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Çürük Nedeniyle Dişlerin Mineralize Dokularında Oluşan Kayıplar KIBT ile Kantitatif Olarak Ölçülebilir mi?

Can the Loss of Mineralized Tissues of the Teeth Caused by Caries be Quantitatively Measured by CBCT?

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Özet

Bilindiği gibi günümüzde diş hekimliğinde yaygın olarak kullanılmaya başlanılan üç boyutlu konik ışınlı bilgisayarlı tomografiler (KIBT) ile elde edilen görüntülerde bilgisayar ortamında Hounsfield units (HU) skalası yardımıyla sert dokularının mineral yoğunlukları ölçülebilmektedir.

Çalışmamızda çeşitli nedenlerle elde edilmiş olan KIBT tarama görüntülerinden seçilmiş olan 15 çürük dişte çürük ve sağlıklı mine-dentin dokularından elde edilen HU skalası ölçüm değerleri karşılaştırılmıştır.

Bu öncül çalışmada, çürük diş mine ve dentin dokularının mineralizasyon yoğunluk ölçümünün yapılabilirliği bu sayede çürük dişlerin kantitatif değerler ışığında karşılaştırılabileceği belirlenmiştir. Ancak KIBT görüntüleri elde edilirken hastanın yüksek radyasyon dozlarına maruz kalmasından dolayı günümüz için çürük tespitinde klinik muayene ve geleneksel görüntüleme yöntemlerinin yeterli olduğu düşünüldü.

Clinical Research (HRU Int J Dent Oral Res 2022; 2(2): 82-85)

Anahtar kelimeler: Çürük, KIBT, Hounsfield skalası

Abstract

As it is known, the mineral density of hard tissues can be measured with the help of Hounsfield Units (HU) scale in the computer software in the images obtained by three-dimensional cone beam computed tomography (CBCT), which is widely used in dentistry today.

In our study, HU scale measurement values obtained from carious and healthy enamel-dentin tissues in 15 carious teeth selected from CBCT scan images obtained for various reasons were compared.

In this preliminary study, it was determined that the mineralization density measurement of decayed tooth enamel and dentin tissues could be measured, so that decayed teeth could be compared in the light of quantitative values. However, due to the exposure of the patient to high radiation doses while obtaining CBCT images, it was thought that clinical examination and traditional imaging methods were sufficient for the detection of caries today.

Keywords: Caries, CBCT, Hounsfield units

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Giriş

Diş hekimliğinde günümüze kadar koruyucu yöntemler ile azaltılabilmesi dışında kesin olarak çözüme ulaştırılamamış en büyük problemlerden biri diş çürükleridir.

Diş çürüğü, bakteri plağında bulunan karyojenik çürük yapıcı mikroorganizmaların fermente olabilen karbonhidratları metabolize ederek asit üretmesi sonucu, dişin sert dokularındaki dengenin bozulmasıyla meydana gelir. Çürük oluşumunda bireysel etmenlerin; genetik, çevresel, sosyal ve davranışsal faktörlerin etkili olduğu bilinmektedir (1).

Çürük, dişin dış tabakası olan mine kısmında başlar bu nedenle oral flora ve tükürük ile temas halinde olan diş mine dokusunun mineral içeriği önem arz etmektedir (2). Diş mine dokusu insan vücudunun en sert ve en mineralize dokusudur. Mine-dentin yapısı histolojik çalışmalar ile belirlenmiştir. Diş minesinin ağırlıkça yaklaşık %96'sı inorganik mineralize ve geri kalanı organik madde ve sudan oluşmaktadır (3). Dişin mineral kısmı prizmalar içinde birbirine sıkıca bağlanmış hidroksiapatit kristallerinden oluşmuştur(4). Mine prizmaları esasen mine-dentin birleşimine dik ve diş yüzeyine dışa doğru uzandığı belirlenmiştir (5, 6).

Bilgisayarlı tomografi temelinde oluşturulan KIBT görüntüleme teknolojileri, yapıların üç boyutlu olarak görüntülenmesini, yapının detayını, tahribatsız ve niteliksel analizine izin vermektedir. Ayrıca çeşitli dokuların yoğunluklarının belirlenmesine ve dokuların kapsamlı bir nicel analizini yapma fırsatı sunmaktadır (7).

Dişhekimliğinde mineralize dokuların analizi ve yoğunluk ölçümü çürük araştırmaları açısından önemlidir. KIBT'ın dişhekimliğinde kullanıma girmesiyle araştırmacılara, insanlarda ve deneysel örneklerde dental dokularda herhangi bir yıkım veya tahribat yapmadan mine, dentin ve kemik gibi mineralize dokuların mineral yoğunluklarını kantitatif olarak ölçme imkanı sunmuştur. Bu sayede farklı diş gurupları, dişlerdeki gelişimsel mineralizasyon bozuklukları ve farklı hasta gruplarının diş dokularını karşılaştırma imkanı oluşmuştur. Örneğin periapikal lezyonda dokulardaki mineral kayıpları ile tedavi sonrası mineralizasyonlar incelenip karşılaştırılabilmektedir (8).

KIBT dişhekimlerine bilimsel çalışmalarda birçok imkan sunmaktadır. Hounsfield Unit (HU) skalası bunlardan biridir. HU skalası, KIBT görüntülerinde mineral yoğunluğunu sayısal olarak ölçebilen bir yöntemdir. 1972 yılında Godfrey Newbold Hounsfield tarafından geliştirilmiştir.

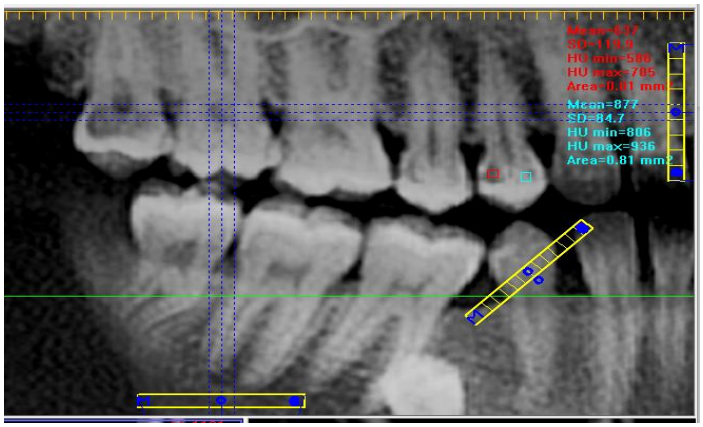
Farklı hasta gruplarında HU skalası kullanılarak kemik ve diş gibi mineralize dokuların yoğunluğu kantitatif olarak rakamsal değerler ile ölçülüp incelenebilir. KIBT taramasında HU skalasına göre dokuların durumunu -1000 ile +3000 arasında HU biriminde değer alır (9-12).

Bu çalışmanın amacı, KIBT ile diş mine ve dentin dokularındaki çürük şüphesi olan radyolüsens alanların mineralizasyon yoğunluk ölçümlerinin yapılabilirliği ve çürük tespitinde KIBT teknolojisinin kullanılabilir yöntem olup olmadığını incelemektir.

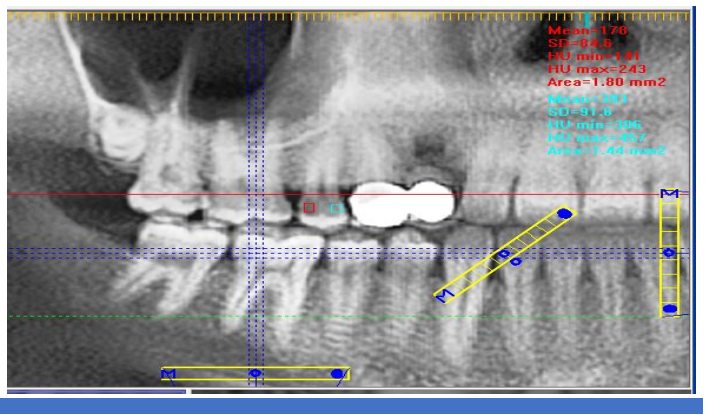
Bu öncül çalışmada, çürük diş mine ve dentin dokularının mineralizasyon yoğunluk ölçümünün yapılabilirliği göstermek ve bu sayede KIBT görüntülerinde dişlerde izlenen şüpheli radyolüsens alanların çürük ile ilişkilerinin kantitatif olarak belirlenip belirlenemeyeceği araştırılmıştır.

Materyal Metod

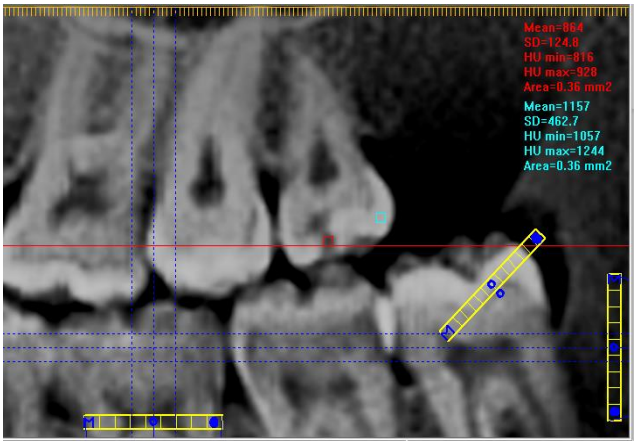
Çalışmada çürük 15 adet diş incelendi. Dişlerin KIBT (Imaging Science International, Hatfield, ABD) görüntüleri I-CAT VisionTM programı ile çürük mine, çürük dentin, sağlıklı mine ve sağlıklı dentin mineral yoğunluk değerleri ortalamaları HU sakalası mesio-distal yönde sagittal kesitte 2 mm2'lik alanda ölçülerek kaydedildi. (Resim 1a, 1b, 1c, 1d).



a



b



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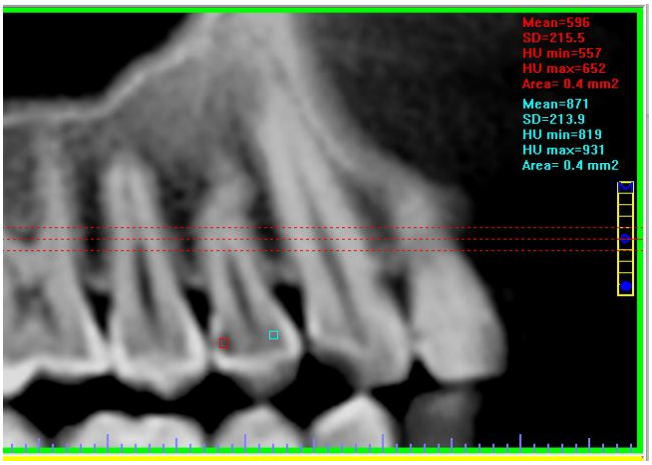


d

Resim 1a, 1b, 1c, 1d. KIBT ile mesio-distal yönde sagittal kesitte incelenen dişlerin HU skalası ile ölçüm görüntü örnekleri.

Çekim parametreleri 12 KvP, 5 mA ve 8.9 sn'de 0.3 voksel boyutunda KIBT taramaları yapılıp görüntü verileri elde edildi. Görüntüler cihazın hasta etrafında tek bir defa 360 derece döndürülmesi ile elde edildi ve tüm görüntüler Digital Imaging DICOM formatında kaydedildi. Çalışmada daha önce çeşitli tedavi gereksinimleri nedenleriyle çekilmiş olan KIBT görüntü verileri kullanıldı. Diş görüntülerinde dişlerin çürük mine, çürük dentin, sağlıklı mine ve sağlıklı dentin mineralizasyon yoğunlukları HU skalası ile tespit edilip karşılaştırıldı.

Çalışma Dicle Üniversitesi Diş Hekimliği Fakültesi Etik Kurulu izni ile onaylanmış ve Etik Prensiplere uygun olarak yapılmıştır.

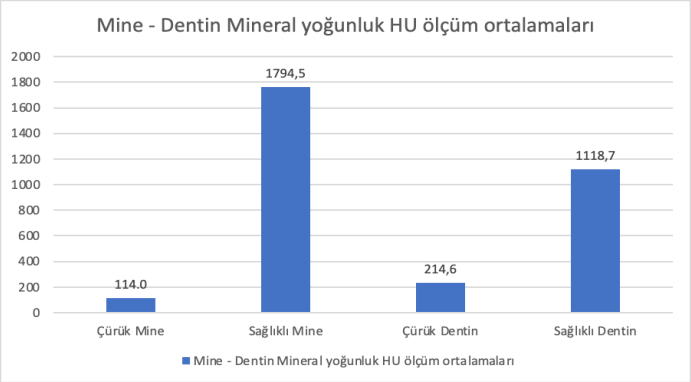
Verilerin ölçüm değerleri Shapiro-Wilk testine göre normal dağılıp dağılmadığı incelendi. Shapiro-wilk testi sonucuna göre veriler normal dağılış gösterdiğinden grupların karşılaştırılmasında parametrik testlerden İki bağımsız grubun ortalamalarını karşılaştıran student's t testi uygulandı. Gruplar arasında fark istatistiksel olarak önemli bulundu P<0,05. Tanımlayıcı istatistiklerin gösteriminde ortalama□standart sapma kullanıldı.

Bulgular

Örneklerin HU skalası ölçüm değerleri istatistiksel olarak anlamlı derecede farklı bulundu P<0.05.

N=15	Mine - Dentin Mineral yoğunluk HU Skalası ölçüm ortalamaları
Çürük Mine	114,0
Sağlıklı Mine	1794,5
Çürük Dentin	214,6
Sağlıklı Dentin	1118,7

Tablo 1. Çürük ve sağlıklı mine-dentin dokularından HU skalası ile elde edilen mineralizasyon yoğunluk ortalamaları (P<0.05).



Grafik 1. Çürük ve sağlıklı mine - dentin dokularından HU skalası ile elde edilen mineral yoğunluk ortalamaları farklarının grafik görünümü (P<0.05).

Çalışmada incelenen dişlerden elde edilen çürük mine, çürük dentin, sağlıklı mine ve sağlıklı dentin mineral yoğunluk HU skalası ölçüm ortalamaları tablo 1 ve grafik 1'de görülmektedir.

Tartışma

Dişhekimliğinde günümüze kadar en çok araştırılan konuların başında diş çürükleri gelmektedir. Çürüğün diş mine ve dentin dokusunun mineral içeriğinde kayıp ile karekterize olduğu bilinmektedir.

Dişlerin morfolojileri, kapsamlı bir şekilde incelenmiş olmasına rağmen, dişlerin mineral yoğunluğu geçmiş teknolojiler ile klinik olarak değerlendirilememiştir. Günümüzde teknolojik imkanların gelişmesiyle

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bireylerde in-vivo olarak elde edilen KIBT görüntüleri sayesinde mineral yoğunluk ölçümleri yapılabilmesi imkanı ortaya çıkmıştır. Ayrıca deneysel amaçlarla mikro-CT kullanılarak diş mineral yoğunluklarının in-vitro olarak ölçülebildiği bilinmektedir. KIBT görüntü verilerinde, Mimics gibi görüntü değerlendirme, modelleme ve geliştirme yazılımları sayesinde kalsifiye diş yapılarının 3 boyutlu izole görüntüleri ve mineral yoğunlukları hesaplanıp incelenebilmektedir (13).

Çalışmamız öncül bir çalışma niteliğindedir. Dişlerin mineral yoğunluk ölçümleri KIBT görüntü verilerinde HU skalası yardımıyla gerçekleştirilmiş, dişlerin çürük ve sağlıklı mine-dentin dokularının mineral yoğunlukları kantitatif ölçülüp karşılaştırılmıştır. Elde edilen verilerde dişlerin çürük ve sağlıklı yapılarının tamamında mine ve dentin HU mineral yoğunluk ölçüm değerleri arasında anlamlı farklılıklar görüldü ($P<0.05$) (Tablo 1, Grafik 1).

Çürük dişlerden HU skalası ile elde edilen tüm mine ve dentin mineral yoğunluk değerleri sağlıklı taraftan elde edilen değerlerden istatistiksel olarak önemli derecede düşük bulundu ($P<0.05$).

Çürük mineden elde edilen HU değerlerinin çürük dentinden elde edilen değerlerinden düşük olmasının nedeni, çürüğün ilk mine dokusunda yıkım yapması dentin dokusunda yıkımın ilk aşamalarda olmamasından kaynaklandığı düşünüldü.

Bu bilgiler ışığında diş sert dokularının HU skalası ile mineral yoğunluğunun ölçülebilirliği, mine ve dentinin çürükten ne kadar etkilediği, invivo olarak diş dokularına hasar vermeden çürük analizlerinin yapılabileceği görüldü. Büyüme ve gelişme bozuklukları çalışmalarında mineral yoğunluğu analizlerinin yapılabileceği, sonuçların yüksek güvenirlikte ölçüm değerleri ile gösterilebileceği düşünüldü.

Literatürde 3D KIBT görüntü verileri kullanılarak dişlerin mineral yoğunluk farklılıklarını değerlendiren in vivo bir çalışmaya rastlanmamıştır. Bu araştırma öncül çalışma olma niteliğindedir. Çalışmamızda elde ettiğimiz verilerin ve yöntemin gelecekteki benzer araştırmalar için yeni fikirler verebileceği, çürüklerin erken tespitinde, mine ve dentin mineralizasyonları ile ilgili mekanizmaların incelenmesinde kantitatif olarak sayısal bir standart oluşturulması, araştırıcının yorumundan etkilenmemesi açısından önemli olduğu düşünüldü.

Sonuçlar

KIBT teknolojisi ile dişlerin HU skalası biriminde mineral yoğunluklarının ölçülebilirliği dişhekimliği araştırmaları için önemli bir gelişmedir, ancak geleneksel röntgen görüntüleme yöntemlerine göre radyasyon dozu çok yüksek olan KIBT görüntüleri günümüz için çürük tespitinde kullanılabilecek bir yöntem olarak değerlendirilmedi. Bunun yerine klinik muayene ve geleneksel görüntüleme yöntemlerinin çürük tespitinde yeterli olduğu düşünüldü. Araştırmacıya farklı açı ve düzlemlerden radyolüsens alanların yoğunluk ölçümlerini yapabilme imkanı sunmaktadır. KIBT teknolojisinin geliştirilmesi ile hastaya verilen radyasyon dozunun kabul edilebilir sınırlarda olması durumunda dişhekimliği alanında daha çok kullanılabilir olabileceği düşünüldü.

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Anatomic Variations and Lesions in Mandibular First Molar Region Detected with Cone Beam Computerized Tomography

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Abstract

Background: The aim of the present study was to evaluate the submandibular fossa (SF) depth, periodontal bone loss (PBL), furcation defects (FD) and periapical (PA) status in mandibular first molar region with cone beam computerized tomography.

Materials and Methods: The retrospective study consisted of CBCT images of 402 mandibular posterior regions from 201 patients. The CBCT scans were assessed to detect the prevalence of SF depth, PBL, FD and periapical status. X2-test was used to detect whether there were significant differences in the prevalence of PBL, PA status, FD, and SF by gender and by age, by occlusion. Pearson's coefficient was applied to evaluate the correlation between variables.

Result: 90 females, 111 males, mean age of 30.52±13.08) were examined. There were significant associations between age and SF depth, PBL, FD, PA status at both right and left sides ($p<0.05$).There were statistically significant difference among the FD and PBL with regard to occlusal contact at right side ($p<0.05$). Also, age was correlated with SF depth, PBL, FD, PA and gender was correlated with PBL, FD.

Conclusion: CBCT should be preferred after a detailed and careful clinical evaluation, especially in complex cases where invasive treatment approaches such as regenerative and dental implant surgery are considered as conventional 2D radiography is not sufficient**.**

Research Article (HRU Int J Dent Oral Res 2022; 2(2): 87-94)

Keywords: Anatomy, radiology, CBCT, dental implants, furcation defect.

Introduction

The role of radiology in dental treatment planning is increasing with the development of imaging methods (1). Normal anatomical structures, pathologies, traumas, impacted teeth, paranasal sinus neighborhoods, cysts and tumors can be easily evaluated with cone beam computerized tomography (CBCT) technique (2).

In dentistry, CBCT is mostly used for the evaluation of teeth and surrounding anatomic structures during the treatment planning. One of the most significantly used treatment is dental implants where the size of the bone and the localization of the anatomical structures must be known (3). Submandibular fossa (SF) is a significant anatomic structure in the posterior mandibular region that should be evaluated before implant treatment (4).

CBCT also provides convenience in the identification of periodontal diseases characterized by periodontal bone defects especially with three dimensional (3D) images (5, 6). Defects formed as a result of the pathologic resorption of the bone between the roots of multi-rooted teeth are defined as furcation defects (FD). FD is a complex periodontal disorder due to its anatomic and morphologic features, and difficult to diagnose and treatment (7).

CBCT plays an important role in the diagnosis and treatment of periapical lesions. Detection of the apical lesions of the teeth and the choice of the treatment method to be applied afterwards, provides a great benefit to the practitioner compared to conventional two-dimensional radiographs. Early diagnosis of periapical bone lesions affects treatment success and prognosis positively (8-10).

Therefore the purpose of this study was to evaluate the diagnostic value of CBCT in examining the 3D topography of SF depth, periodontal bone loss (PBL), FD

defects and periapical status in mandibular first molar region.

Material and Methods

The Institutional Review Board approved this retrospective clinical study (approval number: 05.10.2017-13/31). The CBCT images of 423 patients were evaluated, and 222 patients were excluded for any of the following reasons: unilateral or bilateral 1st molar teeth, loss of having had previous surgical procedures, bone grafting in the posterior mandible, jaw fracture, presence of metallic artifacts and non-diagnostic, low-resolution quality of CBCT images. Therefore, this study consisted images of 402 mandibular posterior regions from 201 patients (90 female and 111 male patients; mean age 30.52± 13.08 years; range 10-67 years).

All images were obtained at the Department of Dento-Maxillofacial Radiology between 2017 and 2019. Patients who were seeking dental and/or oral treatments (i.e., dental implants, endodontic procedures, oral/periodontal surgery, orthodontics, and treatment of oral diseases) were included.

1. CBCT Image Analysis

CBCT images of all patients were obtained with the Planmeca Promax 3D Mid (Planmeca Oy, Helsinki, Finland, 2012) CBCT device. The operating parameters of the device are 90 kV, 10 mA and 36 sec. The voxel size of the obtained images was 0.4 mm and cross-sectional thickness was 0.40 mm. The images of mandible obtained by successive irradiation of FOV size 16x9 cm were combined with Romexis 2.92 software program (Planmeca Oy, Helsinki, Finland). All images were reviewed and all the measurements were performed by one calibrated examiner (F.O.).

2.Assessment of Submandibular Fossa Depth

Cross- sectional view were used to determined the depth of the SF. A line was placed on the most prominent superior and inferior points of the lingual concavity, and a second line was drawn from the deepest point of the concavity perpendicular to the first line Figure 1.
SF groups were classified as:(11)
Group I: a flat impression < 2 mm deep,
Group II: a 2 to 3 mm concavity,
Group III: a concavity > 3 mm.

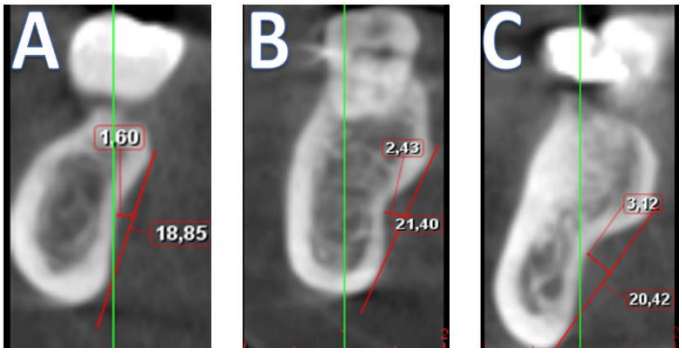

Figure 1: Crossectional CBCT section identifying the submandibular fossa depth. (A) a flat impression < 2 mm deep, (B) a 2 to 3 mm concavity, (C) a concavity > 3 mm.

3. Assessment of Periodontal Bone Loss

Panoramic view was used to evaluate PBL in CBCT images. The percentage of normal periodontal bone height was calculated at mesial and distal sides of each tooth. To assess the level of PBL, the distance between the point 2 mm under the cemento enamel junction and the upper point of the alveolar bone was measured. The extent of PBL was classified as described before: (12)
Group 1: normal to mild, < 25% bone loss
Group 2: moderate, 25% to 50% bone loss
Group 3: severe, > 50% bone loss

4. Assessment of Furcation Defect

Sagittal and axial views were used to assess furcation defect (13) (Figure 2).
Group I:There is no bone loss in furcation region
Group II: There is vertical bone loss in furcation region but not horizontal bone loss.
Group III: There is a horizontal bone loss in furcation region but the destruction of furcation region does not include all.
Group IV: Complete loss of interradicular bone at furcation site bone destruction is such that the transition from one to the other.

