pretpostavlja znanje o varijacijama kanala korena, dobar taktilni osećaj za apeksno suženje, upotrebu papirnih poena za detekciju krvi ili drugih tkivnih tečnosti u kanalu i sve to uporedi sa rendgenografskim prikazom.[19]

Zaključak

Na osnovu dobijenih rezultata može se zaključiti da je:

- Najveća prosečna udaljenost glavnih otvora od vrha mezijalnog korena iznosila 0,84mm, a najmanja 0,61mm; dok je za distalni koren najveća prosečna udaljenost iznosila 0,89mm a najmanja 0,62mm (u trećoj grupaciji);
- Prosečna udaljenost pomoćnih otvora od vrha mezijalnog korena u prvoj grupi je iznosila 0,76mm, a u drugoj grupi 0,67 mm Prosečno udaljenje pomoćnih otvora od vrha distalnog korena u prvoj starosnoj grupi je iznosilo 0,62mm, a u drugoj 1,22mm.
- Na osnovu rezultata dobijenih digitalnom rengenografijom može se zaključiti da je najveća prosečna udaljenost glavnog otvora od vrha mezijalnog korena uočena u drugoj strarosnoj grupi (0,91mm) potom u prvoj (0,83 mm) i najmanja u trećoj starosnoj grupi (0,71mm); dok je za distalni koren najveća prosečna udaljenost glavnog otvora od vrha korena uočena u trećoj strarosnoj grupi (0,95mm) potom u prvoj (0,90 mm) i najmanja u drugoj starosnoj grupi (0,89mm).

followed.[2,3,14,15] For rightfully chosen the furthest spot for canal instrumentation and filling, the Langeland's rule should be followed, which assumed the knowledge of root variations, good tactile feeling for apex narrowing, use of the paper points for blood detection or other tissue fluids in a canal and all that compared to roentgenographic finding.[19]

Conclusion

On the bases of the obtained results it could be concluded:

- The largest average distance of the main openings from the medial root top was 0.84mm, and the smallest was 0.61mm; while for the distal root the largest average distance was 0.89mm, and the smallest was 0.62 (in the third age group);
- The average distance of the auxiliary openings from the medial root top in the first age group was 0.76mm, and in the second group it was 0.67mm. The average distance of the auxiliary openings from the distal root top in the first age group was 0.62mm, and in the second group it was 1.22mm.
- On the basis of the results gained with digital roentenography it could be concluded that the largest average distance of the main openings from the medial root top was noticed in the second age group (0.91mm) then in the first (0.83mm) and the smallest in the third age group (0.71mm); while for the distal root the largest average distance of the main openings from the root top was noticed in the third age group (0.95mm) then in the first (0.90mm) and the smallest in the second age group (0.89mm).

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