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ARAŞTIRMA MAKALELERİ - RESEARCH ARTICLES

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2015 yılından beri yayınlanan ve İstanbul Aydın Üniversitesi, Diş Hekimliği Fakültesi'nin bilimsel dergisi olan Aydın Dental Dergisi (Aydin Dental Journal), TR-Dizin kriterlerine uygun olarak yılda üç sayı olarak yayın hayatına devam ederken, yer aldığı ASOS Index, Directory Research Journals Indexing ve ACAR Index gibi indekslere ilaveten son olarak Index Copernicus'da da yerini almıştır.

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Pre-operative examination of inferior alveolar nerve and impacted lower third molars relation by panoramic radiography and cone beam computerized tomography: Are panoramic radiographies still standard diagnostic tools for impacted lower third molars?

Alt gömülü yirmi yaş dişlerinin inferior alveolar sinir ile ilişkisinin panoramik radyografi ve konik ışınlı bilgisayarlı tomografi ile operasyon öncesi muayenesi: Panoramik radyografiler alt gömülü yirmi yaş dişler için hala standart tanı araçları mıdır?

Merve Çakır[1*], Meltem Karaman[2]

ABSTRACT

Objectives: The aim of this study was to evaluate the compatibility of radiological markers of the impacted lower third molar (LTM) relationship to inferior alveolar nerve (IAN) in panoramic radiographs (PR) with cone beam computerized tomography (CBCT) images.

Materials and Methods: PR and CBCT images of the patients who were referred for LTM removal between September-December 2021 were used. LTM were classified according to the Pederson Difficulty Index in PR. If relation between the teeth and IAN was detected, then CBCT images were investigated to verify the relation.

Results: 52 LTM were included to the study because of having CBCT images. According to Pederson Index 14 teeth were classified as very difficult, 38 as moderately difficult. In PR examination, a relationship with the IAN was observed in 44 teeth. When the CBCT images of 44 teeth were examined, seven of these showed no relationship. On the other hand, when the CBCT images of the eight teeth, which were classified as 'no relationship' in PR images, were examined, it was determined that four of them had relationship. Thus, 41 of the 52 teeth were related to the IAN. The CBCT images of 41 of the 52 teeth confirmed for the proximity of the IAN, 14 of them were classified as very difficult, and 27 of them were classified as moderately difficult.

Conclusion: These findings indicate that if IAN-LTM relation is suspicious according to PR and teeth classified as difficult or very difficult according to Pederson's Index, CBCT is necessary before the surgery.

Keywords: *CBCT, IAN, Impacted lower third molar, Panoramic radiograph*

ÖZET

Amaç: Bu çalışmanın amacı, konik ışınlı bilgisayarlı tomografi (KIBT) görüntüleri ile panoramik radyografilerde (PR) alt gömülü yirmi yaş dişlerinin (AGY) inferior alveolar sinir (IAN) ile ilişkisinin radyolojik belirteçlerinin uyumluluğunu değerlendirmektir.

Gereç ve Yöntemler: Eylül-Aralık 2021 tarihleri arasında AGY çıkarılması için sevk edilen hastaların PR ve KIBT görüntüleri kullanılmıştır. AGY'ler, PR'de Pederson Zorluk İndeksi'ne göre sınıflandırılmış. Dişler ile IAN arasındaki ilişki tespit edilirse, ilişkiyi doğrulamak için KIBT görüntüleri incelenmiştir.

Bulgular: 52 AGY'li 45 hasta, PR yanında KIBT görüntüleri olduğu için çalışmaya dahil edilmiştir. Pederson İndeksine göre 14 diş çok zor, kalan 38 diş ise orta derecede zor olarak sınıflandırılmıştır. Dişlerin PR görüntüleri incelendiğinde 44 dişte IAN ile ilişki saptanmıştır. IAN ile ilişkili 44 dişin KIBT görüntüleri incelendiğinde bu dişlerden yedisinde IAN ile ilişki saptanmamıştır. Öte yandan ilişki yok olarak sınıflandırılan sekiz dişin KIBT görüntüleri incelendiğinde dört tanesinin IAN ile ilişkisi olduğu belirlenmiştir. Böylece 52 dişin 41'i IAN ile ilişkili bulunmuştur. 52 dişin 41'inin KIBT görüntüleri IAN'ın yakınlığını doğrulamış, 14'ü çok zor, 27'si orta derecede zor olarak sınıflandırılmıştır.

Sonuç: Bu bulgular, PR'ye göre IAN-AGY ilişkisi şüpheli ise ve Pederson indeksine göre orta derecede zor veya çok zor olarak sınıflandırılan dişler varsa, ameliyattan önce KIBT çekilmesi gerektiğini göstermektedir.