5. Assessment of PA status

The PA index scoring system was used to assess PA status as described previously: (14)
Group I: Normal periapical structure
Group II: Minor changes in bone structure
Group III: Changes in bone structure with mineral loss
Group IV: Periodontitis with prominent radiolucent area
Group V: Severe periodontitis characterized by exacerbation

The study patients were also classified by gender by occlusion (Group I: No teeth opposite arch, Group II: Teeth at opposite arch) and by age in years as under Group I: 25 years, Group II: 25 to 50 years, and Group III: over 50 years

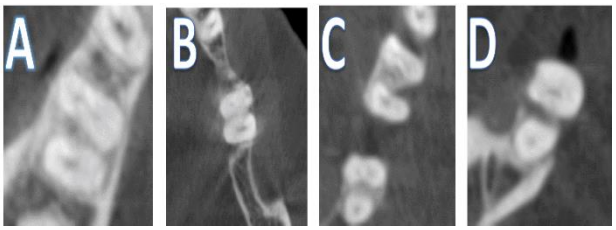

Figure 2: Axial CBCT section identifying the furcation defect . (A) no bone loss in furcation region. (B) There is vertical bone loss in furcation region but not horizontal bone loss. (C) There is a horizontal bone loss in furcation region but the destruction of furcation region does not include all. (D) Complete loss of interradicular bone at furcation site bone destruction is such that the transition from one to the other

Statistical analysis

X2-test was used to detect whether there were significant differences in the prevalence of PBL, PAstatus, FD, and SF by gender and by age, by occlusion pattern in both the left and right sites P values less than 0.05 were considered statistically significant. Pearson's coefficient was applied to evaluate the correlation between variables. All computations were performed by using SPSS version 23.0 (SPSS Inc., Chicago, IL, U.S.A).

Results

The CBCT images of 402 mandibular posterior regions from 201 patients (90 females, 111 males, mean age of 30.52±13.08) were examined. At right sides, 91.1% of mandibular first molar teeth were in occlusal contact and in left side 93.6% were in occlusal contact.

SF depth ranged from 0.3mm to 7.2 mm. The mean SF was 2.30±0.97 mm. SF depth of less than 2 mm, 2 to 3 mm, and more than 3 mm were observed 39.7%, 38.8%, and 21.3% of the images, respectively. The average SF depth of males, and females were 2.34±1.04 mm, and 2.26±0.88 mm, respectively. There were no significant associations between gender and SF at both right and left sides (p=0.842, p=0.310). When SF depth evaluated according to age groups, there were significant associations between age and SF depth at both right and left sides (p=0.012, p=0.001). Occlusion had no significant effect on SF depth (p=0.491, p=0.122) (Table 1).

Group I PBL was observed in 48.8% of males and 43.3% of females, and group II PDL was observed in 6.5% of males 1.5% of females. PBL was significantly associated with gender at right side (p=0.004) and occlusal contact at right side (p=0.028). Table 2 shows the association between gender, age and occlusal contact and the degree of PBL.

Table 1. Differences related to age, gender, side and occlusion of depth of SF

	Right Submandibular fossa depth				**Left** Submandibular fossa depth			
	I	II	III	p	I	II	III	p
Gender								
Male	49(24.3%)	39(19.4%)	23(11.4%)	0.841	42(20.9%)	42(20.9%)	27(13.4%)	0.310
Female	36(17.9%)	33(16.4%)	21(10.4%)		33(16.4%)	42(20.9%)	15(7.5%)	
Age								
Group I	54(26.8%)	32(15.9%)	20(9.9%)	**0.012***	56(27.9%)	39(19.4%)	15(7.5%)	**0.001***
Group II	22(10.9%)	32(15.9%)	15(7.4%)		13(6.5%)	37(18.4%)	22(10.9%)	
Group III	7(3.4%)	4(1.9%)	15(7.4%)		6(3%)	8(4%)	5(2.5%)	
Occlusion								
I	76(37.8%)	65(32.3%)	42(20.8%)	0.491	70(34.8%)	76(37.8%)	42(20.9%)	0.122
II	8(3.9%)	6(2.9%)	4(1.9%)		5(2.5%)	8(4%)	0(0%)	

*p<0.05 statistically significant

Table 2. Association between periodontal bone loss and gender, age, occlusion

	Right Periodontal Bone Loss			Left Periodontal Bone Loss		
	<25%	25-50%	p	<25%	25-50%	p
Gender						
Male	96 (47.8%)	15(7.5%)	**0.004***	100 (49.8%)	11(5.5%)	0.115
Female	88(43.8%)	2(1%)		86(42.8%)	4(2%)	
Age						
Group I	106 (52.7%)	4(2%)	**0.013***	106 (52.7%)	4(2%)	**0.019***
Group II	63 (31.3%)	9(4.5%)		65 (32.3%)	7(3.5%)	
Group III	15 (7.5%)	4(2%)		15 (7.5%)	4(2%)	
Occlusion						
I	170 (84.6%)	13(6.5%)	**0.028***	173 (86.1%)	15(7.5%)	0.290
II	14(7%)	4(2%)		13(6.5%)	0 (0%)	

*p<0.05 statistically significant

FD was observed in 77.3% of the arches, in which 40.55% were group I, 30.55% were group II, and 6.25% were group III. FD was significantly associated with age at both right (p=0.001) and left sides (p=0.01). There was no significant association between gender and FD at both right and left side (p=0.093, p=0.063). There was a statistically significant difference among the FD with regard to occlusal contact at right side (p=0.01) (Table 3).

PA lesions were found in 41.8% of the alveolar crests in which 23.7% of males and, 18.2% of female patients. No significant association between PA lesions and gender (p=0.817) and lateralizations (p=0.650) were detected. Age is an important factor affecting PA status at both right and left sides (p=0.003, p=0.006) (Table 4).

Table 5 show that age was correlated with SF depth, PBL, FD, PA and gender was correlated with PBL, FD.

Table 3. Differences related to age, gender, side and occlusion of furcation classification

	Right Furcation classification					Left Furcation classification				
	0	I	II	III	p	0	I	II	III	p
Gender										
Male	26(12.9%)	39(19.4%)	35(17.4%)	11(5.5%)	0.093	27(13.4%)	36(17.9%)	40(19.9%)	8(4%)	0.063
Female	21(10.4%)	42(20.9%)	25(12.4%)	2(1%)		17(8.5%)	46(22.9%)	23(11.4%)	4(2%)	
Age										
Group I	35(17.4%)	47(23.4%)	26(12.9%)	2(1%)	**0.001***	33(16.4%)	45(22.4%)	29(14.4%)	3(1.5%)	**0.01***
Group II	10(5%)	28(13.9%)	27(13.4%)	7(3.5%)		9(4.5%)	32(15.9%)	25(12.4%)	6(3%)	
Group III	2(1%)	6(3%)	7(3.5%)	4(2%)		2(1%)	5(2.5%)	9(4.5%)	3(1.5%)	
Occlusion										
I	43(21.4%)	80(39.8%)	52(25.9%)	8(4%)	**0.001***	38(18.9%)	81(40.3%)	58(28.9%)	11(5.5%)	0.051
II	4(2%)	1(0.5%)	8(4%)	5(2.5%)		6(3%)	1(0.5%)	5(2.5%)	1(0.5%)	

*p<0.05 statistically significant

Table 4. Association between periapical status and gender, age, occlusion

	Right						Left					
	Periapical status						Periapical status					
	I	II	III	IV	V	p	I	II	III	IV	V	p
Gender												
Male	61(30.3%)	28(13.9%)	11(5.5%)	8(4%)	3(1.5%)	0.810	66(32.8%)	20(10%)	16(8%)	6(3%)	3(1.5%)	0.850
Female	56(27.9)	20(10.0)	7(3.5)	4(2)	3(1.5%)		51(25.4%)	22(10.9%)	11(5.5%)	4(2%)	2(1%)	
Age												
Group I	77(38.3%)	24(11.9%)	5(2.5%)	3(1.5%)	1(0.5%)	**0.003***	75(37.3%)	23(11.4%)	8(4%)	4(2%)	0(0%)	**0.006***
Group II	33(16.4%)	18(9%)	10(5%)	6(3%)	5(2.5%)		35(17.4%)	16(8%)	13(6.5%)	4(2%)	4(2%)	
Group III	7(3.5%)	6(3%)	3(1.5%)	3(1.5%)	0(0%)		7(3.5%)	3(1.5%)	6(3%)	2(1%)	1(0.5%)	
Occlusion												
I	111(55.2%)	43(21.4%)	12(6%)	12(6%)	5(2.5%)	**0.002***	109(54.2%)	40(19.9%)	26(12.9%)	8(4%)	5(2.5%)	0.414
II	6(3%)	5(2.5%)	6(3%)	0(0%)	1(0.5%)		8(4%)	2(1%)	1(0.5%)	2(1%)	0(0%)	

*p<0.05 statistically significant

Table 5. Correlations regarding to age, gender and occlusion with SF depth, periodontal bone loss, furcation classification and periapical status

	Submandibular fossa depth		Periodontal bone loss		Furcation classification		Periapical status	
	r	p	r	p	r	p	r	p
Gender	0.042	0.405	0.158	**0.001***	0.106	**0.033***	0.048	0.336
Age	0.269	**0.001***	0.187	**0.001***	0.312	**0.001***	0.304	**0.001***
Occlusion	0.077	0.124	0.053	0.291	0.094	0.059	0.077	0.12

*p<0.05 statistically significant

Discussion

New diagnostic imaging methods have been developed based on technological advances in computer systems. CBCT devices, available at lower prices than CT machines, provide dentists with valuable diagnostic information (15). Cross-sectional images obtained with CBCTs allow the dentist to evaluate the area more accurately than conventional 2 dimensional imaging methods (16).

The most important part of the examination of the tomography obtained from the surgical site in the evaluation before the dental implant surgery is to evaluate the relationship between the anatomical structures and variations of the region where the dental implant will be applied (14). The depth of SF is one of the most important parameters that should be evaluated in the mandibular posterior region before dental implant surgery to eliminate perforation of the lingual bone cortex and to eradicate potentially dangerous complication (17, 18).

Evaluation of SF by preoperative palpation or flap elevation with a direct view is insufficient for a safe surgery (19). In the literature, many studies have been reported on lingual cortex perforation after dental implant placement (20, 21). Souze et al. reported that the depth of SF should be evaluated carefully, especially in the mandibular molar region not the premolar areas (19).

According to the results of the present study, the depth of SF showed no significant difference according to gender and occlusion status of both right and left sides. However, a statistically significant relationship was determined according to age groups. Group I SF was more common in group I, and group II SF was more common in group II. We think that submandibular fossa depth increases with increasing bone resorption with age. Contrary to our results, Parnia et al investigated no significant differences among age categories (11). The differences between our study and Parina may be based on different classifications used or the presence of age.

One of the most common groups of periodontal diseases is periodontitis characterized by alveolar bone loss (22). The success of periodontal treatment depends on many factors. One of the most important factors is the accurate

visualization of periodontal bone destruction and morphology of bone defects for treatment planning (23). It is reported that only 21% of the angular defects in periodontal diseases can be detected by panoramic radiographs, 32% by periapical radiographs, and 43% of angular bone defects can be detected with both methods (22). The results of the present study showed that PBL was more common in men than in women. Bone destruction was increased with age. Helmi et al reported that males had a higher risk of developing periodontal diseases with significantly higher alveolar bone loss compared to females (24) and this result coincided with similar results reported in literature indicating that males having higher risk of developing the disease (25, 26). A study conducted by Eke et al. to evaluated the prevalence of periodontal diseases in adults where older age groups had a higher risk and proportion of periodontitis compared to younger age groups (25)

CBCT is a valuable imaging technique especially for the diagnosis of intra-bony defects, furcation involvement and buccal / lingual bone destructions (27). Early diagnosis of bone defects is crucial for successful results in periodontal treatment. In the literature, studies comparing the 3D and 2D imaging methods for the detection of alveolar bone defects have shown that CBCT has a sensitivity of 80-100% for the detection of bone defects, and 63-67% for intraoral radiographs (28). In order to detect bone resorption on conventional radiographs, excessive mineral loss (30-50%) is required in the bone (29). Therefore, bone lesions may be overlooked in the initial stage by conventional radiographs. Early diagnosis of FDs is very important in the success rate of periodontal treatment (13).

Current study also found that group 0 was 22.6%, group I was 40.55%, group II was 30.55% group III was 6.25%. The result of this study showed that mean ages were statistically higher in group III group, and statistically lower in the group 0 when compared with other groups. Previous research demostrated that the prevalence and severity of FD increased with age (30, 31). Recent studies demostrated that PBL increased with age (12, 14). No significant relationship was found between gender and FD. Similar to our study, Ozcan et al. reported that gender was not an important parameter affecting the furcation defects (32).

Evaluation of periapical region and detection of changes in this area is one of the most important steps in the planning of diagnosis and treatment of dental diseases. Because of the diagnostic confusion in the diagnosis of these periapical changes, these lesions can often be difficult to diagnose, difficult to treat, and costly. Traditional techniques have been preferred for many years in dental applications despite some diagnostic deficiencies. In traditional and digital techniques, which are 2D, approximately 30-50% of the bone destruction is required to detect lesions (33). Distortion, magnification, superposition, narrow areas of imaging and application errors are limited to the reasons such as, sometimes can give false information. CBCT gives 3D (axial, coronal and sagittal) images. These cross-sectional images are used as a reliable technique in the evaluation of root canal lesions and root canal treatments (34). Patel et al. reported that the success of both imaging systems in detecting periapical lesions was reported as 100% and 24.8%, respectively when CBCT sections and intraoral radiography images were compared (35).

In the present study shown, 58.2% of teeth had no periapical lesions, while 22.4% had group II, 11.25% had group III, 5.5% had group IV, and 2.75% had group V. The frequency of periapical lesions increases with age. Previous studies reported that periapical and periodontal lesions were increased with age (12, 14). We think that this result may be associated with longer exposure of teeth in the oral cavity having physiological and pathologic factors such as aging. Similar to our results Keser et al. reported that no statistically significant difference was found between the number of teeth with lesion in male and female subjects (36). Ampara et al observed that no significant associations between periapical lesions and gender (37).

Conclusion

CBCT should be preferred after a detailed and careful clinical evaluation, especially in complex cases where invasive treatment approaches such as regenerative and dental implant surgery are considered as conventional 2D radiography is not sufficient**.** According to the findings of the present study, while the effect of age on the anatomical structures and parameters examined was high, gender had an effect only on periodontal bone loss.

Occlusal status was found to be important in PDL, FD, PA evaluations in the right side of the patients.

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Ethical approval

The ethical approval was released by Institutional Review Board Approval of Firat University (05.10.2017-13/31).

Informed consent

For this type of study, formal consent is not required.

Declaration of competing interest

The authors declare that has no conflict of interest.

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Prevalence of Tongue Anomalies in Turkish Children in the Eastern Anatolia Region

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Abstract

Background: In this study, the prevalence of tongue anomalies in children was investigated according to age, gender, systemic diseases, and allergies.
Materials and Methods: Eight hundred children ages 3-14 were examined. The age (3-6, 7-10, 11-14 years), sex and tongue anomalies (fissured tongue, geographic tongue, ankyloglossia, atrophic tongue, hairy tongue) were recorded together with any history of systemic diseases and allergies.**Results:** 800 children in total (mean age:8.37±2.8 years) were evaluated; 414 (51.8%) females, 386 (48.3%) males. The number of children determined to have tongue anomalies was 94 (11.7%). The most common tongue anomaly was fissured tongue, followed by ankyloglossia, geographic tongue, and atrophic tongue. While the prevalence of fissured tongue increased due to age, the prevalence of geographic tongue decreased (p=0.00). The number of children with a fissured tongue accompanied by a geographic tongue was 6(0.8%). Of the children, 5.1% (n=41) had systemic disease, 1.5% (n=12) were allergic, and 1.1% (n=9) were syndromic. Tongue anomaly was found in 6 children with systemic disease, and in 1 of the syndromic patients, no tongue anomalies were found in children with a history of allergy. Tongue anomalies were more common in males.
Conclusions: Assessment of tongue anomalies during the pediatric examination may provide clues in determining the child's lifestyle, eating habits, and underlying systemic diseases.

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Keywords: Fissured tongue, geographic tongue, pediatric population, systemic disease, tongue anomalies.

Introduction

The term "tongue anomalies" includes many conditions. Some of these are primarily of little clinical significance to be considered normal variants. Some are significant deformities of the tongue, which in most cases help identify a group of diverse conditions that show evidence of some hereditary syndromes and developmental etiologies (1,2).

In epidemiological studies on children, there are differences in the prevalence of tongue anomalies (3-8). The most common conditions are fissured (3-5) and geographic tongue (6,7). Fissured tongue is a relatively common condition that is characterized by the presence of numerous grooves or fissures on the dorsal tongue surface. It has been reported that fissured tongue is seen in patients with Down syndrome, acromegaly, psoriasis, Sjögren's syndrome, and Melkersson-Rosenthal syndrome (10). Geographic tongue (GT) is characterized by the loss of filiform papillae, leading to denuded lesions that rapidly undergo change and migrate in a map-like pattern. The lesions typically change over time, with periods of remission (10). Some studies report that geographic and fissured tongue prevalence differences may be due to geography and ethnic origin. Also, it is thought that there may be a connection between the formation of a geographic tongue and fissured tongue (9).

Ankyloglossia is a congenital developmental anomaly of the tongue characterized by a short, thick lingual frenulum resulting in limitation of tongue movement (10). Atrophic tongue or smooth tongue results from atrophy of the filiform papillae, which is well known due to nutritional deficiencies such as vitamin B12, folic acid, or iron. Etiological factors of these conditions include nutritional deficiencies and diabetes, xerostomia, and candidiasis (10). Hairy tongue, excessive accumulation of keratin in the filiform papillae

on the dorsum of the tongue leads to the formation of long hair-like threads (10). To in out knowledge, only a few studies have reported the prevalence of tongue anomalies in children, such as ankyloglossia, atrophic tongue, and hairy tongue (3,5-7).

Traditionally, tongue anomalies have been considered disorders of primary concern regarding oral and general health (11). However, the lack of standard methods to determine tongue anomalies in healthy children and the lack of epidemiological data due to different diagnostic criteria may cause these anomalies to be overlooked. The epidemiological literature in this area, especially on children, is limited (12) despite the recommendations of the World Health Organization. Additionally, the signs and symptoms of oral mucosal disorders in childhood may change with age, and their prevalence may differ from adult oral pathologies.

The purpose of this study was to learn more about the prevalence of tongue anomalies, which are commonly seen in pediatric dentistry.

Materials and Methods

In this study, 800 Turkish patients between the ages of 3- 14 who came for a routine dental check-up at Inonu University, Department of Pediatric Dentistry, were examined in terms of various tongue anomalies. Again, all of the patients consisted of Turkish children living in the Eastern Anatolia region. Required permissions and approvals for this study were obtained from the Ethics Committee of the university (2022/2981). All patients had their parents' informed consent and consent for data use, and the study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

A pre-designed structured questionnaire recorded age, gender, and systemic disease details. After the anamnesis, a systematic, comprehensive oral clinical examination aided by dental light and mouth mirrors was carried out on all patients. The tongue was examined for surface differences, specific anomalies, and movements. The clinical examination of the oral mucosa and tongue was performed according to World Health Organization (WHO) guidelines (13). Five types of tongue anomalies, namely fissured tongue, geographic tongue, partial ankyloglossia, hairy tongue, and atrophic tongue, were identified in this series. Children were divided into three groups according to age: 3–6, 7–10, and 11–14 years. The data were analyzed according to age groups.

All patients were examined by previously calibrated trained examiners. Photographs of the patients' tongues which were thought to have tongue anomalies, were taken and stored. In those cases where there were differences in the diagnoses reached by the examiners, the case was discussed and re-evaluated until a common diagnosis was achieved. Diagnosis of tongue anomalies was made based on the consensus of all two examiners. Where this failed, the case was excluded from the study series.

Statistical analysis

Data were analyzed using Microsoft Excel 2010 (Microsoft Corporation, Redmond, Washington, USA) and SPSS 21.0 (IBM, Chicago, USA) programs, and presented using descriptive statistics and Pearson's chi-squared test. P-values of < 0.05 were regarded as statistically significant.

Results

Eight hundred children in total (mean age: 8.37±2.8 years) were evaluated, of which 414 (51.8%) were females and 386 (48.3%) males. The number of children determined to have tongue anomalies was 94 (11.7%). Although it was designed for five types, one type (hairy tongue) has never been observed. The most common tongue anomaly was fissured tongue (7.5%) (Fig. 1a), followed by ankyloglossia (2.8%), geographic tongue (2.3%) (Fig. 1b), and atrophic tongue (0.1%), respectively.

The distribution of tongue anomalies by different age groups is shown in Table 1. The prevalence of the most common fissured tongue increased with age. Prevalences determined were 1.7% in the 3-6 age group, 7.3% in the 7-10, and 14% in the 11-14 age group. The prevalence of geographic tongue anomalies decreased with age, unlike fissured tongue. Prevalences were determined as 4.3% in the 3-6 age group, 2.5% in the 7-10 age group, and not found in the 11-14 age group. The difference between the ages was statistically significant (p=0.00).

Most of the children had one type of anomaly, and 1.1% (n=9) of the children had two types of anomalies together. The number of children with fissured tongue anomalies accompanied by geographic tongue was 6 (0.8%) (Fig. 1c). Two (0.3%) children were detected with both ankyloglossia and fissured tongue anomalies. The number of children with geographic tongue accompanied by ankyloglossia tongue anomaly was 1 (0.1%).

The distribution of tongue anomalies by gender is shown in Table 2. The prevalence of tongue anomalies in males was higher than in females (p=0.347).

The prevalence of fissured tongue and ankyloglossia were higher in males, while the prevalence of geographic tongue was higher in females.

According to the anamnesis taken from the parents, 5.1% (n=41) of the children had the systemic disease (heart, diabetes, thyroid, epilepsy, etc.), 1.5% (n=12) were allergic, and 1.1% (n=9) were syndromic (autism, down, etc.).While tongue anomaly was found in 6 children with systemic disease and 1 of the syndromic patients, no tongue anomaly was found in children with a history of allergy. Three of the children with systemic diseases (1 asthma, one heart failure, one blood pressure + one kidney) had fissured tongue, 1 (asthma) atrophic tongue, 2 (1 asthma, 1 epilepsy) ankyloglossia tongue was detected.

The fissured tongue was detected in one child with the syndrome (down syndrome).

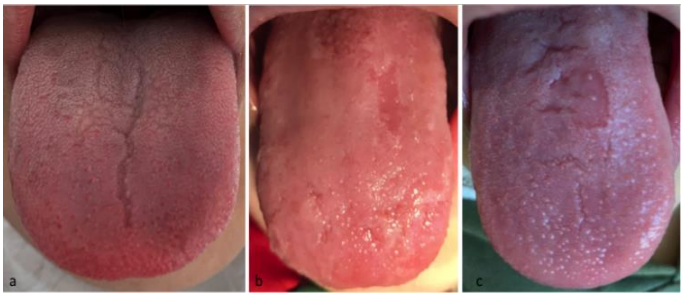

Figure 1: Tongue anomalies **a**; fissured tongue,
b; geographic tongue,
c; combined anomaly of fissured and geographic tongue.

Table 1. Prevalence of tongue lesions according to age groups.

		Anomalies (some of the children had several anomalies)					
Age Groups* (years)	Children n (%)	Fissured tongue n (%)	Geographic tongue n (%)	Ankyloglossia n (%)	Atrophic tongue n (%)	No lesions n (%)	P value
3-6	230	4 (1.73)	10 (4.34)	4 (1.73)	-	214 (93.04)	
7-10	356	26 (7.30)	9 (2.52)	11 (3.08)	-	315 (88.48)	0.000*
11-14	214	30 (14.01)	-	8 (3.73)	1(0.46)	177 (82.71)	
Total	800	60 (7.5)	19 (2.37)	23 (2.87)	1(0.12)	706 (88.25)	

* Chi-squared test, ** p<0.05.

Table 2. Prevalence of tongue lesions according to gender.

		Anomalies (some of the children had several anomalies)					
Gender*	Children n (%)	Fissured tongue n (%)	Geographic tongue n (%)	Ankyloglossia n (%)	Atrofic tongue n (%)	No lesions n (%)	P value
Female	414	29 (7.00)	11 (2.65)	9 (2.17)	-	370 (89.37)	
Male	386	31 (8.03)	8 (2.07)	14 (3.62)	1 (0.25)	336 (87.04)	0.347
Total	800	60 (7.5)	19 (2.37)	23 (2.87)	1 (0.12)	706 (88.25)	

* Chi-squared test.

Discussion

Tongue anomalies are a common condition in the population. While tongue anomalies sometimes progress with systemic diseases, they can sometimes be seen with an underlying etiology, such as the habits of the living area, the nutritional characteristics, and the drugs used (10). Ethnicity can also create differences in the prevalence of hereditary tongue anomalies (3). In addition, the rate of tongue anomalies in children and adults varies (6, 9). Although previous studies (4, 7, 11) that determine tongue anomalies in children and adults in this country are available, this study is one of the very few studies that evaluate tongue anomalies in children living in the Eastern Anatolia region.

The prevalence of fissured and geographic tongues in children varies in different studies (3-8). In the study Voros-Balog et al. (3), it was reported that fissured tongue anomaly was the most common, with 29.2% in children aged 1-14. Similarly, Abdullah et al. (14) found the most common fissured tongue with 13.1% in the 0-13 age group, and Khozeimeh et al. (5) 11.8% in the 7-17 age group. Contrary to these studies, Majorana et al. (6) identified the most common anomaly as geographic tongue in children aged 0-12 with 9.93%. In our country, Unur et al. (4) study in children aged 0-13, and the most common anomaly was fissured tongue with 3.4%, while in the study of Ugar-Cankal (7) in children aged 6-12, the geographic tongue was the most common condition with 1.8%. Avcı et al. (11) found that in 5150 patients aged between 13 and 83, the most common tongue anomaly in individuals aged 13-20 was again a fissured tongue. In this study conducted with children aged 3-14 years, the fissured tongue was determined as the most common anomaly and it was higher than the geographic tongue prevalence. Furthermore, the prevalence of fissured tongue (7.5%) in this study is higher than in previous studies conducted in our country by Unur et al. (4) and Ugar-Cankal et al. (7), but lower than the studies in Hungary (3), Iran (5), and Erbil (14). The age groups, evaluation criteria, calibrations, education of the examiners, ethnicity, and genetic factors may be the reason for this.

Most patients with fissured tongues are asymptomatic; it is noticed spontaneously during a clinical examination (9). Although the fissured tongue is generally thought to be hereditary, some studies report that it increases with age and is less common in children (especially under the age of 10) than in adults (6,9). Some studies (1-3) state that the geographic tongue increases at younger ages (especially 0-6 years old), unlike fissured ones. In this study, the prevalence of fissured tongue increased with age, while the prevalence of geographic tongue decreased.

There is also an opinion that the geographic tongue may be a pre-stage of fissured tongue and that fissured tongue and geographic tongue may be two different versions of the same disease (9,15). In a study conducted in Hungary (3), 8.75% of children with fissured tongues also had signs of geographic tongue, while 44.82% of children with geographic tongue also had fissured tongues. In the Abdullah et al. study (14), the prevalence of fissured tongue coexisting with geographic tongue was found to be 1.5%.In the current study, the prevalence of children with geographic and fissured tongues was 0.8%. The prevalence of ankyloglossia may vary according to the socio-economic status, education level, ethnic origin of the families, and individual's age, due to the possibility of children with limitations being treated at an early age. The ankyloglossia tongue anomaly was 1.7% in a study conducted with 600 patients in Malaysia (16), 7.8% in a study conducted in India (17), 3.1% in a study conducted with 520 children in Iraq (14), and 2.8% in this study conducted with 800 pediatric patients. Moreover, in this study, the atrophic tongue was seen only in one (0.1%) patient, while the prevalence of hairy tongue was not found.

In this study, the prevalence of tongue anomalies in males was higher than in females, consistent with previous studies (3,5,7,17-19). In Koey et al.'s (16) study, fissured tongue lesions were more common in males, while geographic tongue lesions were more common in females, similar to this study.

A study evaluating the relationship between tongue anomalies and systemic diseases (16) found a significant relationship between fissured tongue and systemic diseases, especially between the fissured tongue and diabetes mellitus. In another study, Majorana et al. (6) detected tongue lesions mostly in patients with encephalopathy. In this study conducted with pediatric patients, the fissured tongue was observed in 3 (7.3%) children with systemic disease, ankyloglossia in 2 (4.9%), and atrophic tongue anomaly in 1 (2.4%) child. Fissured tongue anomaly was detected in one (11.1%) child with a syndrome. No tongue anomalies were observed in children with allergies.

Conclusion

Assessment of tongue anomalies during the pediatric examination may provide clues in determining the child's lifestyle, eating habits, and underlying systemic diseases. Clinicians should define these differences and raise awareness in dental examination and contribute to

the literature with studies evaluating the rate of tongue anomalies in children. This study is one of the few studies conducted in this region and these age groups, but further studies with a more comprehensive evaluation of oral lesions in children are necessary.

Conflict of Interest: The authors declare that they have no conflict of interest.

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A Retrospective Evaluation of The Morphologic Features of The Glenoid Fossa Using Cone Beam Computed Tomography

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Abstract

Aim: The aim of this study is to examine the morphologic features of the glenoid fossa according to age and gender.
Material and methods: CBCT images of 764 temporomandibular joints (TMJ) were analyzed retrospectively. The shape of the glenoid fossa was examined in four groups as deformed, flattened, sigmoid and box. These groups were evaluated separately for both sexes and for five separate decades.
Results: Sigmoid and flattened shaped glenoid fossa were more common in men, and box shaped glenoid fossa was more common in women ($p<0.05$). The sigmoid shape was observed in the 30-39 age range, the box shape was observed in the 40-49 age range, and the flattened and deformed shape in the 60-69 age range was significantly higher ($p<0.05$).
Conclusions: While the sigmoid shape of the glenoid fossa is common in men, the box shape is more common in women. Deformed and flattened shapes increased with age. The box shape of the glenoid fossa may be a predisposing factor for disc displacement in women. Flattened and deformed forms can be interpreted as different forms of the bone remodeling process.

Clinical Research (HRU Int J Dent Oral Res 2022; 2(2): 100-104)

Keywords: Shape of the glenoid fossa, cone beam ct, temporomandibular joint, oral radiology, anatomy.

Introduction

The temporomandibular joint (TMJ) is one of the most important joints of the body, involved in vital functions such as chewing, swallowing, speaking and breathing (1,2). With its unique structure, it enables the mandible to perform all movements perfectly (3). TMJ is in harmony with masticatory muscles, ligaments, teeth and surrounding soft tissues, and jaw movements are controlled by all these structures (4). The bony components of the joint are formed by the processus condylaris of the mandible, the glenoid fossa of the temporal bone, and the tuberculum articulare. The processus condylaris shows more convexity in the anteroposterior direction and less in the mediolateral direction. The mandibular fossa is concave in line with this. The articular tubercle in front of the fossa restricts the anterior movement of the processus condylaris(5,6). The bone structure of the joint may show anatomical variations[7]. With this; age, gender, occlusal changes, trauma, presence of pathology may cause the joint to be followed in different ways (4). In addition, conditions that directly concern the joint such as disc perforation, disc displacement, degenerative joint disease can also change the radiological appearance of hard tissues (1,8,9).

It is a matter of debate whether the bone morphology of the TMJ and temporomandibular disorders (TMD) are related. There are studies showing that the risk of TMD increases when the articular tubercle is in an upright structure (10,11,12). However, there are not adequate studies on this subject and a comprehensive examination has not been made according to patient groups.

TMJ can be examined with different imaging methods. Orthopantomography, lateral projections, frontal projections, ultrasonography, magnetic resonance imaging (MRI), computed tomography, cone-beam computed tomography (CBCT) are some

of them (13,14). CBCT is often used to examine the bony components of the joint (15). It provides an ideal diagnostic quality with its low radiation dose and cost (16).

The aim of this study is to examine the morphological features of glenoid fossa according to age and gender. It is known that anatomical differences can be a predisposing factor for pathologies. Knowing the anatomy of the hard tissue will shed light on the diagnosis and treatment of clinical symptoms (10,17).

Materials and Methods

The presented retrospective study was conducted at Cukurova University Faculty of Dentistry Department of Oral and Maxillofacial Radiology. Ethical approval for the study was obtained from University Ethics Committee (decision no: 18, date: 10.09.2021).

Images were taken with the Planmeca ProMax 3D Mid device and analyzed with a Romexis software program (Planmeca Oy, Helsinki, Finland) with a 15×15cm field of view. Images were acquired at 110 kVp, 3 mA and 3.3 seconds irradiation time. The patients were standing with the Frankfort plane parallel to the horizontal plane laterally. In the images, the section with the largest mediolateral diameter of the condylar prominence was used. Measurements were made in the central sagittal section of the condyle. Images were created with a cross-section range of 0.5 mm and thickness, and it was ensured that all measurements were made from the same standard point.

In this study, the angle between the Frankfort plane of the articular eminence slope and the plane passing through the highest point on the roof of the glenoid fossa and the plane passing through the lowest point on the apex of the articular eminence was evaluated. Evaluation is based on observation, not angular measurement. For this reason, the images were examined by two experienced radiologists. All images were re-evaluated one week later to avoid a possible error.

CBCT images of 382 random patients who applied for various dental treatments between 2019-2021 were analyzed. Patients who had undergone surgery or trauma in the joint area, patients with rheumatological disorders and patients with syndrome were not included in the study. Artifacted and low-quality CBCT images were also excluded.

The present study included 191 male and 191 female patients.

The mean age of the cases was 42.28 ± 13.08 (min: 22 max: 68). The patients were divided into five groups according to age: 20-29, 30-39, 40-49, 50-59 and 60-69 years.

Image Analysis

The morphology of the glenoid fossa was evaluated according to the classification of Kurita et al. (18).

1) Box type: It was classified as box type if the posterior slope of the eminence was steep (Figure 1a)
2) Sigmoid type: if it was softer (Figure 1b),
3) Flattened type: if it was completely flattened (Figure 1c)
4) Deformed type: If there was deformation in the cortical layer (Figure 1d).

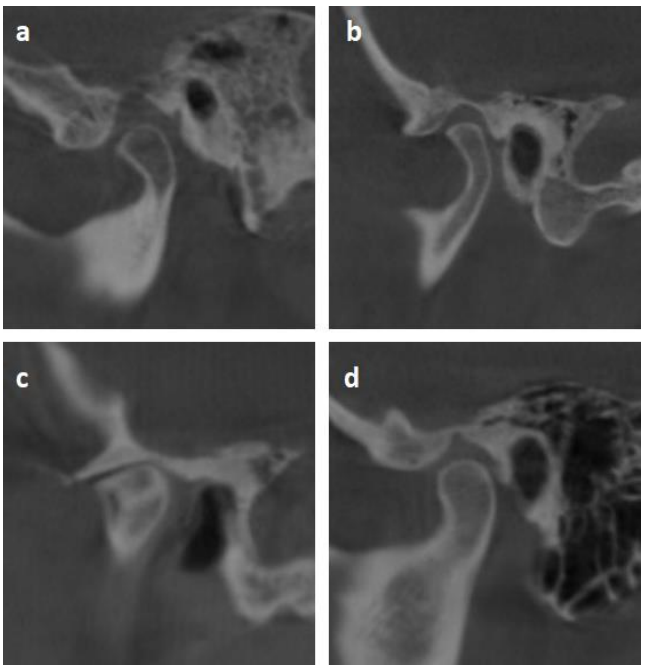

Figure 1. Sagittal cone beam computed tomography images of glenoid fossa. a. Box b. Sigmoid c. Flattened d. Deformed

Statistical Analysis

Statistical analysis was performed using SPSS software package 25.0 (Chicago, IL, USA). The age and gender of the patients were determined. The significance level was set at $p<0.05$. Chi-square test was used to evaluate the distribution of categorical variables.

Results

A total number of 764 joints were evaluated. The distribution of glenoid fossa shape findings by gender is shown in Table 1.

Sigmoid and flattened shaped glenoid fossa were more common in men, and box shaped glenoid fossa was more common in women (p<0.05) (Table 1).

Another parameter examined is the distribution of the shape of the glenoid fossa by age groups. Statistical results are shown in Table 2.

When the shape of the glenoid fossa was examined according to age, the sigmoid shape was observed in the 30-39 age range, the box shape was observed in the 40-49 age range, and the flattened and deformed shape in the 60-69 age range was significantly higher (p<0.05).

Table 1. Distribution of glenoid fossa shape by gender

SGF**	Female	Male	Total	*p* value
Sigmoid	206	151	357	
	40,60%	59,00%	46,70%	**0.000***
Box	212	30	242	
	41,70%	11,70%	31,70%	**0.000***
Flattened	63	66	129	
	12,40%	25,80%	16,90%	**0.000***
Deformed	27	9	36	
	5,30%	3,50%	4,70%	0.268
Total	508	256	764	
	100,00%	100,00%	100,00%	

Chi-square test (*p<0.05).

** Shape of the glenoid fossa

Table 2. Distribution of glenoid fossa shape by age groups

SGF**	20-29	30-39	40-49	50-59	60-69	Total	*p* value
Sigmoid	132	138	78	6	3	357	
	64,70%	76,70%	41,90%	4,40%	5,30%	46,70%	**0.000***
Box	72	36	71	51	12	242	
	35,30%	20,00%	38,20%	37,20%	21,10%	31,70%	**0.000***
Flattened	-	-	28	68	33	129	
			15,10%	49,60%	57,90%	16,90%	**0.000***
Deformed	-	6	9	12	9	36	
		3,30%	4,80%	8,80%	15,80%	4,70%	**0.000***
Total	204	180	186	137	57	764	
	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	

Chi-square test (*p<0.05). ** Shape of the glenoid fossa

Discussion

Temporomandibular joint disorders are an important health problem affecting approximately 5-12% of the general population (19). The clinical symptoms of temporomandibular joint disorders can be listed as pain, arthralgia, limitation of movement, open or closed locking and joint sounds (19,20). The anatomy of the TMJ needs much more research to understand the etiology of all these symptoms. On the other hand, TMJ anatomy should be examined with all its aspects in order to reveal the goals and results of the treatments, apart from distinguishing physiological and pathological conditions (19). Brooks et al. (21) stated that the joint is difficult to examine due to its anatomical complexity and proximity to the temporal bone, mastoid air cells, and auditory structures.

Genetics acquired factors and patient age affect the morphology of the bone components of the joint (19,20). Morphological differences between the sexes can be explained by biological, physiological, genetic and psychological factors. To explain with an example, the load carried by the TMJ during chewing is different in both sexes. The anatomy of the bony components of the joint must be fully known in order to reveal the variations, together with their causes and consequences. These studies also shed light on preventive and therapeutic applications as orthodontic, prosthetic and surgical (2,19).

Examining the anatomy and degenerative disorders of the TMJ is important in both symptomatic and asymptomatic patients. Variations or bone changes should not necessarily be associated with symptomatic patients as they may be part of the age-related remodeling process or physiological response. The CBCT images included in this study were also selected without considering the clinical condition of the patients (22,23).

Kurita et al. (18) investigated the relationship between glenoid fossa shapes and disc displacement in their study on MR images of 220 patients. In their study, the glenoid fossa was examined in four groups according to its shape and flattened glenoid fossa was found to be associated with disc displacement. The fact that there is no research on whether the shape of the glenoid fossa depends on age and gender and their incidence has led us to include this subject in our study.

Sülün et al. (10) examined the articular eminence angle and mandibular fossa morphology in their study. The relationship between the hard tissue components of the TMJ and internal disorders has been investigated. High tuberculum articulare and narrow articular fossa structure, which we define as box form, were found to be associated with reduced disc displacement. The flattened form of the glenoid fossa is associated with unreduced disc displacement. Their study showed us that anatomical differences should be investigated first for the diagnosis and treatment of clinical findings.

Bone tissue adapts to the physiological and pathological forces, and this process is defined as remodeling (24). When the applied force is above physiological limits, pathological changes are observed (25). In another study by Kurita et al. (26), it was found that the internal derangements of the joint were related to the flattened type of glenoid fossa. This result once again demonstrated the importance of examining the bone component.

There are very few studies examining TMJ hard tissues in different patient groups. Paknahad et al. (17) evaluated the difference between the sexes in their study in which they examined the shape of the glenoid fossa. The steepness of the eminence did not make a significant difference in men and women. however, it was observed that the glenoid fossa resembled the box form in the group with internal derangement.

In the present study, when both genders are compared, sigmoid and flattened forms of the glenoid fossa in men and box form in women are frequently seen. There are studies showing that TMD symptoms are observed more frequently in women (27,28,29). In the light of this information, authors suggest that the box form of the glenoid fossa increases the frequency of TMD.

Conclusions

To summarize the results, the flattened shape of the glenoid fossa is associated with advanced age and male gender. While the sigmoid shape is frequently observed in men and in the third decade, the box formation is high in the fourth decade and in women. The deformed glenoid fossa was only associated with the sixth decade. According to these findings, it can be considered that the box form is a predisposing factor for TMD and the flattened and deformed forms are an adaptation of the bone against the forces.

Conflict of interest

Author declare that there is no conflict of interest.

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Effect of Turkish Dental Education on The Level of Knowledge of Students About Emergency Dental Applications

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Abstract

Objective: The Coronavirus Disease (COVID-19) first appeared in December 2019 and spread to many countries in a short time. Thus, it has been decided to limit dental visits only to emergency dental practices (EDA), and to postpone non-emergency and non-compulsory dental practices to a later date. In this survey study; our aim is to determine the level of knowledge of dentistry students about EDA and to contribute to the literature by determining the adequacy of dental education in this field.
Subjects and Methods: The questionnaire that was prepared using Google Forms was sent to dental students in Turkey by WhatsApp, email, and private social platforms. First part of the questionnaire included basic questions that provide demographic data and the questions about EDA in the second part.
Results: A total of 1452 dentistry students, 558 males and 894 females, with a mean age of ±21.15 ± 1.96, participated in the survey study. It was found that the EDA knowledge level of female participants was significantly higher than that of male participants ($p<0.05$). The difference in knowledge score between the first, second and third grades was found to be statistically significant, while the difference between the fourth and fifth grades was not statistically significant *($p>0.05$)*. When the knowledge scores of the students in the 1st grade are compared with the knowledge scores of the students in the 5th grade, there is a statistically significant difference ($p <0.05$).
Conclusion: Education of dentistry in Turkey is contributing to the students about the EDA. It gives students the ability to evaluate acute and non-acute situations. In this way, non-acute treatments can be delayed and the risk of COVID-19 transmission can be reduced and individuals who really need treatment are not deprived of treatment.

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Keywords: Emergency dental applications, covid-19, pandemic.

Introduction

The Coronavirus Disease (COVID-19) first appeared in December 2019 and spread to many countries in a short time(1).Worldwide measures have been taken to control this disease, which has been declared as a 'pandemic' by the world health organization(2-3). It was decided to postpone non-urgent and non-compulsory dental applications and the emergency dental applications (EDA) were defined as follows(4):

a) Treatment of severe toothache caused by pulpal inflammation
b) Treatment of severe pain caused by pericoronitis or an impacted/infected 3rd molar
c) Treatment of postoperative osteitis or alveolitis
d) Treatment of an abscess and/or bacterial infection causing localised pain and swelling
e) Treatment of a tooth fracture causing pain or soft tissue trauma
f) Treatment of traumatic dental avulsion/luxation
g) Treatment of fractures of the chin or other facial bones
h) Treatment of acute and painful lesions/ulceration of the oral mucosa
i) Treatment of life-threatening or uncontrolled bleeding

j) Treatment of intraoral/extraoral infections that compromise the airway
k) Essential treatment of patients who are receiving, or are planned for receiving, radio- and/or chemotherapy before organ transplantation
l) Dental consultation for medical problems
m) Suture removal procedures
n) Treatment of injuries, by a non-aerosol generating method, that prevent the use of removable dentures and repair of loss of temporary restorations/fractures
o) Attending to dislocation and breakage of brackets and wires in patients undergoing orthodontic treatment.

Coronaviruses are mainly transmitted through direct contact and droplets(5-6).Thus, COVID-19 is likely to be contracted by those who get exposed to high concentrations of aerosols in relatively closed environments. Consequently, such aerosols generated during routine dental treatments pose a potential risk to dentists, assistant staff, and patients(2-6-7).So, limiting dental visits to emergency dental applications only and postponing non-urgent and non-compulsory dental applications is important for controlling COVID-19.

In this survey study; our aim is to determine the level of knowledge of dentistry students about EDA and to contribute to the literature by determining the adequacy of dental education in this field.

Subjects and Methods

The Ethics Committee of Harran University approved the study protocol and procedures, and informed consent was obtained from all participants before the formal survey was conducted (reference number: HRU/20.19.19). A new questionnaire regarding emergency applications in dentistry was developed for this study.

Three experts (one endodontist, one maxillofacial surgeon and one maxillofacial radiologist) assessed the clarity of the statements and the adequacy of the content of the questionnaire that was prepared using Google Forms. We performed a pilot survey with 5 participants who were later excluded from the final analysis. According to the suggestions of these participants, we revised the questions that those that were difficult to understand, and those with grammatical errors.

The final online questionnaire was sent to dental students in Turkey by WhatsApp, email, and private social platforms, such as Instagram and

Facebook. A stratified random sampling method was used in this cross-sectional observational study. Dental professionals were excluded from the study, and data were collected between April 1 and 7, 2020.

Participants were informed of the purpose, risks, and benefits of the study, and they had the option of opting out of the study. The questionnaire comprised 2 section. The first part of the questionnaire included basic questions that provide demographic data and the questions about EDA in the second part. 21 questions evaluated the dental students' knowledge of emergency applications in dentistry (Table 1). These questions had the following three responses to choose from: "Urgent" or "Not urgent." or" I don't know". Incorrect/unknown and correct answers were assigned scores of 0 and 1, respectively. The total knowledge scores ranged from 0 to 21, and a higher score indicated better knowledge of EDA. The Cronbach's alpha coefficient (indicating acceptable internal consistency) of our questionnaire was 0.73(8).

Table 1. The Survey Questions

Q1	Treatment of severe toothache caused by pulpal inflammation?
Q2	Treatment of severe pain caused by pericoronitis or an impacted/infected 3rd molar?
Q3	Gingival bleeding that starts while brushing and doesn't stop for at least five minutes?
Q4	Treatment of an abscess and/or bacterial infection causing localised pain and swelling?
Q5	Bad breath?
Q6	Treatment of postoperative osteitis or alveolitis?
Q7	Treatment of a tooth fracture causing pain or soft tissue trauma
Q8	Treatment of traumatic dental avulsion/luxation
Q9	Treatment of fractures of the chin or other facial bones
Q10	Treatment of acute and painful lesions/ulceration of the oral mucosa
Q11	Treatment of life-threatening or uncontrolled bleeding
Q12	Treatment of intraoral/extraoral infections that compromise the airway
Q13	Essential treatment of patients who are receiving, or are planned for receiving, radio- and/or chemotherapy before organ transplantation.
Q14	Treatment of enamel-dentin level cavitations that do not cause spontaneous pain?
Q15	Dental consultation for medical problems
Q16	The need for implant treatment for missing teeth in the mouth?
Q17	Suture removal procedures
Q18	Treatment of stains causing aesthetic problems in anterior teeth?
Q19	Treatment of injuries, by a non-aerosol generating method, that prevent the use of removable dentures and repair of loss of temporary restorations/fractures
Q20	Attending to dislocation and breakage of brackets and wires in patients undergoing orthodontic treatment
Q21	Sensitivity in all teeth when eating or drinking something cold (ice cream, cold water)?

The power analysis estimated that surveys with 1,346 or more individuals needed to have a 98% confidence interval, a population about size of 40,000 individuals, with the real value within ±3% of the surveyed value. However, in order to increase the reliability of the findings of this study, 1.452 individuals who answered the web-based questionnaire during the survey application period were included. The data were analysed using Statistical Package for Social Science version 23.0 (SPSS Inc., Chicago, IL, USA). The median, minimum-maximum, and percentage values were calculated for descriptive statistics. The normality of the data distribution was tested using histograms and the Kolmogorov-Smirnov test. As the data were normally distributed, the independent t test was used for intergroup comparisons. The one-way ANOVA test was used to compare the variables in the more than 2 groups. In all analyses, statistical significance was accepted as $p<0.05$.

Results

A total of 1452 dentistry students, 558 (38.43%) male and 894 (61.57%) female, with a mean age of 21.15 ± 1.96, participated in the survey study. 205 (14.1%) of the participants were in the first grade, 291 (20.0%) in the second grade,

354 (24.4%) in the third grade, 272 (18.7%) in the fourth grade, and 330 (22.8%) in the fifth grade (Table 2).

Table 2. Distribution of participants by duration of education and gender

Year of Education	Men n (%)	Women n (%)	Total n (%)
1.year	74	131	205(14,1)
2.year	107	184	291(20,0)
3.year	153	201	354(24,4)
4.year	92	180	272(18,7)
5.year	132	198	330 (22,8)
Total	558	894	1452 (100,0)

The relationship between knowledge scores in different education years is shown in table 3. The knowledge score of the first graders was calculated as 9.75 ± 4.37, the second grade as 11.90 ± 3.19, the third grade as 13.11 ± 3.29, the fourth grade as 15.12 ± 2.45 and the fifth grade as 15.39 ± 3.34. The difference in knowledge score between the first, second and third grades was found to be statistically significant, while the difference between the fourth and fifth grades was not statistically significant *($p>0.05$).*

Tablo 3. Comparison of knowledge scores in different education years

Year of Education	Total Mean±SD	1.year	2.year	3.year	4.year	5.year
1.year	9,75±4,37		p<0.001	p<0.001	p<0.001	p<0.001
2.year	11,90±3,19	p<0.001		p<0.001	p<0.001	p<0.001
3.year	13,11±3,29	p<0.001	p<0.001		p<0.001	p<0.001
4.year	15,12±2,45	p<0.001	p<0.001	p<0.001		p>0.05
5.year	15,39±3.34	p<0.001	p<0.001	p<0.001	p>0.05	

Table 4 shows the knowledge scores of the participants by gender and years of education. In the first, second, third and fourth education years, no statistically significant difference was observed between knowledge scores of women and men (p>0.05). However, the knowledge scores of women (15.82 ± 2.83) in the fifth school year were higher than the knowledge scores of men (14.75 ± 3.89) *(p<0.05).*

Table 4. Knowledge scores by gender in different educational years

Year of Education	Men Mean±SD	Women Mean±SD	Total Mean±SD	p
1.year	9,25±4,49	10,03±4,29	9,75±4,37	0,220
2.year	11,92±2,99	11,88±3,31	11,90±3,19	0,919
3.year	12,78±3,75	13,37±2,88	13,11±3,29	0.096
4.year	14,88±2,24	15,25±2,55	15,12±2,45	0.235
5.year	14.75±3,89	15.82±2.83	15,39±3.34	0.004*
Total	12,96±4,01	13,51±3,74	13,29±3,84	0.010*

The distribution of the answers given to the questions according to the years of education is shown in Table 5. The most "correct" answers were found in the fourth and fifth grades, and the most "incorrect / unknown" answers in the first and second grades. Q11; is the most correctly answered question in all classes. Q17; is the question most wrongly answered by dental students in fourth and fifth grades.

Table 5. The distribution of the answers given to the questions according to the years of education

	1. year			2. year			
	Correct	Incorrect	Unknown	Correct	Incorrect	Unknown	Correct
Q1	89 (43.4)	12 (5.9)	104 (50.7)	198 (68.0)	12 (4.1)	81 (27.8)	306 (86.4)
Q2	61 (29.8)	31 (15.1)	113 (55.1)	144 (49.5)	36 (12.4)	111 (38.1)	186 (52.5)
Q3	44 (21.5)	119 (58.0)	42 (20.5)	186 (63.9)	58 (19.9)	47 (16.2)	199 (56.2)
Q4	118 (57.6)	32 (15.6)	55 (26.8)	207 (71.1)	54 (18.6)	30 (10.3)	245 (69.2)
Q5	149 (72.7)	27 (13.2)	29 (14.1)	242 (83.2)	34 (11.7)	15 (5.2)	302 (85.3)
Q6	35 (17.1)	14 (6.8)	156 (76.1)	69 (23.7)	24 (8.2)	198 (68.0)	154 (43.5)
Q7	60 (29.3)	35 (17.1)	110 (53.7)	125 (43.0)	46 (15.8)	120 (41.2)	166 (46,9)
Q8	72 (35.1)	12 (5.9)	121 (59.0)	141 (48.5)	22 (7.6)	128 (44.0)	202 (57.1)
Q9	61 (29.8)	30 (14.6)	114 (55.6)	145 (49.89	23 (7.9)	123 (42.3)	204 (57.6)
Q10	76 (37.1)	21 (10.2)	108 (52.7)	157 (54.0)	33 (11.3)	101 (34.7)	207 (58.5)
Q11	182 (88.8)	4 (2.0)	19 (9.3)	283 (97.3)	4 (1.4)	4 (1.4)	341 (96.3)
Q12	157 (76.6)	9 (4.4)	39 (19.0)	249 (85.6)	6 (2.1)	36 (12.4)	329 (92.9)
Q13	126 (61.5)	33 (16.1)	46 (22.4)	189 (64.9)	50 (17.2)	52 (17.9)	228 (64.4)
Q14	105 (51.2)	17 (8.3)	83 (40.5)	215 (73.9)	20 (6.9)	56 (19.2)	292 (82.5)
Q15	43 (21.0)	41 (20.0)	121 (59.0)	73 (25.1)	105 (36.1)	113 (38.8)	140 (39.5)
Q16	27 (13.2)	149 (72.7)	29 (14.1)	33 (11.3)	242 (83.2)	16 (5.5)	308 (87.0)
Q17	50 (24.4)	26 (12.7)	129 (62.9)	48 (16.5)	90 (30.9)	153 (52.6)	85 (24.0)
Q18	161 (78.5)	11 (5.4)	33 (16.1)	264 (90.7)	13 (4.5)	14 (4.8)	319 (90.1)
Q19	41 (20.0)	53 (25.9)	111 (54.1)	72 (24.7)	116 (39.9)	103 (35.4)	165 (46.6)
Q20	116 (56.6)	49 (23.9)	40 (19.5)	154 (52.9)	104 (35.7)	33 (11.3)	177 (50.0)
Q21	129 (62.9)	48 (23.4)	28 (13.7)	188 (64.6)	80 (27.5)	23 (7.9)	235 (66.4)

3. year			4. year			5. year	
Incorrect	Unknown	Correct	Incorrect	Inknown	Correct	Incorrect	Unknown
19 (5.4)	29 (8.2)	257 (94.5)	10 (3.7)	5 (1.8)	295 (89,4)	15 (4.5)	20 (6.1)
69 (19.5)	99 (28.0)	197 (72.4)	54 (19.9)	21 (7.7)	239 (72.4)	64 (19.4)	27 (82)
111 (31.4)	44 (12.4)	130 (47.8)	103 (37.9)	39 (14.3)	144 (43.6)	151 (45.8)	35 (10.6)
69 (19.5)	40 (11.3)	216 (79.4)	42 (15.4)	148 (5.1)	263 (79.7)	51 (15.5)	16 (4.8)
26 (7.3)	26 (7.3)	244 (89.7)	14 (5.1)	14 (5.1)	300 (90.9)	20 (6.1)	10 (3.0)
44 (12.4)	156 (44.1)	207 (76.1)	37 (13.6)	28 (10.3)	246 (74.5)	40 (12.1)	44 (13.3)
76 (21.5)	112 (31.6)	174 (64.0)	67 (24.6)	31 (11.4)	245 (74.2)	64 (19.4)	21 (6.4)
42 (11.9)	110 (31.1)	226 (83.1)	34 (12.5)	12 (4.4)	288 (87.3)	13 (3.9)	29 (8.8)
38 (10.7)	112 (31.6)	217 (79.8)	28 (10.3)	27 (9.9)	279 (84.5)	23 (7.0)	28 (8.5)
60 (16.9)	87 (24.6)	176 (64.7)	56 (20.6)	40 (14.7)	217 (65.8)	75 (22.7)	38 (11.5)
4 (1.1)	9 (2.5)	269 (98.9)	1 (0.4)	2 (0.7)	319 (96.7)	7 (2.1)	4 (1.2)
6 (1.7)	19 (5.4)	266 (97.8)	4 (1.5)	2 (0.7)	312 (94.5)	11 (3.3)	7 (2.1)
75 (21.2)	51 (14.4)	198 (72.8)	57 (21.0)	17 (6.3)	267 (80.9)	46 (13.9)	17 (5.2)
30 (8.5)	32 (9.0)	253 (93.0)	12 (4.4)	7 (2.6)	298 (90.3)	21 (6.4)	11 (3.3)
127 (35.9)	87 (24.6)	116 (42.6)	112 (41.2)	44 (16.2)	149 (45.2)	144 (43.6)	37 (11.2)
27 (7.6)	19 (5.4)	257 (94.5)	9 (3.3)	6 (2.2)	310 (93.9)	14 (4.2)	6 (1.8)
157 (44.4)	112 (31.6)	66 (24,3)	178 (65.4)	28 (10.3)	69 (20.9)	217 (65.8)	44 (13.3)
22 (6.2)	13 (3.7)	256 (94.1)	12 (4.4)	4 (1.5)	316 (95.8)	9 (2.7)	5 (1.5)
107 (30.2)	82 (23.2)	100 (36.8)	127 (46,7)	45 (16.5)	111 (33.6)	185 (56.1)	34 (10.3)
135 (38.1)	42 (11.9)	109 (40.1)	130 (47,8)	33 (12.1)	155 (47.0)	149 (45.2)	26 (7.9)
82 (32.2)	37 (10.5)	208 (76.5)	49 (18.0)	15 (5.5)	259 (78.5)	58 (17.6)	13 (3.9)

Discussion

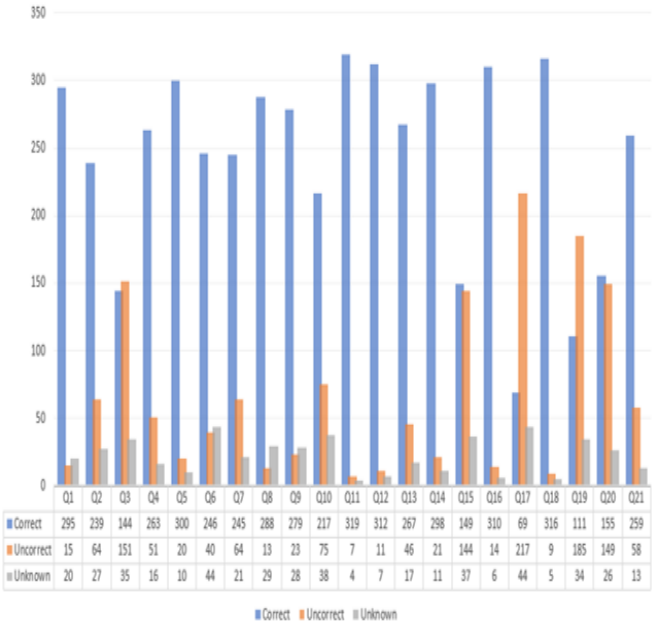
The oral cavity, which is an important part of the upper respiratory and digestive system, is thought to play an important role in the transmission of COVID-19(9-10). For this reason, it is believed that limiting dental procedures involving the oral cavity with EDA during the pandemic will reduce the spread rate of the

epidemic(11).Therefore, if the pandemic continues or new outbreaks are encountered in the upcoming years, the knowledge level of future dentists about EDA will play an important role in controlling the epidemics. While evaluating the level of knowledge of dental students about EDA, our study also sheds light on the deficiencies of dental education in this regard. As far as we know, our study is the first study in which dental students and dental education system are evaluated regarding EDA.

In this study, knowledge scores increase from the first grade (9.75 ± 4.37) to the fifth grade (15.39 ± 3.34). Based on the difference between the knowledge score of the first graders and the knowledge score of the fifth graders, it is possible to say that the education system contributes to the students about EDA. In present study, where the highest score was 21, the mean score of the fifth graders was calculated as 15.39 ± 3.34. This is an indication that dental students have not reached the maximum level of knowledge about EDA even in their last education years. In this way, dental students can distinguish between urgent and non-urgent situations, delay non-urgent treatments and reduce the risk of COVID-19 transmission, while intervening in emergencies and preventing urgent patients from being deprived of treatment. In our study, the difference in score between the fourth and fifth grades was not statistically significant. One of the reasons may be that the emphasis is on practical applications rather than theoretical lessons in fifth grade education.

In the first, second, third and fourth years of education, women's knowledge scores are higher than men's knowledge scores, but this difference is not statistically significant. For fifth grade students, the difference in knowledge score between female and male participants is statistically significant. Based on these results of our study, we can conclude that women benefit more from dental education than men. However, more studies are needed to elucidate the reasons for this difference between men and women.

Fifth grade students mostly answered questions Q3, Q15, Q17, Q19, Q20 incorrectly. (Grafic 1). Knowing which questions fifth grade students answered incorrectly is important in terms of seeing the shortcomings of the education curriculum about EDA. Based on the results of this study, incorrect and unknown questions answered by the students can be identified and the curriculum can be updated in this sense. In addition, a lesson on distinguishing between urgent and non-urgent dental practices can be added to the fifth grade curriculum. And in this way, we inform the dentists about how they should behave in case of the continuation of the pandemic process we are in or if similar situations occur in the following years.



Grafic 1. Fifth grade students' answers to the questions

In our study the education system in Turkey is evaluated. However, there is no data in the literature about the education system in different countries. EDA knowledge scores of dental students from different countries can be evaluated in future studies. EDA knowledge levels in countries affected by the epidemic process to varying degrees, can be compared.

This study has some limitations. Dentistry education is given in different countries with different methods. In our only evaluated the dental education curriculum in Turkey. Therefore, the ability of the results of this study to generalize dental education programs around the world may be limited. Another limitation of our study was the inadequate and unstandardized assessment of the knowledge of students regarding EDA. Due to the very limited time available for developing the questionnaire, dental students were assessed with only simple questions.

Conclusions

Dentistry education in Turkey gives students the ability to distinguish between urgent and non-emergency dental practices. Differentiation and postponement of non-emergency treatments contributes to both reducing the risk of COVID-19 transmission and not depriving patients in acute conditions from treatment. In order to fight more effectively against epidemics like COVID-19 that may occur in the future, the deficiencies of education in EDA should be eliminated.

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Diş Sürmesinde D Vitamininin Rolü; Derleme

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Özet

Erüpsiyon, dişin gelişiminin başlangıcından fonksiyona katılmasına kadar devam eden dinamik bir süreçtir. Çeşitli mineral ve hormon eksiklikleri; sürme gecikmesine, hipomineralizasyona, alveolar kemik yapısında bozulmaya neden olabilmektedir. Dental gelişim şekli süt ve daimi dişlerin persiste kalmasına ve gecikmiş diş sürmesine neden olabilmektedir. Sürme gecikmesi, cinsiyet ve etnik köken dışında, bazı durumlardan dolayı zamanı gelmesine rağmen dişin ağız ortamında görülmemesidir. D vitamini, yağda çözünen bir vitamindir. D vitamini yaş ve cinsiyetten bağımsız olarak sürme gecikmesine neden olabilmektedir. Bu derlemenin amacı D Vitamini ile sürme gecikmesi arasındaki ilişkiyi tanımlamaktır. Pedodonti pratiğinde oldukça sık karşılaşılan sürme gecikmelerinde D vitamininin rolünün incelenmesi oldukça önemlidir.

Anahtar Kelimeler: Sürme gecikmesi, vitamin D, mineralizasyon.

Abstract

The eruption is a dynamic process that continues from the beginning of the development of the tooth to its participation in function. Various mineral and hormone deficiencies; It can cause delayed eruption, hypomineralization, and deterioration in alveolar bone structure. The dental development pattern may cause persistent primary and permanent teeth and delayed eruption. The delayed eruption is the absence of a tooth in the oral environment, although due to some circumstances, apart from gender and ethnicity. Vitamin D is a fat-soluble vitamin. Vitamin D may cause delayed eruption regardless of age and gender. This review aims to describe the relationship between Vitamin D and delayed eruption. It is very important to examine the role of vitamin D in delayed eruption, which is quite common in pediatric dentistry.

Review (HRU Int J Dent Oral Res 2022; 2(2): 111-115)

Keywords: Delayed eruption, vitamin D, mineralization.

Giriş

Sürme Mekanizması

Sürme, bir dişin çene kemiği içerisinde geliştiği bölgedeki fonksiyonel olmayan konumundan fonksiyonel konumuna gelmesini sağlayan aksiyal hareketi ve fizyolojik olayların bütünüdür (1). Periodonsiyumun oluşmasını, kök gelişiminin tamamlanmasını ve fonksiyonel bir oklüzyonun elde edilip sürdürülmesini kapsayan dinamik bir süreçtir (2). Dişi alveolar süreç boyunca ağız içindeki antagonisti ile son oklüzyon konumuna doğru hareket ettirmekten sorumludur. Dişler, gelişim devam ettikçe çene kemiği ve alveol kemiklerdeki büyümeye bağlı olarak vertikal, mezial ve transvers yönde sürekli hareket etmektedir. Süren diş ile karşıt diş temas edene kadar erüpsiyon devam etmektedir (3).

Uterustaki 6. haftada, süt dişlenme için gerekli fonksiyonel diş germleri, her bir çenedeki birincil diş laminasından oluşmaya başlamaktadır (4). Süt dişlerinin oluşumu, uterustaki 4. ayda mine organının linguali ile yakından ilişkili olan ardışık diş laminasından başlamakta iken; daimi dişlerin oluşumu ise çan aşamasında başlamaktadır (5). Daimi azılar, primer dental laminanın distal uzantısından sırasıyla oluşmaktadır (4).

Daimi dişlerin oluşumu başladıktan sonra dental lamina parçalanmakta ve gerilemektedir (6,7). Aynı şekilde, üçüncü büyük azı dişinin oluşmaya başlamasından sonra, daimi azı dişleri için uzayan dental lamina parçalanmakta ve gerilemektedir. Dental laminanın kalıntıları, diş etinin haricinde çene içinde de epitel incileri veya adacıklar olarak kalmaktadır. Dental laminanın gerilemesi, yerine geçecek daimi dişlerin daha da gelişmesini önlemede önemli bir mekanizma gibi görünmektedir. Dental laminanın gerilemesini sağlayan mekanizmaların, hücrelerin laminadan uzağa göçü ve apoptoz yoluyla da bir miktar kaybıyla beraber mezenşime farklılaşmasının bir kombinasyonunu içerdiği deneysel çalışmalarla gösterilmiştir (7).

Sürme esnasında birçok işlem aynı anda gerçekleşmektedir. Kök oluşumunun başlamasıyla süreç başlamakta, dişin kökü uzamakta, alveol kemiği içinde hareket edip yükselmekte ve süt dişinde rezorpsiyon olmaktadır (2). Mine ve dentinin kalsifikasyonlarının başlamasıyla beraber mine organının altında, kole bölgesinde 2 katlı bir epitel dokusu gelişmeye başlamaktadır. İç katmanda **'iç mine epiteli'**, dış katmanda **'dış mine epiteli'** hücreleri bulunan bu epitel doku, kökün gelişiminden ve dişin sürmesinden sorumlu **'Hertwig epitelyal kök kını'** olarak adlandırılmaktadır (8). Hertwig epitelyal kök kını, tek köklü dişlerde apekse doğru konik bir şekilde ilerlemektedir. Hertwig epitelinin ucunda apikal diyafram denilen açıklıktan apikal foramen oluşmaktadır. Çok köklü dişlerde oluşacak kök sayısı kadar Hertwig epitelyal kök kını dental papilla vasıtasıyla oluşturulmakta ve hem apekse hem de bifurkasyon/trifurkasyona doğru ilerlemektedir. Hertwig epitelyal kök kınları bifurkasyon/trifurkasyon bölgesinde karşılıklı olarak birleşmekte ve kının iç kısmındaki iç mine epitel hücrelerinin indüklediği odontoblastlar burada dentin oluşturmaktadır. Yeterli kök gelişimiyle beraber erüpsiyon süreci başlamış bulunmaktadır (8). Bir dişin sürmesi üç mekanizmayla açıklanmaktadır;

a) Sürme yolundaki boşluk: Dental folikülün üzerindeki kemik dokuyu rezorbe etmesi, sürme yolu için gerekli olan boşluğu oluşturmaktadır. Ektoderm dokusu bu aşamadaki moleküler-biyolojik sürecin temelini oluşturmaktadır.

b) Foliküle apikal taraftan uygulanan basınç: Kök membranı adeta glanduler membran gibi işlev görmekte; membranın inervasyonu sonucu kök yüzeyinde, periodontal membranda ve pulpa dokusunda basınç oluşmaktadır. Bu basınç, kökün sürme yönüne doğru yükselmesinde etkili olmaktadır.

c)Periodontal membranın adaptasyon kapasitesi: Periodontal membranın adaptasyon ve yeniden organize olma yeteneği sürme için çok büyük öneme sahiptir. Bu yeniden organize olma süreci, sürmesi devam eden bir dişin periodonsiyumunun köke en yakın olan en içteki tabakasında oluşan apoptoz-nekroz mekanizmasında da varlığını göstermektedir. Sürme yolundaki süt ve daimi dişlerde apoptotik hücre tabakası varlığına işaret edilmiştir (9).

Diş sürmesi, birçok etkenin senkronizasyonunu içeren kompleks bir olaydır (10). Süt ve daimi dişler geniş bir kronolojik yaş aralığında sürmektedir. Irksal, etnik, cinsiyet ve bireysel faktörler erüpsiyonu zamanını etkileyebilmekte ve normal erüpsiyon standardizasyonu belirlenirken dikkate alınmaktadır (2,11,12). Sürme genellikle dişin ağız boşluğuna çıkış anı olarak nitelendirilmektedir. Sürme zamanları hem süt hem sürekli dişlenme dönemi için bireyler arasında farklılık gösterebilmektedir. Yapılan çalışmalara göre 6 aylık sapmalar normal kabul edilmektedir (8). Dental gelişim şekli süt dişlerinin persiste kalmasına ve gecikmiş diş sürmesine neden olabilmektedir.

Sürme gecikmesi, cinsiyet ve etnik köken dışında, bazı durumlardan dolayı zamanı gelmesine rağmen dişin ağız ortamında görülmemesidir (13). Klinik uygulamada, erüpsiyon süresinin yerleşik normlarından sıklıkla önemli sapmalar gözlenmektedir. Erken erüpsiyon da bildirilmiştir, fakat gecikmiş diş erüpsiyonu (DTE) en sık karşılaşılan sapmadır (14,15). DTE' yi tanımlamak için en sık kronolojik yaş kullanılmıştır. Kronolojik yaş, biyolojik yaşı temsil etmese de, hastaların ileri klinik değerlendirmesi için genellikle normal diş sürme zamanı için bir temel oluşturmaktadır (2,16). DTE, çoğu kez lokal veya sistemik bir patolojinin asıl veya tek belirtisi olabilmektedir. Erüpsiyonda oluşan bir gecikme, ortodontik hasta için endikasyonu, tedavi planını ve tedavi zamanlamasını direkt etkileyebilmektedir. Yani DTE' nin hastanın sağlık taraması üzerinde önemli bir etkisi olabilmektedir (17). Birçok vakada, DTE aslında erken teşhis için uyarı gibidir. DTE' den süt dişler de daimi dişler de etkilenebilmektedir. Maksilla ve mandibulada santral, lateral ve kaninler en sık etkilenen dişlerdir. Diş yapısında meydana gelen anormallik, bu durumdaki sürme bozukluklarından kaynaklı olabilmektedir (18).

Vitaminlerin ve minerallerin eksikliği veya fazlalığı ağız, diş ve genel sağlık üzerinde de oldukça etkilidir (19).

Sert diş dokuları gelişim evrelerinde, beslenme durumundan ve dolayısıyla vitamin alım miktarından fazlasıyla etkilenmektedir (20). Özellikle de kalsiyum, fosfor ve D, A, B ve C vitaminlerinin eksikliği hipomineralizasyona, dişin geç sürmesine, diş eti kanamalarına, bozulmuş alveolar kemik paternlerine ve periodontal hastalıklara yol açmaktadır (21). Dikkate değer bir istisna ise, aminoasit triptofandan üretilen niasin ve kısa dalgalı ultraviyole B (UVB) ışınlarının 7-dehidrokolesterol üzerindeki etkisiyle üretilen D vitaminidir (22).

Elamin ve Liversidge' ın (23) yaptıkları çalışmada ise dişlerin besin eksikliğine karşı biyolojik stabilitesini destekler nitelikte, yetersiz beslenmenin çocuklarda diş gelişimi ve zamanlaması üzerine hiçbir etkisinin olmadığı gösterilmiştir.

D Vitamini Metabolizması ve Diş Sürmesine Etkisi

Fizyolojik etkileri ve diğer metabolik yolaklardaki rollerinden dolayı, D vitamini düzeyinin belirlenip değerlendirilmesi çok önemli bir hale gelmiştir (24). **'Kalsiferol'** olarak da bilinen D vitamini, çözünür sterol yağ türevi olan yani yağda çözünen bir vitamindir. Aynı zamanda, sentezlendiği bölgeden uzakta etkiler gösterebildiğinden ve feed-back kontrolünün olmasından dolayı hormon benzeri fonksiyonlara sahip steroid yapıda bir bileşiktir. Deri veya bağırsak emilimi ile elde edilen metabolitlerin dönüştürülmesiyle sentezlenir ve canlı organizmalar için kritik öneme sahiptir. Vitamin D diyetle alınmakta ya da endojen olarak üretilmektedir. Bir prohormon olan D vitamininin D_2 ve D_3 olmak üzere iki formu vardır ve biyolojik olarak aktif değillerdir. Karaciğerde 2-hidroksilaz tarafından, böbrekte ise metabolik olarak aktive olmaktadırlar. Sadece yan zincirleri farklıdır ama bu durumun metabolizma ve aktivasyon üzerinde hiçbir etkisi yoktur. D_2 vitamini olan **'ergokalsiferol'** bitkilerden ve D_3 vitamini olan **'kolekalsiferol'** ise hem hayvanlardan hem de kolesterolün endojen olarak sentezinde bir ara metabolit olan 7-dehidrokolesterolden (provitamin D_3) güneş ışığı veya ultraviyole UV ışınlarının fotolitik etkisiyle deride sentezlenmektedir ve bu süreç yaklaşık üç gün kadardır. Normal şartlarda güneş ışınları vasıtasıyla sentez edilen vitamin D miktarı yaklaşık olarak %90-95'tir (25). 7-dehidrokolesterolün derideki kökeni haricinde, bazı araştırmacılar bağırsak kaynaklı bir kökene de bakmışlar; daha yeni çalışmalar ise 7-dehidrokolesterolün çok sayıda cilt tipi hücre tarafından de novo olarak sentezlendiğini ileri sürmüşlerdir (25). Ultraviyole B'ye maruz kaldığında 290 ile 320 nm dalga boyundaki ışınlar 7-dehidrokolesterolü D_3'e çevirmektedir. Bu endojen üretim D vitamininin temel kaynağıdır. D vitamininin bir öncüsü olarak D_3 vitamini cilt kılcal damarlarına difüze olmakta, serbest bir bileşik olan bağlayıcı protein (DBP) ile karaciğere taşınmakta ve karaciğerde 25-hidroksilaz enzimi (25-OHaz) tarafından 25-hidroksi vitamin D ($25(OH)D_3$) üretmek için hidroksillenmektedir (26). D vitamininin başlıca dolaşım şekli olan plazma $25(OH)D_3$, aktif formu olmamasına rağmen, hem kan dolaşımında en fazla bu formda bulunması hem de ortalama 2 ila 3 haftalık uzun yarılanma ömrü (20 gün) nedeniyle D vitamini seviyesinin değerlendirilmesi için kullanılan güvenilir bir indekstir (27).

D vitamini eksikliği dünya çapında yaygın bir tıbbi durumdur. Kapalı alanlarda geçirilen sürenin artması, düzensiz ve/veya yetersiz beslenme, artan güneş kremi kullanımı ve melanomun önlenmesi için yapılan uygulamalar, özellikle kış aylarında daha yüksek enlemlere sahip ülkelerde, daha düşük D vitamini seviyeleri ile sonuçlanmıştır. Böylelikle D vitamini takviyesinin önemi, gelişen küresel farkındalıkla beraber daha da artmıştır (21). Yeni doğan ve çocuklarda D vitamini eksikliği ciddi sorunlar oluşturmaktadır. Hatta düşük D vitamini düzeylerinin çocuklarda ve yetişkinlerde morbidite ile ilişkilendirildiği çalışmalar mevcuttur (28). Bir hastanın D vitamini seviyesini belirlemek için kabul edilen sınıflandırma şu şekildedir; serum **$25(OH)D_3$** düzeylerinin <20 ng/ml olması eksikliği göstermekte, çünkü bu düzeyin altındaki değerler rikets veya osteomalazi ile ilişkilendirilmektedir. 20-30 ng/ml arasındaki serum $25(OH)D_3$ düzeyleri yetersizliği göstermektedir. 30-44 ng/ml yeterlilik, 50-70 ng/ml optimal seviye olarak kabul edilmektedir. 150 ng/ml üzeri ise toksiktir (29). Amerikan Pediatri Akademisi (AAP) klinik raporuna göre, çocuklarda ve ergenlerde kemik sağlığını optimize etmek için ihtiyaç duyulan doz 12 aylıktan küçük bebekler için günde 400 Uluslararası Birim (IU), daha büyük çocuklar ve ergenler için ise günde 600 IU olarak belirlenmiştir (30).

Biyomineralizasyon, canlı organizmaların kemik, mine, dentin ve sement gibi spesifik hibrit biyolojik dokular üretmek için organik matrikslerde inorganik nanokristallerin çökelmesinin düzenlendiği dinamik bir süreçtir (21). Bu nedenle, kemikler ve özellikle dişler oral kavitedeki konumları ve dizilimleri nedeniyle yaşamları boyunca sürekli olarak demineralizasyon riski taşımaktadırlar. Mine ve dentinin mineralizasyonu

azalırsa, diş çürüğü oluşumu daha da artmaktadır (31). Vitamin D seviyesi ve genetik polimorfizm VDR (Vitamin D Reseptör Gen), daimi diş sürmesi üzerine büyük bir etkiye sahiptir. Vitamin D hem kemik formasyonunu hem de rezorpsiyonu dengeleyen bir vitamindir (13). Aktif D vitamininin en önemli rolü, kemik mineralizasyonunun kritik düzenleyicisi olmasıdır. D vitamini, kemiklerin ve dişlerin ideal mineralizasyonu için şart olan kalsiyum, magnezyum ve fosforun bağırsaktan emilimi için gerekli bir hormondur. Organizmadaki $25(OH)D_3$ düzeyinin normal olduğu durumlarda, kemiklerin mineralizasyonu üzerinde olumlu etkisi vardır (32). D vitamini eksikliğinin dişlerdeki kalsifiye dokular üzerinde öncelikle gelişimsel etkileri gözlenmektedir. Normal D vitamini seviyeleri, osteoprotegerin seviyelerini azaltarak ve nükleer faktör kappa-beta ligand reseptör ekspresyonunu uyararak alveolar kemik metabolizmasını etkilemektedir. Böylece osteoklast aktivasyonunu uyarmakta, önceki kemiğin rezorpsiyonunu ve yeni kemik apozisyonu tetiklemektedir (33). Uzun süreli D vitamini eksikliği, serum kalsiyum seviyesini düşürmekte ve kollajen matriksin mineralizasyonunun azalmasına sebep olan paratiroid hormon salınımını artırmaktadır (34). D vitamini eksikliği durumlarında, $25(OH)D_3$ yeterli konsantrasyona ulaşana kadar PTH salgısı arttığı için, hipoparatiroidizm dişlerin sürmesinde gecikme ile ilişkilendirilirken (35); hiperparatiroidizm ise kalsifikasyon sürecinin hızını artırarak diş olgunlaşmasında önemli bir rol oynayan artan bir alkalin fosfataz konsantrasyonu ile ilişkilidir (36). Raşitizm görülen çocuklar, sendromik olmayan amelogenezis ve dentinogenezis imperfekta ile kliniklere başvurabilmektedirler (37). D vitaminine dirençli raşitizmlerde kusurlu dentin mineralizasyonu, dentin defektleri ve bunu takiben genişlemiş pulpa odalarının varlığı gözlemlenmiştir (38).

D vitamininin lokal uygulanmasının daha hızlı diş hareketi ile sonuçlandığını gösteren birçok hayvan modelli çalışma bulunmakta ve D vitamini eksikliğinin, daha yavaş diş hareketine, bunun sonucunda tedavinin gecikmesine veya komplikasyonlara neden olduğu görülmektedir (39). D vitamini ortodontik tedavi sırasındaki diş hareketinde de önemli bir rol oynayabilir ve bu konuyla ilgili umut verici sonuçlar elde edilmiştir (40). Xaviyer ve arkadaşlarının (13) 2021 yılında yaptıkları bir sürme gecikmesi çalışmalarında persiste süt dişi olan grupta $25(OH)D_3$ serum seviyesinin kontrol grubuna göre oldukça düşük olduğu görülmekle birlikte; %26,7 oranında persiste süt dişi nedeniyle sürme gecikmesi olan grupta çok açık bir şekilde vitamin D yetersizliği gözlendiği belirtilmiştir. Bu çalışmanın sonucu olarak Vitamin D yetersizliğinin çocuklarda sürme gecikmesine neden olabileceği net bir şekilde belirtilmiştir. Dhamo ve arkadaşlarının (41) 2019 yılında yaptıkları çalışmada, doğum sırasında ve hamileliğin 2. trimesterinde görülen düşük D vitamini seviyesinin süt dişi sürmesini geciktirdiği net bir şekilde açıklanmıştır. Jairam ve arkadaşlarının (42) 2020 yılında yaptıkları bir çalışmada, hamilelikteki düşük Vitamin D seviyesinin infantlarda süt dişi sürme gecikmelerine neden olduğu ve annenin hamilelik esnasında güneşten faydalanmasının Vitamin D seviyesini direkt etkilediği ve bunun da süt dişi erüpsiyon zamanında önemli rol oynadığı bildirilmiştir. Crincoli ve arkadaşlarının (43) 2021 yılında yaptıkları mandibular 3. Molar dişin gömük kalması ile Vitamin D yetersizliği arasındaki ilişkiye baktıkları çalışmalarında, $25(OH)D_3$ seviyesinin hasta grubunda düşük olduğunu göstermişlerdir. Yine çift taraflı gömük kalma hastalarında da hipotezlerinin desteklediğini bildirmişlerdir. Van der Tas ve arkadaşlarının (44) literatürde optimal D vitamini konsantrasyonunun diş dokularının sağlıklı gelişimi ve mineralizasyonu üzerindeki rolü ağırlıklı olarak vurgulanmasına rağmen, mine hipomineralizasyonunun varlığı ile fetal, neonatal ve çocuk D vitamini durumu arasında hiçbir ilişki olmadığını belirtmiştir.

Sonuç

$25(OH)D_3$ seviyesinin kemik metabolizması üzerinden sürme mekanizmasına etkilerinden dolayı önemli bir parametre olduğu görülmüştür. D vitamini seviyesi, yaş ve cinsiyetten bağımsız olarak sürme gecikmesine neden olabilmektedir. Bu amaçla özellikle gelişme periyodundaki çocuk popülasyonunda muhakkak takip edilmesi gereken bir parametre olduğu düşünülmektedir.

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Çocuk Diş Hekimliğinde Probiyotikler
Probıotıcs ın Pedıatrıc Dentıstry

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Özet

Canlı bakteri içeren ve sağlığa faydaları kanıtlanmış probiyotik ürünlerin kullanımı günümüzde artmaktadır. Özellikle bazı patojenlerin antibiyotiklere karşı direnç geliştirmesi, tedavi paradigmasını spesifik bakteri eliminasyonundan probiyotiklerle bakteri ekolojisini değiştirmeye kaydırmanın düşünülmesini gerektiğini gündeme getirmiş ve "bakteriyoterapi" kavramı ortaya çıkmştır. Probiyotikler, potansiyel olarak faydalı mikroorganizmaları içeren, hastalıklara neden olan patojenleri baskılamaya yardımcı olan diyet takviyeleridir. Genel olarak; probiyotikler bağırsak sağlığı ile ilişkilendirilmiş olup bu ürünlerin gastrointestinal enfeksiyon ve hastalıkların önlenmesi veya tedavisi için kullanımları yaygındır. Bununla birlikte, son yıllarda araştırmacılar probiyotiklerin ağız sağlığına etkilerine yönelik çeşitli çalışmalara odaklanmaktadır. Klinik pratisyenlerin bakış açısından, probiyotiklerin kullanımına ilişkin doğrudan öneriler henüz verilemese de bugüne kadar bilimsel kanıtlar, probiyotik tedavinin gelecekte diş hekimliği alanında da alternatif bir yaklaşım olarak değerlendirilebileceğini düşündürmektedir. Bu derlemenin amacı, probiyotik bakterilerin ağız boşluğundaki potansiyel mekanizmalarını incelemek, probiyotiklerin ağız sağlığna etkilerini değerlendirmek ve probiyotik içerikli ürünlerin diş hekimliği alanındaki çeşitli uygulamalarını özetlemektir.

Review (HRU Int J Dent Oral Res 2022; 2(2):116-123)

Anahtar kelimeler: Probiyotikler, ağız sağlığı, diş hekimliği.

Abstract

The use of probiotic products containing live bacteria and proven health benefits is increasing today. In particular, the development of resistance of some pathogens to antibiotics brought up the need to consider shifting the treatment paradigm from specific bacterial elimination to changing bacterial ecology with probiotics, and the concept of "bacteriotherapy" emerged. Probiotics are dietary supplements that contain potentially beneficial microorganisms that help suppress disease-causing pathogens. Generally; probiotics have been associated with gut health, and these products are widely used for the prevention or treatment of gastrointestinal infections and diseases. However, in recent years, researchers have focused on various studies on the effects of probiotics on oral health. Although direct recommendations on the use of probiotics from the point of view of clinical practitioners have not yet been given, the scientific evidence to date suggests that probiotic therapy may be considered as an alternative approach in the field of dentistry in the future. The aim of this review is to examine the potential mechanisms of probiotic bacteria in the oral cavity, to evaluate the effects of probiotics on oral health, and to summarize the various applications of probiotic-containing products in the field of dentistry.

Review (HRU Int J Dent Oral Res 2022; 2(2): 116-123)

Keywords: Probiotics, oral health, dentistry.

Giriş

Probiyotik terimi, Yunanca kökenli bir kelime olan "pro bios", "yaşam için" anlamına gelmektedir (1). Probiyotikler, Dünya Sağlık Örgütü (WHO) ve Amerika Gıda ve Tarım Örgütü (FAO) tarafından "yeterli miktarda alındığı zaman sağlığa yararlı etki sağlayan canlı mikroorganizmalar" şeklinde tanımlanmaktadır(2). Prebiyotikler ise bağırsakta bulunan bakterinin büyümesini ve aktivitesini seçici olarak uyaran, konağı faydalı şekilde etkileyen sindirilemeyen bir gıda bileşeni olarak tanımlanmaktadır(3).

Probiyotiklerin insan sağlığına yararlı etkileri ilk olarak 1908 yılında Elie Metchnikoff tarafından öne sürülmüş olup fermente süt ürünlerindeki canlı mikroorganizmaların düzenli tüketimin mikroflorayı olumlu yönde etkileyerek yaşam süresini uzattığı belirtmiştir(4). "Probiyotik" terimi 1965 yılında Lilly ve Stillwell bir mikroorganizmanın salgıladığı diğer mikroorganizmaların büyümesini uyaran maddeler olarak tanımlamıştır. 1974 yılında ise Parker tarafından probiyotiklerin bağırsağın mikrobiyal dengesine katkı sağlayan organizmalar ve maddeler olduğu öne sürülmüştür(5).

Probiyotik mikroorganizmaları genellikle Lactococcus, Lactobacillus, Bifidobacterium, Streptococcus, Enterococcus, Bacillus gibi bakteri suşları olarak bilinmekle birlikte Saccharomyces cinsine ait bazı maya suşları da probiyotik ürünlerde kullanılmaktadır.

Tablo 1: Probiyotik özellik gösteren mikroorganizmalar(6):

Cins	**Tür**
Lactococcus	L. lactis subsp. Laktis
Lactobacillus	L. rhamnosus, L. fermentum, L. reuteri, L. acidophilus, L. brevis, L. johnsonii, L.plantarum, L. casei
Bifidobacterium	B. animalis subsp. laktis, B. infantis, B. bifidum, B. longum, B. Breve
Streptococcus	S. thermophilus
Enterococcus	E. faecium, E. faecalis, E. Durans
Bacillus	B. cereus, B. coagluans, B. Subtilis
Saccharomyces	S. boulardi

Probiyotikler özellikle gastrointestinal sağlığı korumak için kullanılmakta olup popülariteleri ağız sağlığının geliştirilmesindeki rollerine olan ilginin artmasına neden olmuştur(7). Yakın geçmişte ağız boşluğunun ekolojisi ve mikrobiyolojisinin daha iyi anlaşılması nedeniyle ağız hastalıklarının oluşum ve gelişim süreçlerinin anlaşılmasında da değişiklikler olmuştur. Literatürde ağız sağlığını etkileyen çürük, periodontal hastalıklar gibi patolojik durumların önlenmesinde rolü olduğu düşünülen probiyotikleri araştıran çok sayıda çalışma bulunmaktadır. Bu makale, probiyotiklerin ağız sağlığı için potansiyel faydaları hakkında güncel literatürdeki verileri özetlemektedir.

Probiyotiklerin terapötik klinik etkileri(8):

- Gastrointestinal hastalıkların önlenmesi
- Kolorektal kanserlerin önlenmesi ve tedavisinde
- Kadınlarda ürogenital sistem enfeksiyonlarının azaltılması ve HPV lezyonlarının tedavisi
- Bağışıklık sisteminin düzenlenmesi
- Patojen mikroorganizmaların kolonizasyonunun önlenmesi
- Kan kolesterol düzeylerinin düşürülmesi
- Karaciğer toksisitesinin azaltılması ve karaciğer hastalıklarının azaltılması
- Alerjik hastalıkların ve atopik duyarlılığın azaltılması

Yan etkiler

Probiyotiklerin güvenliği özellikle küçük çocuklar, yaşlılar ve bağışıklık sistemi zayıf olan kişiler için oldukça önemlidir. Probiyotiklerin yan etkileri, genelde hafif sindirim sistemi sorunu (gaz veya şişkinlik gibi) olsa da metabolik değişiklikler ve bağışıklık sisteminin uyarılması sonucu özellikle altta yatan sağlık sorunları olan kişilerde antibiyotiklerle tedavi edilmesi gereken enfeksiyonlara neden olduğu düşünülmektedir. Lactobacillus preparatları, laktoza veya süte aşırı duyarlılığı olan kişilerde kontrendikedir(9).

Moleküler ve genetik araştırmaların sonucunda ortaya çıkan probiyotiklerin etki mekanizmaları şu şekilde sıralanabilir(10):

- Patojen mikroorganizmalar için inhibe edici maddelerin üretimi (bakteriosin, organik asit, hidrojen peroksit)
- Patojen mikroorganizmalar ile tutunma ve beslenme rekabetine girerek konağa yerleşmelerinin engellenmesi

- Konak bağışıklık sisteminin modülasyonu
- Bakteriyel toksin üretiminin inhibisyonu

Laktik asit bakterileri; florada ağızda, bağırsakta ve vajinada bulunarak karbonhidrat fermentasyonu ile laktik asit ve asetik asit gibi organik asitler üretebilir(11). Bu asitler, çevredeki mikroorganizmaların büyümesini engelleyecek düşük bir ekolojik pH sağlar. Ek olarak antimikrobiyal maddeler olan hidrojen peroksit (oksitleyici ajan) ve/veya bakteriyosinler (protein yapılı bileşikler) üretir(12,13). Antimikrobiyal aktiviteleri ile çeşitli mikroorganizmalar üzerinde inhibitör bir etki gösterirler. Yapılan çalışmalarda bu bakterilerin ağız, bağırsak ve vajina enfeksiyonlarına karşı biyolojik koruyucu olarak etkileri gösterilmiştir(14-16). Aynı zamanda bu bakteriler spesifik olmayan immüniteyi uyararak, hümoral ve hücresel bağışıklık yanıtını modüle ederek faydalı etkiler sağlayabilir(17).
Probiyotik bakteriler; laktik asit üretimi, düşük pH'ın artırılması, bakteriyosin, etanol, CO2, H2O2 ve diasetil üretimi, düşük redoks potansiyeli gibi özellikleri nedeniyle patojenik bakterilere karşı etkilidir (18).

Probiyotik bakterinin ağız boşluğundaki yararlı etkileri için gerekli olan özellikleri aşağıdaki gibidir(19):

- Biyofilminde bulunarak ağız dokularına yapışma ve patojenik bakterilerle yer değiştirme yeteneğine sahip olmalıdır.
- Oral patojenik bakterilere karşı antimikrobiyal maddelerin üretimi ve patojenik bakterilerin büyümesinin önlemelidir.
- Asiditeyi azaltmadan ağızdaki düşük pH değerlerine direnç göstermelidir.
- Gıdalarda şekeri metabolize ederken asit üretimi düşük düzeyde olmalıdır.

Probiyotik bakterilerin çoğu doğal olarak mukozal mikrobiyotanın bir parçası olan Lactobacillus, Bifidobacterium, Propionibacterium ve Streptococcus cinsine aittir. Bu bakteriler olarak patojenik mikroorganizmaların yapışmasını ve kolonizasyonunu inhibe edebilir. Lactobacillus türlerinin adezyon yarışı, asit üretimi, bakteriyosin, biyosürfaktan ve hidrojen peroksit aracılığıyla patojenlerin inhibisyonunu yapabildikleri açıklanmıştır(20).

Probiyotiklerin Çocuk Diş Hekimliğinde Kullanım Alanları

Bakteriyoterapi kapsamında probiyotik kullanımının genel sağlığı korumada ve ağız hastalıklarının önlenmesinde özellikle antibiyotiklerin potansiyel zararlı etkilerinin bulunduğu erken çocukluk döneminde doğal bir yol olduğu düşünülmektedir. Ağız boşluğunda bulunan bakteriler üzerinde inhibitör etkisi olan günlük probiyotik laktobasil suşu alımı içeren süt veya yoğurt, çocukluk çağı çürüklerinin uzun süreli önlenmesinde bir tedavi seçeneği olarak değerlendirilmektedir(21).

Probiyotikler; ağız boşluğunda konak inflamatuar yanıtının modülasyonu, patojenik bakterilere karşı doğrudan veya dolaylı etkileri ile ağız sağlığını düzenlemektedir(22).

Probiyotiklerin ağız florasına etki mekanizması şu şekilde özetlenebilir(18):

- Probiyotikler, ağızda çeşitli antimikrobiyal maddeler (bakteriosin proteinleri) üreterek özellikle asidik etki gösterir.
- Probiyotikler, diş yüzeyine kolonize olmak için ve ortamdaki gıda maddeleri için ağızdaki patojenik mikroorganizmalarla rekabet eder.
- Probiyotikler; pelikül yapısında, ağızdaki pH ve redoks potansiyelinde değişikliğe yol açar. Streptococcus mutans'ın diş yüzeyine yapışmasında etkili olan tükürük aglütinin seviyesinin azalmasına ve tükürükte antimikrobiyal aktiviteye sahip olan peroksidaz seviyesinin azalmasına neden olur.
- Probiyotikler; nonspesifik immün yanıtı, hümoral ve hücresel immün yanıtları düzenleyerek inflamatuar yanıtı azaltır.

Ağız boşluğu, sağlık ve hastalık durumu ile ilişkili çeşitli mikroorganizmalar için bir yaşam alanıdır. Bakteriler ağız boşluğunda kolonize olan başlıca mikroorganizmalardır. Ağız mikrobiyotasının çeşitliliği kolonize yüzeylerin doğasına, mikroorganizmalar tarafından metabolize edilecek besinlerin varlığına, ağız hijyeni uygulamalarına ve çevresel faktörlere bağlıdır(23).

Sağlıklı ağız mikrobiyotasının homeostatik dengesindeki bir bozukluk; diş çürüğü, periodontitis, gingivitis, mukozal enfeksiyonlar gibi ağız hastalıklarının gelişmesine neden olmaktadır(24).

Ağız florasında Streptococcus salivarius, S. sanguis, S. mitis ve S. mutans en sık izole edilen türlerdir. Özellikle S. mutans, diş yüzeylerine kolonize olarak ağız ortamının pH'ını düşürme ve sükrozdan hücre dışı polisakkarit sentezleme özelliği ile diş çürüğü oluşumuna neden olmaktadır. Probiyotik laktobasillerin karyojenik özellik gösteren S. mutans'ın büyümesini inhibe ettiği bilinmektedir. Probiyotik laktobasiller bu inhibisyonu bakterisidal - bakteriyostatik etkileri, organik asitler, hidrojen peroksit gibi antimikrobiyal ürünlerin ve bakteriyosinler gibi antifungal bileşiklerin üretimi ile gerçekleştirmektedir(25). Probiyotik kullanımı, oral

kavitede patojenlerin sayısını azaltarak ağız sağlığının korunmasına fayda sağlamaktadır(26).

Ağız Mikrobiyotası

Genel olarak mikrobiyotanın konak metabolizması ve bağışıklık sistemi ile ilişkisi dış faktörlerin (patojenik enfeksiyon ve immünosupresan ilaçlar gibi) ve/veya iç faktörlerin (otoimmün bozukluk gibi) etkisiyle bozularak hastalıkların gelişimine neden olabilmektedir(27).

Ağız, konakçı sisteme mikrobiyal giriş için ana giriştir. Mikroorganizmalar ağız mukozası, dil, diş yüzeyi ve diş etine kolonize olur(28). Ağız mikrobiyotası mikrobiyal topluluğun ~ 700-1000 türü ve ~ 19.000 genotipinden oluşur. Diyet, yaş, genetik, hijyen, diyet, antibiyotik / probiyotik / prebiyotik kullanımı, yaşam şekli ve immün yetmezlik oral mikrobiyal çeşitliliği büyük ölçüde etkilemektedir(29, 30).

Streptococcus mutans, diş çürüklerine neden olan asidik koşullarda hayatta kalma kabiliyeti nedeniyle başlıca karyojenik bakteri olarak kabul edilir(31). Mutansların yanında, streptokok suşları ve Candida türleri, hem yetişkinlerde hem de çocuklarda çürüklerin %40 ila 60'ından sıklıkla izole edilir ve güçlü bir ikincil karyojenik ajanlar olarak kabul edilir(32, 33). Lactobacilli de sıklıkla çürük lezyonlarından izole edilir. Candida türleri gibi, laktobasiller de çürük gelişimi ile ilişkili asidik organizmalardır(34).

Genel olarak, literatür ağız mikrobiyotasının benzersiz ve çeşitli olduğunu göstermekle birlikte gelişmiş teknikler ve araştırmalarla; sağlık ve hastalıkla ilgili olarak ağız mikrobiyotasının çeşitliliğini, çürük gelişiminin mekanizmalarını ortaya çıkarmak için daha fazla çalışmaya ihtiyaç vardır.

Diş çürüğü

Diş çürüğü, diş minesinin demineralizasyonu sonucu görülen multifaktoriyel enfeksiyöz bir hastalıktır. Diş çürüğünün gelişimini kontrol altına almak veya diş çürüğünün oluşumunu önlemek için probiyotik mikroorganizmaların diş yüzeylerine tutunarak dental biyofilme entegre olması gerekmektedir. Aynı zamanda karbonhidrat metabolizmasına etki ederek asit üretimini azaltmalı veya asidik ortamı nötralize etmeli, karyojenik mikroorganizmalara karşı antagonist etki göstererek çoğalmalarını engellemelidir(19).

Diş çürüğü özellikle çocuklarda sık görülen ağız boşluğunun enfeksiyöz bir hastalığıdır. Çocuk diş hekimliğinde florür ve diğer koruyucu prosedürler diş çürüklerini azaltmada etkili olsa da, enfeksiyonu kontrol yetenekleri sınırlıdır(35). Bu nedenle diş çürüklerini önlemek için ağız ekolojisini etkileyen bakteriyoterapi gibi alternatif yöntemler kullanılmaktadır. Bu yöntemde mekanizma patojen bakterilerin faydalı olanlarla değiştirilmesidir(36).

Probiyotikler ağız sağlığının korunmasına ve ağız dokularının hastalıktan korunmasına yardımcı olabilir. Yaşamın ilk yılında Lactobacillus reuteri suşlarını içeren probiyotik damlaların uygulanması çürük prevalansını ve sıklığını etkilemiştir. Günlük oral probiyotik tablet alımını takiben erken çocukluk çağı çürüklerinde önemli bir azalma bildirilmiştir. Probiyotik suşlar içeren süt ürünlerinin uzun süre kullanılması çocukluk çağı çürüklerinin tedavisinde/önlenmesinde kullanılabilir(37). Bir çalışmada süt üretiminde kullanılan Streptococcus thermophilus ve Lactobacillus lactis ssp. Lactis bakterilerinin, hidroksiapatit yüzeyde bulunan bir biyofilme entegre olarak karyojenik Streptococcus sobrinus'un gelişimini etkilediği gösterilmiştir(38).

Bir çalışmada haftalık bir süre boyunca Lactobacillus reuteri içeren yoğurt tüketiminin tükürükteki S. mutans konsantrasyonunu %80'e kadar azalttığını bildirilmiştir(39).

Ortodontik tedavi gören hastalarda probiyotik mikroorganizma içeren peynir tüketiminin ve probiyotik diş macunu kullanımının dental plakta bulunan S. mutans seviyesine etkisi incelenmiş ve S. mutans seviyesinin probiyotik içerikli ürün kullanımı sonrasında anlamlı düzeyde azaldığını gözlenmiştir. Buna dayanarak probiyotik kullanımının ortodontik tedavi gören hastalarda beyaz nokta lezyonu ve diş çürüğünün önlenmesinde bir tedavi seçeneği olabileceğini belirtilmiştir(40).

Yapılan bir çalışmada 1 - 6 yaş arası 594 çocukta L. rhamnosus içeren süt tüketiminin diş çürüğü üzerindeki etkilerini değerlendirilmiş; bu probiyotiği içeren süt tüketimi olan 3 - 4 yaş grubundaki çocukların tükürüklerinde kontrol grubundan daha az S. mutans görülmüş ve L. rhamnosus'un diş çürüğünde azalmaya neden olduğu görülmüştür. Bu sonuçlara dayanarak diş çürüğünün önlenmesi için probiyotiklerin düzenli kullanımları önerilmektedir(41).

Laktik asit üreten probiyotik bakteriler; antimikrobiyal ajan üretimi, bağışıklık sisteminin ve mukozal geçirgenliğin düzenlenmesi ile biyofilm (dental plak) oluşumunu engellemektedir(42).

İn vitro olarak, S. mutans ve S. sobrinus'a karşı en güçlü inhibitör etkiye sahip olan Lactobacillus salivarius ile oral laktobasiller tarafından çürük patojenlerinin etkili bir şekilde inhibe edilebileceğini göstermişlerdir(43).

Probiyotik Lactobacillus rhamnosus GG' nin çürük önleyici etkisi, iyileştirilmiş tükürük tamponlama kapasitesi ve S. mutans sayımlarındaki azalmaya bağlı olabilir(44).

Periodontal hastalık

"Periodontal hastalık" terimi; dişleri saran ve destekleyen dokuların (diş eti, sement, PDL-periodontal ligament ve alveolar kemik) kalıtsal veya edinsel bozukluklarını içerir. Periodontal hastalıklar özellikle bakterilerin neden olduğu kronik enfeksiyöz bozukluklardır. Periodontal hastalıklar günümüzde çocuklar ve ergenler arasında yaygın olarak kabul edilen bir hastalık grubunu oluşturmaktadır(45).

Çocuklar arasında yüksek gingivitis prevalansı görülürken küçük yaş grubu popülasyonunda düşük periodontitis prevalansı izlenmektedir. Bu durum çocukları etkileyen periodontal hastalıkların çoğunun geri dönüşümlü olduğu ve yetişkinlere kıyasla daha az doku hasarına neden olması ile açıklanmaktadır(46).

Periodontal hastalıklara sıklıkla kötü ağız hijyeni nedeniyle dişlerin çevresinde biriken oral biyofilm veya dental plaktaki patojenik mikroorganizmalar neden olmaktadır. Periodontal hastalıklarla ilişkili mikroorganizmalar Porphyromonas gingivalis, A. actinomycetemcomitans ve Tannerella forsythensis olarak sıralanmaktadır(47). Candida albicans ve Herpes virüsleri bağışıklık sistemi zayıf çocuklarda periodontal hastalıkların patogenezinde rol almaktadır(48).

Probiyotiklerin antibakteriyel özelliği periodontal hastalıklardan sorumlu olan Porphyromonas gingivalis, Prevotella intermedia, Aggregatibacter actinomycetemcomitans, Fusobacterium nucleatum gibi bakterilere etki gösterdiği bilinmektedir. Laktobasillerde olduğu gibi birçok probiyotiğin antibakteriyel özelliğinden sorumlu bakteriyosinler ağız sağlığının korunmasında önemli katkı sağlamaktadır(49).

Probiyotiklerin antimikrobiyal aktivitesi ayrıca konak ile mikrobial sinyalleşmeyi ve konağın immun yanıtını değiştirerek etki göstermektedir. Bir çalışmada, laktobasillerin periodontal patojenlere karşı inflamatuar yanıtı modüle ettiğini bulunmuştur(50). Probiyotiklerle tedavi sonrası IL-1β, IL-6 ve tümör nekroz faktörü-α seviyelerindeki değişim görülmüştür(49).

Probiyotikler ve prebiyotikler tarafından mikroflora bileşiminin düzenlenmesinin mukozal ve sistemik bağışıklığın gelişimini etkileyerek periodontitis gibi hastalıkların önlenmesi ve tedavisinde etkili olabilir(51). Periodontal biofilmdeki patojenlerin probiyotik laktobasil uygulamasından sonra önemli ölçüde azaltılabildiği gösterilmiştir(52).

Probiyotik uygulamasının diş eti oluğu sıvısında, sondalamadaki kanamada, gingival ve plak indekslerinde azalma sağladığı gösterilmiştir(53). Bu değişikliklerin probiyotiklerin TNF-α ve IL- 8 gibi inflamatuar sitokinleri azaltması ile ilgili olduğu düşünülmektedir. L. reuteri periodontal patojenlerin sayısında azalmaya ve diş eti sağlığının göstergesi olan klinik parametrelere katkıda bulunmuştur(54).

Probiyotik tedavinin periodontal hastalık üzerindeki etkisine dair daha fazla araştırma gerekmektedir.

Halitozis (ağız kokusu)

Halitozis; kokuya neden olabilecek gıdaların tüketimi, metabolik bozukluklar, solunum yolu enfeksiyonları vb. gibi etiyolojik faktörlere bağlı olarak ortaya çıkabilmekle birlikte çoğu durumda ağız boşluğunun mikroflorasındaki dengesizlik ile ilişkilidir (55).

Halitozis gram - anaerobik bakteriler (Fusobacterium nucleatum, Porphyromonas gingivalis, Prevotella intermedia, and Treponema denticola) nedeniyle ortaya çıkmaktadır(56). Halitozisin oluşumundaki temel mekanizma, amino asitler üretmek için tükürük ve gıda proteinlerini degrade eden anaerobik bakterilerin metabolik ürün olarak hidrojen sülfür ve uçucu sülfür bileşikleri oluşturmasıdır(57).

Oral bir probiyotik olarak kabul edilen Steptococcus salivarus; sağlıklı bireylerde ağıza erken dönemde kolonize olarak dil mikrobiyotasındaki baskın mikroorganizmayı oluşturmakla birlikte uçucu sülfür bileşikleri üretme yeteneği sınırlıdır(58, 59). S. salivarius'un, uçucu sülfür bileşikleri üreten bakteri sayısını azaltmaya katkıda bulunabilecek bakteriyosinleri ürettiği bilinmektedir(60). Yapılan bir çalışmada halitozis teşhisi konan hastalarda S. saliyarius K12 içeren pastil kullanımı uçucu sülfür bileşiklerinin düzeylerini azaltmıştır(61).

S. salivarius'un uçucu sülfür bileşiği ürettiği bilinen bakterilerin sayısını bakteriyosin üreterek azalttığı bilinmektedir(60). S. salivarius içerikli sakız veya pastillerin kulanımının halitozis teşhisi konmuş hastalardaki uçucu sülfür bileşiği seviyelerini azalttığı gösterilmiştir(62). Başka bir çalışmada W. cibaria'nın çeşitli suşlarının, F. nucleatum tarafından uçucu sülfür bileşiklerinin üretimini inhibe etme özelliği olduğu bildirilmiştir. Bu yararlı etkinin, F. nucleatum'un çoğalmasını engelleyen W. cibaria tarafından hidrojen peroksit üretiminden kaynaklandığı sonucuna varılmıştır. Aynı zamanda W. cibaria içeren bir solüsyonla gargara yapmanın hidrojen sülfür ve metil merkaptan üretiminde buna bağlı olarak da halitoziste bir azalma olduğunu gösterilmiştir (63).

Ağız kokusu olan 20 hastada L. salivarius WB21'in ağız kokusu ve klinik parametreler (plak indeksi, periodontal cep derinliği ve sondlamada kanama)

değerlendirilmiş; patolojik halitozisi olan hastalarda organoleptik test ve sondalamadaki kanama skorlarında 4. haftada önemli ölçüde azalma gözlenmiştir(64). Başka bir çalışmada ağız kokusu olan 26 hastaya 14 gün L. salivarius WB21 içeren tabletler veya plasebo tabletler verilmiştir. Sondlamada kanamanın, F. nucleatum'un ve uçucu sülfür bileşiklerinin azalması ile Laktobasil içeren tabletlerin tüketiminin ilişkili olduğu; bu ürünlerin halitozisi kontrol etmede etkili olabileceği düşünülmüştür(65).

Ağız ve bağırsakla ilişkili halitozisin önlenmesinde probiyotiklerin etkin rolü olduğu düşünülmekle birlikte etkinliklerinin kanıtlanabilmesi için daha fazla klinik çalışma gerekmektedir.

Fungal enfeksiyonlar

Ağız boşluğu doğumdan sonra mikroorganizma ile kolonize olur ve yaşam boyu değişen mikrobiyal ortam oluşturur. C. albicans, sağlıklı insanların %20 - %40'ında bulunmakla birlikte bağışıklığı baskılanmış insanların %60'ında baskın flora haline gelir(66).

Candida albicans, çocuklarda en sık izole edilen, diş yüzeyine kolonize olan mantar türüdür. Oral kavite homeostazındaki değişiklik, uzun süreli antibiyotik alımı veya konağın savunma mekanizmasındaki değişiklik C. albicans'ın büyümesini ve kolonizasyonunu etkiler(67).

Candida albicans türünün özellikle erken çocukluk çağı çürüğünün etiyolojisinde önemli rolü bulunmakta olup çocuklarda kötü ağız hijyeni, şeker içerikli diyet ve uzun süreli biberon kullanımının C. albicans'ın yüksek prevalansı ile ilişkili bulunmuştur(68).

Bir çalışmada probiyotik bakteri olan L. Rhamnosus, konak mikroflorasının dengesini değiştirerek Candida gibi patojenik mikroorganizmaların azaltmasını sağlamıştır. Bu sonuçlar kandidiyazis tedavisinde probiyotiklerin iyi bir alternatif olabileceğini düşündürmektedir(69).

Bir çalışmada oral kandidiyazisin tedavisinde geleneksel antifungallerin kullanımı ile karşılaştırıldığında probiyotiklerin tedaviye eklenmiş olması ağrı, hiperemi gibi klinik semptomları iyileştirmiş ve Candida sayısını azaltmıştır(70).

Bir çalışmada probiyotik bakteri içeren (Lactobacillus casei ve Bifidobacterium breve) içecek tüketiminin immünolojik olarak spesifik sekretuar bağışıklık yanıtında ve anti-Candida IgA seviyelerinde önemli bir artış sağladığı gösterilmiştir(71).

Ağız kanserleri

Ağız kanserlerinin %90'ı ağız ve farinkste görülen skuamöz hücreli karsinomdur. Dudak, dil, ağız tabanı, damak, dişeti, alveolar mukoza, yanak mukozası, orofarenks ve retromolar bölge gibi mukozal bölgelerde de ağız kanserleri görülebilir(72).

Oral mukozanın inflamasyonu ve mukozal hasarı ile karakterize oral mukozit,özellikle baş-boyun bölgesinden radyoterapi ve/veya kemoterapi alan kanser hastalarının en sık görülen komplikasyonudur. Radyoterapi/kemoterapinin neden olduğu oral mukozit; ağrıya, yutma güçlüğüne ve yetersiz beslenmeye neden olarak hastaların yaşam kalitesini etkilemektedir. Oral mukozitin tedavisinde büyüme faktörleri, antibiyotikler, klorheksidin, kriyoterapi, düşük seviyeli lazer tedavisi ve anti-inflamatuar ajanlar kullanılabilir; ancak bu ajanlar sınırlı etkinliğe sahiptir. Bu nedenle, oral mukozitin tedavisi için yeni terapötiklerin geliştirilmesine ihtiyaç vardır(73).

Bir çalışmada probiyotik S.salivarius K12'nin oral mikrobiyotayı modüle edebildiğini ve radyasyona bağlı oral mukoziti iyileştirebildiği gösterilmiştir. Buna dayanarak probiyotiklerin kullanımı radyoterapi/kemoterapinin neden olduğu mukozitin tedavisinde hastalarının yaşam kalitesini iyileştirmek amacıyla uygulanan potansiyel bir yaklaşım olarak önerilmektedir(74).

Lactobacillus plantarum'un ağız sağlığına ve oral mukozitisine etkisinin değerlendirildiği bir çalışmada L. plantarum'un ağızdaki kanser gelişimini kontrol etmede önemli olduğu düşünülmüştür(75).

Probiyotiklerin kanseri önleyici etkileri, kromozomal ve DNA hasarı sürecinde etki göstererek olduğu düşünülmektedir(76). Bununla birlikte literatürdeki araştırmalar bu konuda yetersizdir.

SONUÇ

Probiyotiklerin çeşitli biyolojik mekanizmalar ile ağız sağlığına olumlu etkileri bulunmaktadır. Bu nedenle probiyotiklerin ağız sağlığının devamı ve mevcut ağız enfeksiyonlarının önlenmesinde yeni bir araştırma alanı olarak değerlendirilerek özellikle Lactobacillus ve Bifidobacterium suşlarının etkilerine yönelik çok sayıda çalışma yapılmıştır, ancak probiyotiklerin ağız sağlığına yönelik potansiyelini tam olarak ortaya koymak için yeterli klinik çalışma bulunmamaktadır. Doğal ağız mikroflorasında probiyotiklerin varlığı, bu bakterilerin insan ekosistemine mükemmel bir şekilde adapte olma avantajını sunduğu için bu potansiyelden yararlanmak için daha fazla randomize klinik araştırma gerekmektedir. Bu tür çalışmalar; probiyotiklerin gıda ürünleri (peynir, süt, yoğurt) olarak kullanımının yanı sıra diğer uygulama yöntemlerinin (sakız, pastiller) belirlenmesine, uygun konsantrasyonda ve sürede kullanılmasının belirlenmesine olanak sağlayacaktır.

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Surgical Treatment of Aggressive Type Central Giant Cell Granuloma:A Case Report

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Abstract

Giant cell granulomas in the jaws are divided into two according to their location in the bone or soft tissue. Those that develop on the soft tissue basis are called peripheral type giant cell granulomas, while lesions that develop in the bone are called central type giant cell granulomas. Central giant cell granulomas are seen in both jaws, but are more common in the mandible. Although it is seen in both sexes, it is more common in women. Although etiology of central giant cell granuloma is not known exactly, it may be of neoplastic, traumatic and hormonal origin. Treatment options are surgical curettage and excision or medical treatments. In this case report, a case of aggressive central giant cell granuloma in the maxillary posterior region is discussed. The patient applied to our clinic with the complaint of swelling in the lesion area, and the mass was removed with general anesthesia.

Case Report (HRU Int J Dent Oral Res 2022; 2(2): 124-128)

Keywords: Central giant cell granulomas, osteoclastic giant cells, curretage.

Introduction

Central giant cell granuloma is non-odontogenic, intraosseous lesion. Central giant cell granuloma may occur as a result of trauma or reactive processes such as inflammation. The etiology of this lesion is undefined. Although it can be seen in both jaws, it is more common in the mandible. Although central giant cell granuloma is generally seen in benign character, there are cases with an aggressive course. It is more common in women and in the first three decades of life (1,2). The radiological appearance of central giant cell granuloma can be unilocular or multilocular. In some cases, there are cases whose borders are not clear, as well as defining the borders. Central giant cell granuloma may cause resorption of tooth roots and migration of teeth (3). Central giant cell granuloma presents clinically as a slow-growing swelling that is not painful and asymptomatic. As the lesion grows, it may cause pain and cortical destruction (4). Histopathologically, it is quite difficult to distinguish it from a brown tumor of hyperparathyroidism. Central giant cell granuloma histologically contains loose connective tissue fibroblasts and small blood vessels (5). Curettage or resection is preferred in its treatment. If the lesion is aggressive, resection is preferred, while curettage is preferred for non-aggressive lesions (6,7).

Case Report

In the clinical examination of a 43-year-old male patient who applied to our clinic with the complaints of left nasal cavity stenosis and difficulty in breathing due to this, swelling and expansion in the vestibule and palatal sides of the left maxilla posterior region were observed. The patient has no history of trauma or tooth extraction. As a result of the anamnesis, it was

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determined that the lesion had been symptomatic for 1 year. After the clinical and radiological examination of the patient,carried out an incisional biopsy. In the histopathological examination, edematous connective tissue and bleeding sites were seen in the sections, fibrohistiocytic stromal cells and osteoclastic giant cells were observed. (Figure 1) Morphological findings were reported to be compatible with central type giant cell granuloma. The sample conducted a biopsy on also contains reactive bone trabeculae.

Physical examination revealed swelling in the left maxillary region. The lesion is painful on palpation. At the same time, the consistency of the lesion was rubbery. The skin and mucosa over the mass were normal. The brown tumor of hyperparathyroidism is histologically identical to the central giant cell granuloma (CGCG), but these lesions can be differentiated based on history and laboratory findings. The patient's blood calcium and PTH levels were checked to rule out hyperparathyroidism. In the radiological examination of the patient, orthopantomography showed the lesion is extending from the left maxilla to the inferior edge of the orbit.

Advanced imaging techniques were preferred for radiological examination. In maxillofacial computed tomography, it was determined that the lesion caused nasal septum deviation in the three-dimensional image. In addition, destruction of the nasal septum and the inferior border of the left maxillary sinus was observed. (Figure 2,3) In the axial and coronal sections of the maxillofacial computed tomography, the lesion that completely filled the left maxillary sinus, extended to the orbital inferior margin, and caused expansion in the posterior region of the left maxilla was detected.

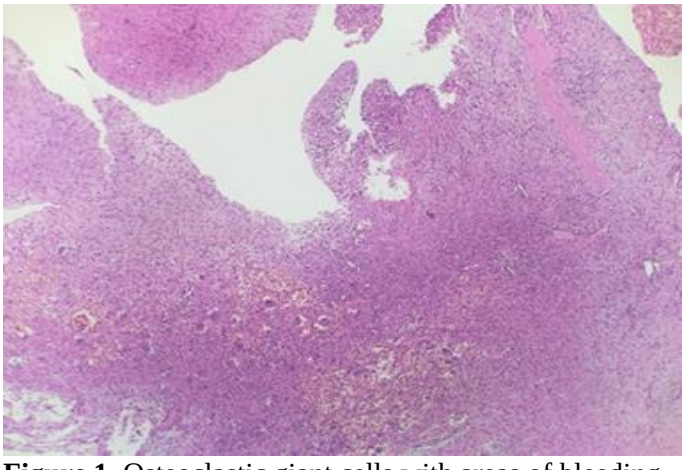

Figure 1. Osteoclastic giant cells with areas of bleeding.

Figure 2. The appearance of the lesion on coronal CT.

Figure 3. The appearance of the lesion on axial CT.

It was decided to remove the lesion with general anesthesia. After nasal intubation, relaxing vertical incisions were made in addition to the gingival sulcus incision in the left maxillary region, and the anterior border of the maxilla was reached, and it was observed that the lesion destroyed the anterior wall of the maxilla. (Figure 4) Osteotomies were performed to reach the center of the lesion. Blunt dissection was used to separate the lesion from the soft tissue. After the lesion was curetted completely, a gas iodoform tampon was placed

in order to provide hemostasis and to support the regeneration of the maxillary sinus tissues. (Figure 5) Gas iodoform tampon was passed through the lateral wall and sutured to the nasal cavity with 3-0 silk sutures. The wound margins were also sutured. (Figure 6) The tampon was removed from the nasal cavity after two days.

Figure 4. İntraoperative image.

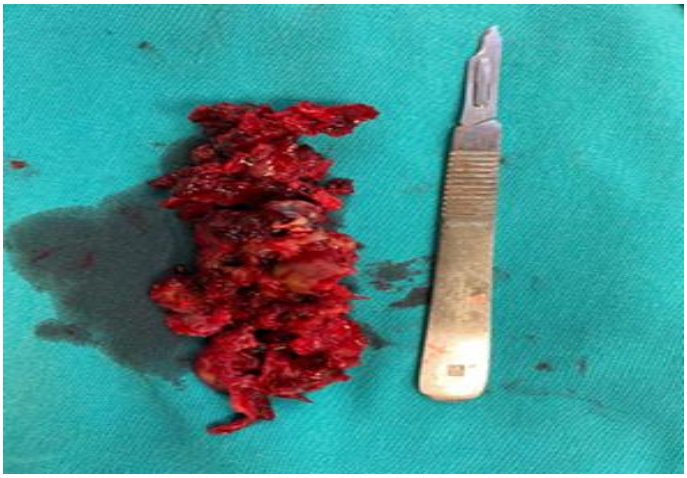

Figure 5. Image of the curetted lesion.

Figure 6. Postoperative image.

Discussion

The central giant cell granuloma was first described by Jaffe in 1953 (9,10). Central giant cell granuloma is a rare benign, local lesion of the jaws (8). It is more common in women (2). In this case, the patient is male. Thus, it differs with the literature in terms of gender.

Localization of central giant cell granuloma cases is often seen in the mandible, anterior to the first molar, but also in both jaws. Studies report that central giant cell granuloma is at least twice as common in the mandible as in the maxilla (7,16). De lange et al. (2005) reported that 8 out of 79 unilocular central giant cell granuloma cases occurred in the periapical region (16). It has been reported that most of the cases published in the literature are located in the anterior region of the mandible and maxilla (15,17,18) The central giant cell granuloma case seen in our report was localized in the left maxilla posterior region. Therefore, the case we presented differs in terms of location with the literature.

The etiology of central giant cell granuloma is not known for certain, but it is thought that local trauma, sex hormones and genetic factors may be effective in its formation (14,15).

When the central giant cell granuloma reaches clinically sufficient size, the deformity of the bone cortex becomes visible radiographically. Facial deformity, migration of teeth and resorption of tooth roots may occur with the enlargement of the lesion. As bone destruction increases, the margin of the lesion becomes clearer radiologically (11).

Radiographically, granulomas can be unilocular or multilocular. The lesion varies radiographically from small apical lesions to destructive multilocular radiolucency more than 4 cm in size, spread over a large area in the maxilla or mandible. Curettage is generally preferred for treatment. While partial resection is required in some cases, total resection is required in cases whose treatment is delayed. Central giant cell granuloma is usually painless. Pain depends on the size of the lesion and its proximity to nerve tissues (12,13,16)

Giant cell granulomas are divided into two as central and peripheral according to their localization. Peripheral giant cell granuloma occurs in the gingiva, while central giant cell granuloma occurs in the bone tissue. Peripheral giant cell granuloma forms areas of erosion under soft tissue. Central giant cell granuloma is seen radiologically as oval or round areas of destruction (7). When the panoramic radiography of our case was examined, a

multicollar lesion was detected starting from the left maxillary central tooth, extending to the second molar tooth and including the sinus. During the operation, destruction of the alveolar bone and anterior wall of the maxillary sinus was observed.

Central giant cell granuloma is classified according to whether or not it is clinically aggressive. If the lesion develops slowly, asymptomatically, without cortical bone perforation and resorption of the tooth roots, it is called non-aggressive. The recurrence rate of the lesion is low in non-aggressive central giant cell granuloma. The aggressive type has a high recurrence rate and the lesion grows rapidly and is painful. It can also perforate the cortical bone (19). Based on these findings, it was determined that the case had an aggressive type central giant cell granuloma because of the complaints of cortical perforation, pain and bone expansion.

In the histopathological section, bleeding areas, osteoclastic giant cells, fibrous connective tissue and cystic degeneration with membranous walls are seen (2). Cherubism, aneurysmal bone cyst, and brown tumor of hyperthyroidism are among the lesions seen in the maxillofacial region and have giant cells in histology. The deposits formed around the blood vessels in central giant cell granuloma are effective in differentiating them from cherubism. These deposits do not occur in cherubism. Large areas of blood are seen in aneurysmal bone cyst. If the patient's serum calcium, parathyroid hormone, alkaline phosphatase, and phosphorus levels are normal, a distinction is made between hyperparathyroidism and central giant cell granuloma (20). In our study, the patient's serum calcium, parathyroid hormone, alkaline phosphatase and phosphorus values were found to be normal, and it was differentiated from hyperparathyroidism.

There are surgical and non-surgical (therapeutic, medical) treatment options for central giant cell granuloma. Alpha interferon, calcitonin and corticosteroid injection are non-surgical treatments. Surgical treatments are the most preferred treatments. They are called traditional methods of treatment. Curettage with excision is preferred in small lesions, while resection is preferred in larger lesions (21,22). In our study, curettage treatment with excision was preferred in the treatment of central giant cell granuloma located in the left maxilla posterior.

Conclusions

Central giant cell granulomas are lesions that nonneoplastic, mostly seen in the anterior of the mandibular first molar. Central giant cell granulomas in the upper jaw are benign but rare lesions. Unlike malignant lesions, the growth rate is usually slow and is common in young people. However, the presence of areas of bone destruction and areas of mineralization on paranasal sinus tomography suggests this lesion. Considering the size of the lesion and the general health of the patient, surgical treatment options such as curettage and resection may be preferred. After surgical treatment, root canal treatment can be applied or extracted to the teeth associated with the lesion. Extracted teeth should be treated prosthetically.

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Fibrous Dysplasia: A Case Report

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Abstract

Fibrous dysplasia is a rare benign bone tumor. It has the potential to demonstrate malignant transformation. Fibrous dysplasia occurs when normal bone tissue is replaced by fibrous tissue. The most common locations in the maxillofacial region are the maxilla and mandible. Fibrous dysplasia is divided into monostotic and polyostotic forms. If involvement is observed in more than one bone, it is called polyostotic fibrous dysplasia, if involvement is observed in a single bone, it is called monostotic fibrous dysplasia. Monostotic type fibrous dysplasia accounts for 75% of cases. There are many syndromes in which polyostotic fibrous dysplasia is seen. The best known of these are McCune Albright syndrome, Jaffe-Lichtenstein syndrome and Mazabraud syndrome.

Case Report (HRU Int J Dent Oral Res 2022; 2(2): 129-133)

Keywords: Fibrous dysplasia, Mccune – Albright syndrome, ground glass.

Introduction

Fibrous dysplasia was first defined by Lichtenstein in 1938 as polyostatic fibrous dysplasia, but this term was changed to fibrous dysplasia because skeletal changes were divided into monostotic and polyostatic forms (1). Fibrous dysplasia is a sporadic disease of genetic origin that occurs in the bone. It occurs as a result of mutation in the gene code in the α subunit of the Gs protein of the GNAS complex locus on chromosome 20q13 (2,3).

Fibroosseous lesions describe processes characterized by the replacement of normal bone by fibrous tissue containing a newly formed mineralized product. Fibro-osseous lesions are fibrous dysplasia, cemento-osseous dysplasia, and ossified fibroma. Fibrous dysplasia is characterized by tumor tissue that develops from the replacement of normal bone tissue with a mixture of irregular trabeculae and cellular fibrous connective tissue (10).

Fibrous dysplasia is a rare skeletal disorder that can cause bone fractures, deformities, pain, and impairment in function. In fibrous dysplasia, bone is replaced by fibrous and osseous tissue, which are structurally weaker. Although it is localized and benign, it can show malignant transformation (4,5).

Fibrous dysplasia is divided into two types, monostotic and polyostotic. In the literature, 70% of fibrous dysplasia cases are monostotic. In a large multicenter clinicopathological study conducted in Europe, it was determined that the most common site of involvement in patients with monostotic fibrous dysplasia disease was the femur. Other common sites of involvement are ribs and craniofacial bones. Polyostatic type fibrous dysplasia is characterized by the presence of multiple foci in many bones (6,7).

McCune-Albright syndrome (MAS), which consists of the triad of fibrous dysplasia, cafe au lait spots, and endocrine disorders, was described in 1937 by Donovan McCune and Fuller Albright. The most common endocrine disorder is related to sex hormones. While surgical treatment was used for treatment in the past, anti-hormonal medical treatments are preferred today. Bone lesions, cafe-au-lait spots, and affected gonads are typically on the same side of the body. Endocrine disorders can be any one of hypothyroidism, adrenal disorders, diabetes, hypopituitarism and hypercalcemia (8,9).

Magnetic resonance imaging, conventional x-rays, computed tomography, histopathology and

scintigraphy may be preferred in the diagnosis of fibrous dysplasia. Computed tomography is very important for the diagnosis and treatment of fibrous dysplasia. In the literature, it has been stated that it is the most effective method used in the diagnosis of fibrous dysplasia. Radiological appearance changes according to the development of the bone matrix. While radiolucent appearance is dominant in the early stage of the lesion, radiopaque appearance is more common in advanced stages. The radiological appearance of the fibrous dysplasia lesion is expressed as 'ground glass' or 'orange peel' (3,5,11,12).

In the early stages of fibrous dysplasia, the lytic zone can be well or poorly circumscribed, unilocular or multilocular. The 'ground glass' appearance seen on the radiograph is one of the most important criteria for diagnosis. In the later stages of the lesion, the lamina dura of the teeth become indistinct in the periapical films taken from the affected area. It has been reported that the canal can change its location in the mandibular canal region (11,13).

In fibrous dysplasia cases, asymptomatic cases are followed or conservative treatment is preferred. Due to the possibility of recurrence, long-term follow-up of the treated cases is required (14).

Case report

A 21-year-old female patient was admitted to the Department of Oral and Maxillofacial Surgery of the Faculty of Dentistry of Harran University with complaints of swelling in the right maxillary region and facial asymmetry. In the anamnesis, it was learned that the patient had previously undergone surgery due to a case of fibrous dysplasia in the same region. It was determined that the patient had been complaining of swelling in the same area for the past year and had difficulty breathing due to this swelling. No systemic disease was detected in the patient.

Extraoral examination revealed an expansive area in the right maxillary region of the patient, extending to the inferior edge of the orbit, causing facial asymmetry. Intraoral examination revealed a painless swelling resembling a bony prominence in the right maxilla. (Figure 1)

Orthopantomograph film was taken for radiological examination. In the examination, bone expansion and ground glass appearance were observed in the right maxillary region. (Figure 2)

Figure 1. Preoperative intraoral view of the case.

Figure 2. Panoramic radiograph of the lesion in the right maxilla

Computed tomography sections were examined in order to more clearly monitor the borders of the lesion. In computed tomography sections, it was observed that the lesion completely filled the inside of the maxillary sinus and caused a deviation in the nasal septum. (Figure 3) Expansion was detected in the right maxillary palatinal and vestibule regions. (Figure 4) It was learned that the patient had difficulty in breathing due to the expansion caused by the lesion. In the three-dimensional film of the patient, it was seen that the lesion included the right posterior region of the maxilla. (Figure 5)

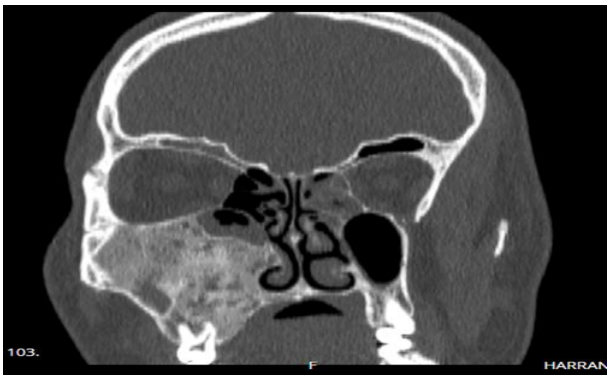

Figure 3. Coronal section computed tomography image of the lesion located in the posterior region of the maxilla.

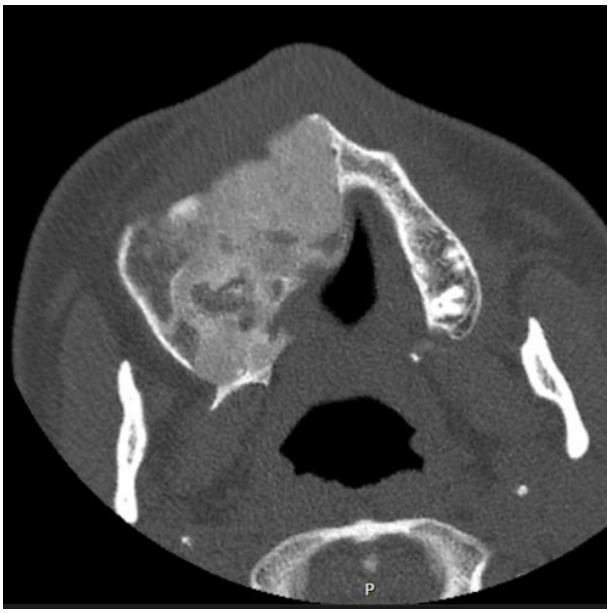

Figure 4. Axial section computed tomography image of the lesion located in the maxilla posterior region.

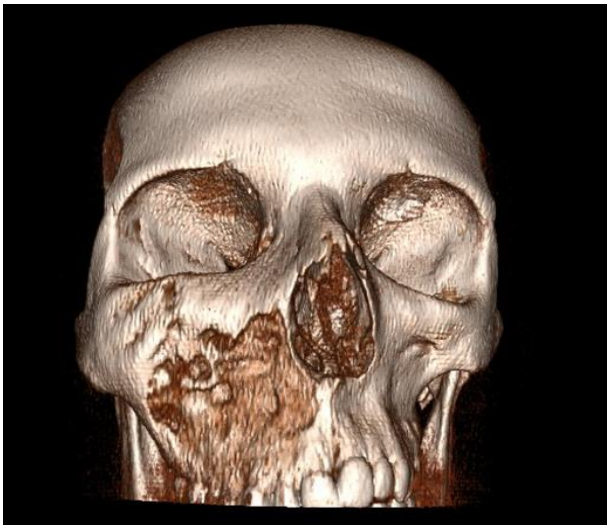

Figure 5. Computed tomography 3D view of the case.

As a result of clinical and radiological examinations, it was decided to carry out a biopsy from the lesion suggestive of fibrous dysplasia. It was deemed appropriate to operate the patient with general anesthesia. After nasal intubation, vertical incisions were added to expose the lesion borders in the right maxillary posterior region and the flap was removed. Bone contour adjustment was made in order to eliminate the cosmetic problem that bothered the patient in the vestibular region. The flap was sutured with 3-0 silk suture. Pieces taken from the lesion were sent for histopathological evaluation. (Figure 6)

Figure 6. Parts removed from the lesion during the operation.

Figure 7. Postoperative radiological image of the patient.

Discussion

Fibrous dysplasia is a non-neoplastic developmental hamartomatous disease of bone characterized by a mixture of fibrous and osseous elements in the region. It is a rare disease with an incidence of 1:4000-1:10,000. It accounts for approximately 2.5% of all bone lesions and approximately 7% of all benign bone tumors. It has three subtypes: polyostotic, monostotic, and craniofacial. Craniofacial fibrous dysplasia describes the lesion that occurs at the junctions of bones in the craniofacial skeleton. Most cases of craniofacial fibrous dysplasia cannot be classified as monostotic because it may involve many bones in the cranium. They are not polyostotic because the outer cortex of the craniofacial complex is preserved. Craniofacial fibrous dysplasia tends to be more common in women. Since it coincides with the maturation time of the bones of the patients, its incidence is high in the thirties (15, 16, 17).

Fibrous dysplasia is generally seen with equal frequency in both sexes. The lesion, which is more common in the maxilla than in the mandible, usually grows slowly. Displacement of teeth, facial asymmetry and malocclusion are common findings of fibrous dysplasia. The lesion may cause expansion in the vestibule region. The mucosa is usually normal in color. Depending on the lesion stages, it may have various radiographic appearances. While there is a multilocular or unilocular radiolucent appearance in the early stage, radiopaque foci are added on the radiolucent area in advanced stages. As the lesion matures, the radiopaque area becomes dominant. Radiological definitions used for fibrous dysplasia; fingerprints, orange peel and frosted glass (18, 19).Petrikowski et al. reported that the only lesion that moves the mandibular canal superiorly is fibrous dysplasia. This finding is used to distinguish fibrous dysplasia from other lesions (20).

Differential diagnosis of fibrous dysplasia; It is performed with Paget's disease, giant cell tumor, Brown tumor seen in hyperthyroidism, ossifying fibroma and central giant cell granuloma. At the same time, the radiological appearance of chronic osteomyelitis and the radiological appearance of fibrous dysplasia are similar. Purulent discharge, pain and tenderness of inflammation are seen in osteomyelitis but not in fibrous dysplasia. Fibrous dysplasia is usually characterized by painless, slow-growing swelling. These features distinguish it from malignant tumors (18,19).

McCune-Albrigth syndrome is a subform of fibrous dysplasia characterized by endocrine disorders and brown patches on the skin described as café-au-lait spots. Findings such as hyperthyroidism, acromegaly and Cushing's syndrome can also be seen in this syndrome. It is more common in the female gender. Stains are usually seen on the dorsum, sacrum and hips (11,12).

Treatment of fibrous dysplasia is mostly surgical. The most effective treatment is total resection of the bone involved by the lesion. However, this leads to serious cosmetic and functional problems. It can also cause serious complications in the future. Therefore, conservative surgical treatment is preferred. With conservative treatment, it is aimed to correct the asymmetry and cosmetic problem caused by the lesion. Patients with fibrous dysplasia need long-term follow-up because of the risk of malignant transformation (21, 22).

Medical treatment is not often preferred in the treatment of fibrous dysplasia. Recognition of the pathogenesis of fibrous dysplasia brought to mind the use of bisphosphonates in the treatment of this disease. Agents with bisphosphonate active ingredients inhibit the osteoclastic activity of the bone and prevent the destruction of the bone. This stabilizes the bone and reduces the patient's pain. At the same time, another medical agent to be used for the treatment of fibrous dysplasia is pamidronate. This drug is also a second generation agent that inhibits bone resorption. Since serum calcium is low in these patients, vitamin D and calcium supplementation are also recommended (16).

Because of the possibility of malignant transformation and recurrence, it should be followed for a long time. Fibrous dysplasia is a rare lesion. The radiological and clinical features differ in cases (1).

In the case we presented, fibrous dysplasia was located in the posterior region of the right maxilla. A ground glass appearance was observed radiologically in the relevant region. Clinically, it caused swelling in the vestibule and caused asymmetry. With conservative surgical treatment, the bone contour was corrected and the cosmetic problem was resolved. The patient is followed in our clinic.

Conclusion

As a result; fibrous dysplasia is a disease diagnosed by radiological, clinical and histopathological correlations. It causes asymmetry and cosmetic problems in the craniofacial region. Ground glass appearance is characteristic in radiology. Its treatment is total resection or conservative surgical approach. Expected results from medical treatments could not be obtained. Fibrous dysplasia because of the risk of transformation into malignant tumors such as osteosarcoma, it should be under continuous follow-up.

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$Ca(OH)^2$ Apexification to a Tooth with Chronic Apical Abscess: A Case Report

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Abstract

In the period when the root development of children's teeth continues, trauma or caries to the teeth stops this root development. If the pulp becomes devitalized in immature permanent teeth due to dental trauma or infection, apexification treatment should be performed to continue root development. In this case report, a chronic apical abscess was observed in an immature permanent central tooth whose pulp was exposed as a result of dental trauma and did not receive any treatment for two years. As a result of clinical-radiological examination, $Ca(OH)^2$ apexification treatment was planned. It has been observed that root formation continues in each session with the periodic renewal of $Ca(OH)^2$.

Case Report (HRU Int J Dent Oral Res 2022; 2(2): 134-138)

Keywords: Apexification, apexification with Ca(OH)2, complicated crown fracture

Introduction

When periapical lesion and necrosis develop in an immature permanent tooth whose root apex is open or root development is incomplete, it isn't easy ,to treat with conventional endodontic treatment methods. Ensuring asepsis in the root canal and creating an apical stop at the root tip are the main elements in the success of endodontic treatment. In cases where apical closure does not occur naturally in an immature permanent tooth, the main purpose is to create a periapical barrier or stop instead of using root canal filling material to prevent excessive extrusion of the tooth.(1,2) For this purpose, apexification treatment is performed instead of traditional endodontic treatment. Apexification is a procedure that promotes the formation of an apical barrier to close the open apex of a devital immature permanent tooth so that filling materials can be retained within the root canal space. The capacity of materials such as calcium hydroxide [$Ca(OH)^2$] to induce the formation of this calcific barrier at the apex makes apexification possible. Clinically, when it is understood that the pulp of an immature permanent tooth is devital and the root will not develop further in terms of apical maturation and thickening of the dentin walls, apexification is performed to close the root tip (3).

Because calcium hydroxide is biologically compatible with pulp and periodontal tissue, it is a successful material that is frequently used in dentistry. Calcium hydroxide was first used by Frank in the treatment of apexification, so it was referred to as the "Frank technique" in the literatüre (4). The success of apexification treatment using calcium hydroxide is between 74-100% in studies. This success rate of calcium hydroxide;

- Stimulating apical development by providing asepsis in periapical tissues,
- Accelerating cementogenesis at the apex by transforming undifferentiated mesenchymal cells into cementoblasts,
- Ensuring the development of calcification under the necrosis layer formed due to its high pH,

- The Ca ions it contains have a reducing effect on capillary leakage,
- To prevent granulation tissue from advancing into the canal by filling the canal space,
- It has been observed that while activating alkaline phosphatase and pyrophosphatase

enzymes, it inhibits osteoclastic activity and forms a hard tissue barrier with the help of all these mechanisms (4,5,6). For all these reasons, calcium hydroxide, has gained the widest acceptance in the treatment of apexification, although various materials have been proposed (6). In our case, we aimed to provide an apical stop using the Frank technique. In our case, the pulp of the left central tooth was exposed as a result of trauma, and a chronic apical abscess developed in the immature permanent tooth, which had not received any treatment for a long time. Root development was evident in each session of the patient, in whom we started apexification treatment using calcium hydroxide. In our patient, whose main aim was to create a stop at the apical level, successful treatment was achieved by providing root development.

Case Report

In the anamnesis taken from the parents of a 9-year-old girl, who applied to the pediatric dentistry clinic of Harran University, it was learned that she fell while walking backwards and forwards two years ago and had a fracture in her left central incisor. In the intraoral examination, a complicated crown fracture with pulp exposure area and its area in tooth number 21 and a fistula on the labial surface of the tooth was seen. In the radiographic examination, it was determined that root development was not completed, and there was a radiolucent area around the root. It was learned that the patient did not have any systemic health problems (Figure 1-2).

Informed consent was obtained from the parents, and treatment was started. It was decided to treat tooth 21 with Ca(OH)2 apexification. Since the pulp exposure area was large in the first session, irrigation with 2.5% sodium hypochlorite was started. During irrigation, the pen tip pieces were removed from the exposure area. (Figure 3) After adequate irrigation, the root canal was dried with sterile paper cones and filled with calcium hydroxide temporary canal sealer (Kalsin, Turkey) and temporary filled with glass ionomer cement. (Kavitan Plus, Pentron, Czech Republic).

Figure 1. Radiographic image taken before treatment

Figure 2. Clinical image taken before

In the session 1 month later, it was observed that there was no pain on percussion and palpation in tooth 21 and the fistula tract was closed. The root canal was washed with 2 ml of 2.5% NaOCl solution to remove the calcium hydroxide and smear layer in the canal. Root development was checked by taking a periapical film. After adequate irrigation, it was temporarily resealed with glass ionomer cement (Figure 4-5) .

In the session three months later, the periapical film was taken with standard canal files (Denco K and H File standard Canal file, Shenzhen perfect medical, China) after irrigation with sodium hypochlorite to see root formation and the presence of apical plug. (Figure 6-7) Periodic 3-month appointments were given to the patient, and intracanal $Ca(OH)^2$ regeneration, root development, and apex formation were followed up.

Figure 3. Pen tip pieces that came out of the canal the as a result of irrigation in the 1st session

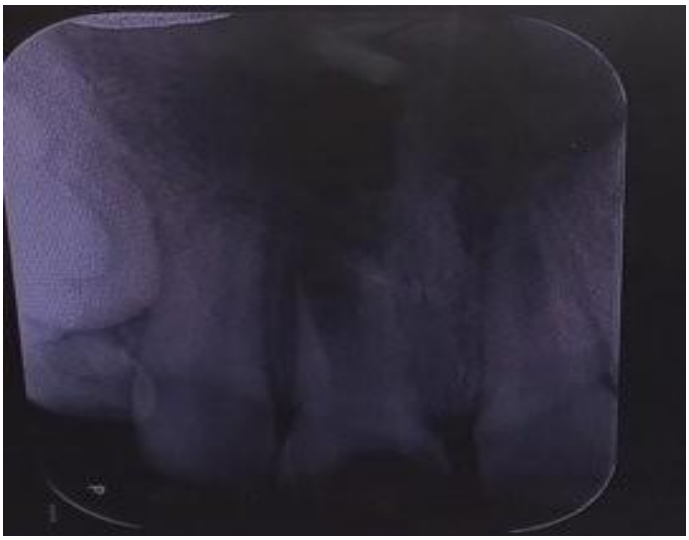

Figure 4. Radiographic image taken before treatment in the 1st session

Figure 5. Radiographic image taken after calcination in the 2nd session

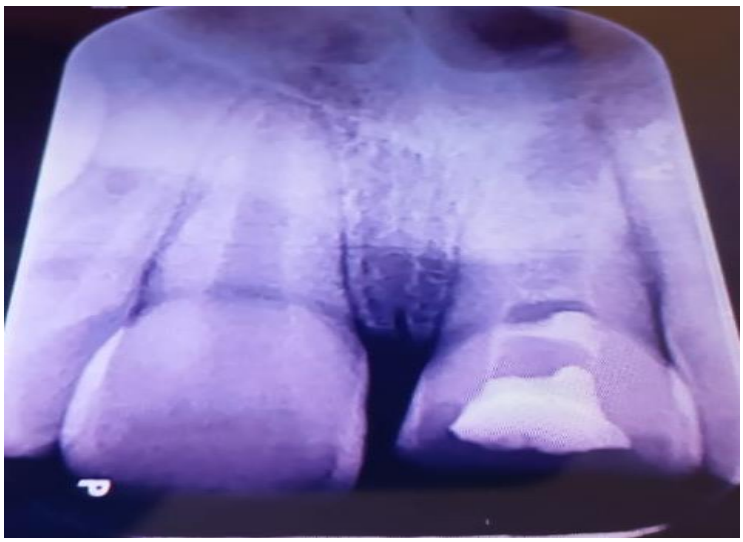

Figure 6. Radiographic image taken in the 3rd session

Figure 7. The clinical image taken before the treatment in the 3rd session

Discussion

Pulp necrosis can be caused by trauma or various damages and usually results in the root development stop of immature permanent teeth. Immature permanent necrotic teeth remain with open apex and thin and short root walls. Other causes of open apex include: chronic periapical periodontitis causing apical resorption, apical resorption due to trauma, destruction of apical narrowing during mechanical debridement, apicalectomy without the use of root tip filling material, and horizontal root fracture (7).

Conventional root canal treatment cannot be used for endodontic treatment of immature permanent necrotic teeth. Since the apex of these teeth is open, it is difficult to create a barrier at the apical level. Many endodontic treatment methods are used for this: Many procedures can be applied including reverse use of gutta-perchas on anterior maxillary teeth, orthograde use of polyantibiotic drugs or materials such as calcium hydroxide, retrograde closure of open apexes, and orthograde use of mineral trioxide aggregate in a single session. This form of treatment is called apexification (8). In our case, chronic apical abscess developed as a result of trauma, as no treatment was given in the early period. We decided to perform apexification with orthograde use of calcium hydroxide as a treatment. We prefer calcium hydroxide because it is easy to use and obtain.

It has been demonstrated in many studies that calcium hydroxide, which is an intracanal drug used for apexification and available in many forms, has had great success from the past to the present. However, the time taken for successful apexification differed in these studies. Walia et al. observed that the treatment time of narrow open-ended teeth was shorter in older children than in younger children. In contrast, Dominguez et al found that the presence or absence of apical pathology prior to treatment hardly affects the duration of treatment for successful apical closure. Sheehy and Roberts found that the mean time for apical barrier formation is approximately 5 to 20 months. In addition, the type of apical closure in apexification also changes (9).

One study by Ballesio found three types of apical barrier formation (10);

1. Physiological development of the apical portion with a final root length equal to the contralateral tooth.
2. Head-like barrier formation.
3. Apical development with final root length, forming different layers of mineralized tissue in a slightly shorter time than the opposite intact tooth.

Weine, on the other hand, described four different types of apical healing in the treatment of apexification with calcium hydroxide. These recovery types can be explained as follows:(11)

1. There is no radiographic change, the barrier can be felt with hand sensitivity.
2. The barrier at or near the apex can be observed by radiography.
3. Root tip closed without change in canal size.
4. Root development, continued and the apex closed.

In control sessions; If the file used for control does not pass through the apical area, the patient does not feel that the file is touching, and the tip of the paper subject inserted into the canal is dry, the apexification process is completed; otherwise the apexification application should be continued.(11)In our case, according to the studies of Ballesio and Weine, it was observed that root development continued and there was a tendency towards equal root length as in the contralateral tooth.

Another factor affecting the success of apexification is disinfecting the root canals. This can be achieved using mechanical instrumentation and chemical irrigation for disinfection. (12) Sodium hypochlorite is the most commonly used solution for root canal disinfection. Sodium hypochlorite (NaOCI); effective against biofilms. At the same time, it dissolves the organic structures in the root canal. However, NaOCl solutions are insufficient to remove the hard tissue residues accumulated during mechanical instrumentation and dissolve the inorganic structures of the smear layer. Therefore, application of the chelating agent ethylenediaminetetraacetic acid (EDTA) is necessary. However, EDTA has been found to destroy active chlorine when combined with NaOCl. It can also abrade dentin if overused. For this reason, EDTA is recommended to be used as a final irrigant before root filling or placing intermediate dressings. (13,14) The use of EDTA to remove Ca(OH)2 from root canals may damage the hard tissue formed clinically after EDTA apexification. (15) Another irrigation solution other than NaOCl is chlorhecidine (CHX); It has extensive activity against gram (+) and gram (-) bacteria. However, CHX has less effect on microbial biofilm than NaOCI. In addition, another disadvantage is that unlike NaOCI, CHX does not have the ability to dissolve textures. Therefore, NaOCI is still used as a primary irrigation solution in endodontics. (16) In our case, for all these reasons, we used NaOCI and saline as irrigation solution.

As for the success rate of apexification with calcium hydroxide, Sheehy and Roberts, Gu et al., and Morse et al. showed 74-100%, 94% and 100%, respectively, with the use of different forms of $Ca(OH)^2$ (9).

As an alternative to apexification, regeneration is one of the treatment methods applied in immature permanent necrotic teeth. However, regeneration is mostly recommended for short roots with wide-open root tips, thin canal walls and teeth without root formation potential. In addition to these, regeneration is also recommended in cases where the prognosis of the tooth is hopeless despite the apexification procedure. Apexification, on the other hand, is recommended in teeth whose apex opening has almost completed root formation. Regenerative endodontic treatments are a biologically based process that aims to replace damaged

structures (necrotic) such as roots and dentin with cells of the pulp-dentin complex (vital cells) (17). The triple antibiotic paste used in the revascularization method, which is one of the regeneration applications, has a harmful effect on the stem cells in the apical papilla, causes bacterial resistance and coronal coloration, the source of the stem cell is difficult to identify in adult stem cell therapy, the problem of creating functional pulp tissue in pulp implantation and the risk for patient health, difficulty in obtaining high porosity and equal pore size in synthetic scaffold materials, development of sensitivity reactions in natural scaffold materials, unpredictability of the concentration and composition of cells trapped in the fibrin clot when blood clot is used as scaffold, clinical application of platelet-rich fibrin is difficult and it requires special equipment,

Since there are limitations in gene therapy method, such as the inability to obtain the vector providing gene transfer, these techniques cannot be used frequently in clinical applications today. Studies in the literature are mostly animal experiments or in-vitro studies, and studies on humans are composed of case reports. Due to their field of work, it is important for pediatric dentists to have detailed information about promising regenerative applications, to share their results by conducting studies, and to strive to improve existing methods. It is thought that more in-vivo and in-vitro human, animal and laboratory studies on the subject with long-term follow-up can eliminate the existing disadvantages in terms of clinical applications (18).

Apexification treatment in children is to continue the root development, as well as to positively affect the child's psychology by providing function and aesthetics. The primary aim of the dentist should be to apply a treatment that ensures the continuity of the tooth's vitality and, where this is not possible, the continuation of the root formation of the tooth (12).

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Treatment of Young Permanent Teeth Pulpitis with Formocresol Pulpotomy

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Abstract

Background: Pulpitis arising from large caries in young permanent teeth present special treatment challenges. Conventional endodontic treatment is not possible due to immaturity of the root apices. Studies presenting inexpensive, reliable, interim and long-term treatment options are lacking.
Objective: These case reports present long-term outcomes of permanent teeth young children (6-12 years old) presenting with large carious lesions and treated with formocresol pulpotomies (FCP) and stainless steel crowns (SSC) or amalgam (Am) restorations.
Methods: Symptomatic first permanent molars with pulpitis and/or carious exposures were treated with full-strength formocresol and received pre-crimped, permanent molar stainless steel crowns cemented with a glass ionomer cement as final restorations. Clinical exams were performed every 6 months and radiographic exams were performed every 6-12 months.
Results: The median follow up period was 5 years with a range of 3-7 years. All teeth treated with FCP and SSC/Am remained clinically and radiographically asymptomatic. Pretreatment periapical radiolucencies when present resolved completely. Root development in all cases proceeded normally to completion.
Conclusions: Formocresol pulpotomy with SSC is a viable, inexpensive, interim and possibly long-term treatment option for immature permanent teeth in children, with large carious lesions and pulpitis.

Case Report (HRU Int J Dent Oral Res 2022; 2(2): 139-141)

Keywords: Formocresol, pulpotomy, permanent teeth, endodontics, pulp biology.

Introduction

Primary teeth are important for eating, phonetics, aesthetics and saving space for permanent teeth. Problems in the primary dentition period have negative effects on children and parents.(1) Newly erupted first permanent molars are the teeth most likely to become carious. Children with large carious lesions approaching the pulp often present with pulpitis. Such teeth would normally be managed with complete pulpectomy and conventional root canal treatment. Conventional endodontic treatment is not possible due to immaturity of the root apices. Studies presenting inexpensive, reliable, interim and long-term treatment options are lacking. (2,3)

Thus, the purpose of this case series was to assess the long-term outcomes of permanent teeth in series of 6 young children (6-12 years old) presenting with large carious lesions and treated with pulpotomies (FCP) and stainless steel crowns (SSC) or amalgam (Am) restorations.

Case Reports

Symptomatic first permanent molars with pulpitis and/or carious exposures were treated with coronal pulpotomy up to the level of the root canal orifices under local anaesthesia and rubber dam isolation. The pulp chambers were irrigated with water but no other instrumentation was performed. Hemostasis was achieved by packing a pledget containing full strength formocresol for 4-5 minutes over amputated pulp stumps at the level of root canal orifices. After, the pulp chambers were filled with a mix of zinc oxide-eugenol- containing a trace of formocresol. All teeth were restored with pre-crimped, permanent molar stainless steel crowns cemented with a glass ionomer cement or amalgam restorations if only the occlusal surface was affected. Clinical exams were performed every 6 months and radiographic exams were performed every 6-12 months, depending upon

the initial presentation and post-treatment signs and symptoms.

The first case is that of a 8 yr 8 month old boy who was referred for treatment of multiple primary and permanent carious teeth and who had extreme anxiety about dental treatment. On initial presentation, the child was experiencing acute, continuous pain from deep caries in the mandibular first permanent molars (Fig. 1). Both molars were treated with formocresol pulpotomy and final restorations of pre-crimped stainless steel crowns (Fig. 1). At the last visit follow up 5 years and 7 months after initial treatment, the molars were clinically asymptomatic, the stainless steel crown restorations and were intact with healthy gingival margins. The rarifying osteitis observed at initial presentation had completely resolved, and the root apices had completely closed (Fig. 1).

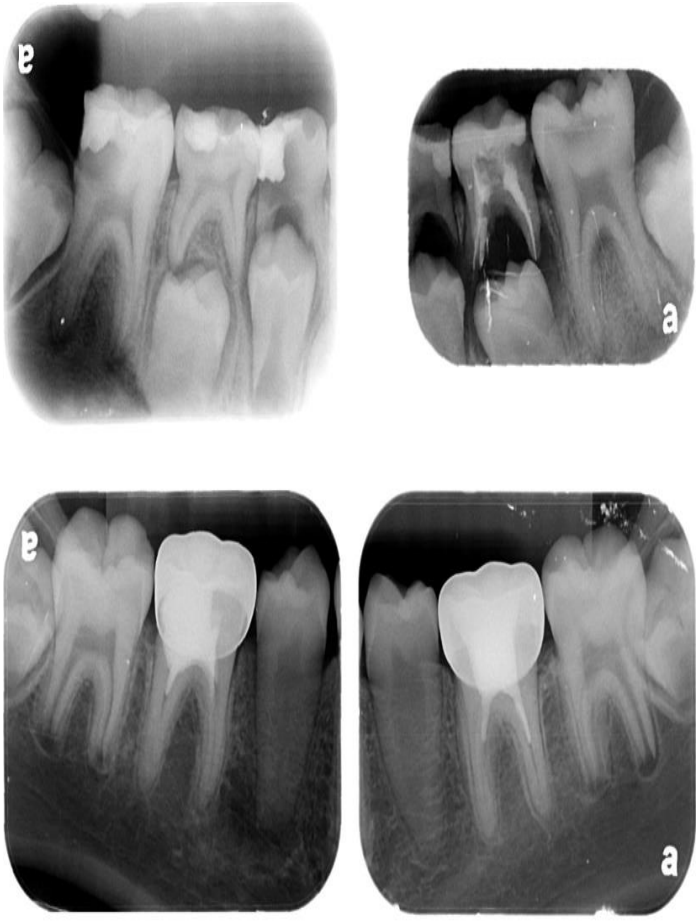

Fig. 1: Case #1: Top radiographs: Pre-treatment radiographs of the carious mandibular first permanent molars with periapical and periapical radiolucencies. Bottom radiographs: Seven year follow up of both molars treated with formocresol pulpotomy and stainless steel crowns. Note the complete resolution of the radiolucencies, return of the lamina dura and complete root end closures.

Fig. 2: Case #2: Top radiograph: Pre-treatment radiograph of the carious, molar-incisor-hypoplasia affected, mandibular right first permanent molar with periapical and inter-radicular radiolucency. Bottom radiograph: Three year follow up of the molar treated with formocresol pulpotomy and stainless steel crown. Note the complete resolution of the radiolucencies, return of the lamina dura and complete root end closure.

Discussion

The formocresol pulpotomy procedures used in this case series resulted in immediate relief of symptoms in all children. Moreover, none of the children were prescribed or required antibiotics. The radiographic signs of rarifying osteitis associated with the involved teeth were observed to resolve over 4-8 weeks, with closures of open apices following their natural timetable. Given the emergency nature of the initial treatment, the final restorations were carried out on second appointments. This allowed clinical and radiographic monitoring of the FC pulpotomy treatment and elicited better cooperation from the child having had relief from pain.

Success of the FC pulpotomy can be jeopardized with a poor final restoration. It is our view that a well-adapted stainless steel crown or well-placed occlusal

amalgam restoration have the highest likelihood of success as opposed to composite resin restorations.

Formocresol is one of the most widely accepted treatment of choice among North American pediatric dentists. (4-6) Despite well-documented high rates of success, formocresol use is still questioned on the grounds of potential tissue toxicity, mutagenicity, and carcinogenicity based on studies carried out in vitro. (4-6) However, these experiments were done at concentrations, volumes and routes of administration different from those employed clinically. It is therefore difficult to extrapolate to the human species. (5) In current literature, there is no documented human scientific evidence of any permanent long-term toxic or carcinogenic effect of formocresol pulpotomies in more than hundred years of its clinical use. (7)

Young permanent teeth are difficult to treat with traditional endodontic treatment due to the presentation of open divergent apex. Without a closed root, permanent retention is limited. (8) As such pulpotomy is often undertaken to promote apexogenesis to encourage the development of root and formation of a closed-end apex. (8) Immature permanent teeth respond favorably to vital pulp therapy and its success may be contributed to the rich vascular supply. (8)

As compared to conventional root canal therapy and FC pulpotomy followed by a class I restoration or a SSC offers a much more cost-effective option for lower socio-economic background patient populations where caries rates are high.

Past literature studies have documented 92% success rate of formocresol pulpotomy in permanent dentition after 10 years and evidence of continued apical development in immature permanent molars following treatment. (8)

Why this paper is important for paediatric dentists

- The case series documents the long term success of formocresol pulpotomy treatment in young permanent teeth.
- The series demonstrates the tissue compatibility of formocresol allowing developing teeth to complete root formation, preserving pulp vitality.
- The paper presents a low cost alternative to conventional endodontic and prosthodontic treatment for pulp involved carious permanent teeth in children.

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Removal of a Broken Pathfile: Case Report

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Abstract

Broken root canal files are challenging complications in endodontics. Especially, teeth with apical pathologies are more difficult to threat because of the must to establish an access to apex. Otherwise, root canal system can't be disinfected by irrigants or medicaments. In this case, a #16.02 pathfile was broken in a tooth with acute apical periodontitis.

After this complication, the broken instrument totally removed from the root canal system and the tooth treated by a multivisit aproach succesfully.

Case Report (HRU Int J Dent Oral Res 2022; 2(2): 142-144)

Keywords: Broken file, complication, ultrasonics

Introduction

In endodontics broken files are one of the most common and feared complications (1). In some cases they make the endodontic treatment impossible and clinicans have to apply apical surgery or extraction (2). Especially, in the cases with apical pathologies like acute apical periodontitis, the whole root canal system must be properly disinfected with irrigants and intracanal medicaments (3-4). But the presence of the broken instrument makes the disinfection impossible so the broken files in the cases with apical pathologies should be removed to avoid further treatments like apical surgery, extraction and dental implants. This treatment options are more invasive and expensive than ortograde endodontics and file removal. There are different techniques and devices for broken instrument removal. Nearly all of these techniques needs a straight way to see and locate the seperated part of the instrument in the root canal (5). After establishing a straight approach to the seperated file clinicians attempt to by-pass the instrument to the apex. If the instrument could be removed from the root canal by hand files no further application is necessary (6).

If it can't be removed by this method, ultrasonic tips can be used to remove the seperated instrument (7-8). All of the ultrasonic scaler manufacturers produce special ultrasonic tips for instrument removal.

Case Report

A 60 year-old female patient was admitted to private practice after being referred with a broken endodontic instrument in tooth #22. After clinical intraoral examination the patient diagnosed with acute apical periodontitis. An intraoral radiograph taken from the tooth #22 (Figure1). There was a long part of a pathfile in the root canal. The patient brought a note from the dentist who referred her that says the broken file is a #16.02 pathfile and the initial diagnosis was acute apical periodontitis.

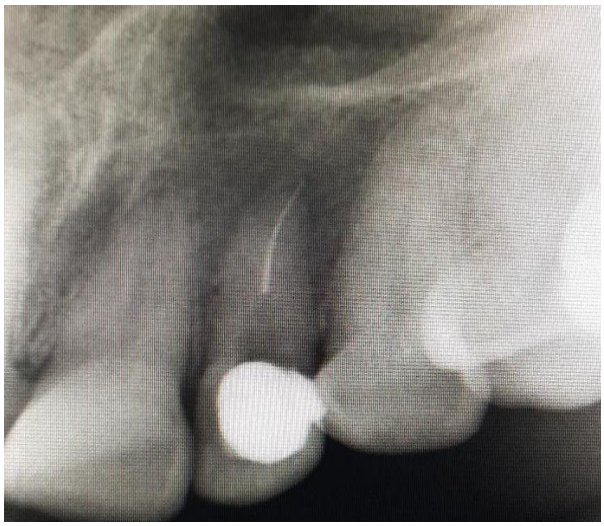

Figure 1. Initial intraoral radiograph of tooth #22.

Because of the painful situation, treatment have been started immediately. Local anesthesia applied before placing the rubberdam(Coltene, Altstätten, Switzerland). Temporary coronal filling material removed using a diamond high-speed bur. A dental loupe has been used all the time during treatment(Carl Zeiss AG, Oberkochen,Germany). The canal orifice has been spotted. Initially the broken file was not seen. Using a K-file #6, the broken instrument detected clinically.

Attempts to by-pass the broken file with #6, #8, #10 K-files have been failed. At this point establishing a direct access to the broken file has been decided. For this porpose, #4-6 Gates-Glidden burs have been modified(Figure2). Gates-Glidden burs used at 1000rpm carefully until the broken file has been reached. Copious irrigation with NaOCl have been applied to avoid debris blokage. At this point dental loupes light power have been set to maximum and the broken file has been detected visually. After visual detection, attempting to by-pass the file have been decided.

But the by-pass attempts failed again. After this using endodontic ultrasonic tip LM,EN-11(LM Dental,Parainen,Finland) to remove the broken file have been decided. Under magnification x4.3, the ultrasonic tip has been used couter clockwise around the broken file. The broken file have been removed during irrigation and unintentionally have been aspired by suction. Then an intraoral radiography taken to comfirm the absence of the broken file (Figure3). Then the working lenght determined by using an apex locator Propex Pixi (Dentsply-Maillefer, Ballaigues, Switzerland) and chemomechanical preparation have been made to an apical size of F3(F3 of the ProTaper system; Dentsply Maillefer, Ballaigues, Switzerland). Then %17 EDTA used for smear layer removal and final irrigation have been made by using NaOCl. After final irrigation root canal dressing with Ca(OH)2 applied to ensure root canal disinfection. The access cavity have been closed by a temporary filling material and an appointment amonged for two weeks later.

Figure 2. Modified Gates-Glidden burs.

Figure 3. Radiograph after file removal.

At the second appointment, the tooth was symptom free. After removal of temporary coronal filling the Ca(OH)2 dressing removed by using ultrasonic tip LM,EN-15(LM Dental, Parainen, Finland). During all ultrasonic interventions the ultrasonic device (LM Dental, Parainen, Finland) arrenged for endodontic mode. There was no drainage in the canal. A warm vertical

compaction technique have been used to achieve a tight roor canal filling. After root canal filling coronal restoration have been made immediately (Figure4).

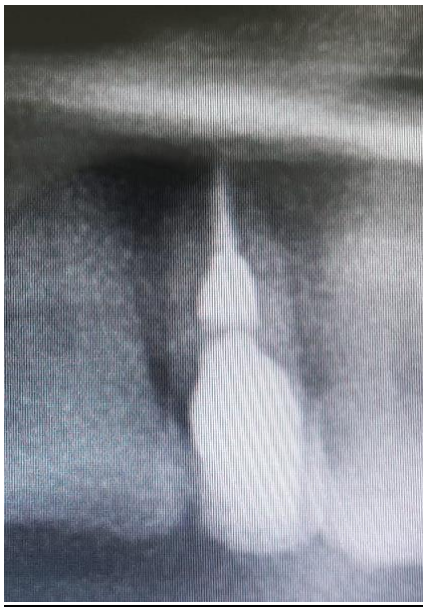

Figure 4. Radiograph after root canal and coronal fillings.

Discussion

The main aspect of root canal treatment is to disinfect all the root canal system (9). The complications like debris blockage, ledge formation or broken root canal instruments make the disinfection harder or even impossible. Because of this, removing the broken instrument plays a vital role on threating the teeth with apical pathologies remains (10). There are few approaches and devices to remove the broken instruments (5). It's well known that the remaining dentin structure both at the coronal part and root plays an important role on the survivability of the root canal threated teeth (11). Due to this fact, when attempting to remove the broken file, by-passing have been tried at the first hand to protect dentin structure. If by-pass attempt failes, removing more dentin structure becomes an option of last resort (12). In this case, using ultrasonics was ended with success. After removing the broken file, routine preparation and disinfection protocols have been applied (13). To ensure the tight sealing, warm vertical compaction technique have been used (14).

Conclusions

Although the successfull removal of the broken file, during the intervention dentin structure have been decreased dramatically. So it's important to keep that in mind, avoiding complications is more important than treating them.

The procedures used for removing files until now are based on removing high amounts of dentin structure. To prolong the life time of root canal treated teeth the need for new broken file removal techniques is obvious. Further investigations and developments are highly needed on this field.

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