Anahtar kelimeler: *Alt gömülü yirmi yaş, İnferior alveolar sinir, KIBT, Panoramik radyografi*

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Introduction

The extraction of impacted wisdom teeth is one of the most frequently performed surgical operations in oral and maxillofacial surgery. Like any surgical procedure, the extraction of impacted lower third molars is associated with complications.[1,2] Inferior alveolar nerve (IAN) damage is a serious complication with an incidence varying between 0.6% and 5.3%, This damage is usually temporary and recovers in six months, but in less than %1 cases may be permanent.[3,4] Performing detailed clinical and radiological examination, and complete anamnesis is essential before the operation to minimize complications.[1]

During the radiological examination, the position of the tooth, the morphology of the roots, and the relation with neighboring anatomical structures should be evaluated accurately. Minimizing the risk of nerve damage, requires assessing the position of and relation between the impacted lower third molar roots and the mandibular canal[1]. Panoramic radiographs (PR) are standard diagnostic tool for the radiological examination of impacted lower third molars.[1,2] PR is sufficient to determine the degree of impaction and difficulty of the tooth, and give an idea about the relation of the tooth roots with the IAN.[5] However, some visual parameters of PRs should be carefully undertaken when evaluating the possible relation between the IAN and the lower third molars. These parameters indicating that the third molar roots may be close to the mandibular canal on PR are; the diversion of the mandibular canal, radiolucency at the root tip, diversion of the root, narrowing of the mandibular canal, loss of continuity of the mandibular canal borders, and contact between the mandibular canal and tooth roots.[6]

If the third molar root is on the level of or inferior to the mandibular canal, evaluating the anatomical relation is different because of insufficient information about the buccolingual view and problems such as the superposition of structures, blurred images, and projection errors. To avoid such disadvantages and obtain three-dimensional (3D) images, computerized tomography (CT) or cone-beam computed tomography (CBCT) techniques are used.[1,2,7]

CBCT is preferred in dentistry because of its lower radiation dose, higher regional resolution, affordability, greater detail, and better image quality of the tooth and surrounding structures compared with multidetector computerized tomography.[8,9] With CBCT images, the relation between the roots of impacted lower third molar teeth and the mandibular canal, their relative positions and lingual cortex perforation can be examined more accurately.[10,11]

Particularly, in situations with classic risk signs noted in panoramic imaging, as noted by Rood[6], this 3D examination might be useful not only for risk evaluation but also helps the surgeon to evaluate the difficulty of the surgery and choose the more appropriate surgical technique.[12]

The aim of this study was to evaluate the compatibility of radiological markers of the impacted lower third molar relation to IAN in PR with CBCT images.

Materials and Methods

This retrospective study included 181 participants, selected from the database of Istanbul Okan University Faculty of Dentistry, who were referred to the clinic for extraction of one or more impacted lower third molars between September 2021 and December 2021. The study was approved by the Istanbul Okan University Ethics Committee (153-2022). Patients without CBCT were excluded from the study. The final sample was comprised of 45 patients with 52 impacted lower third molars.

PRs were obtained using Planmeca Promax 2D S3 unit (Planmeca, Helsinki, Finland). The tomography images were acquired by Planmeca, Promax 3D Max (Planmeca, Helsinki, Finland). Images were obtained at 96 kVp, 5.6 mA, and a voxel size of 200 mm with an exposure time of 12 s.

Table 1. Pederson Difficulty Index for removal of impacted lower third molars based on Pell and Gregory and Winter's classifications

Classification	Difficulty Index Value
Inclination of longitudinal axis of the molar	
Mesioangular	1
Horizontal/transverse	2
Vertical	3
Distoangular	4
Depth (with respect to occlusal plane)	
Level A	1
Level B	2
Level C	3
Available space (with respect to ascending mandibular ramus)	
Class I	1
Class II	2
Class III	3

Very difficult: 7-10, moderately difficult: 5-7, minimally difficult: 3-4

Images were evaluated on a standard computer monitor with Planmeca Romexis Viewer software (v4.6.1.R, Planmeca, Helsinki, Finland) by an oral and maxillofacial surgeon and an oral-maxillofacial radiology residency student.

The observers classified the impacted lower third molars according to Winter's classification[13], Pell and Gregory's classification[14], and Pederson Difficulty Index[15] (Table 1) and evaluated the relation between the mandibular canal and the tooth roots according to Rood and Sheba's radiologic signs[6] on panoramic radiographs. Fifteen days later, observers investigated CBCT images. All analyses and classifications were performed independently by each observer. Any disagreements amongst the observers were subsequently resolved after a discussion till both of them reached an agreed conclusion. After a week, 20% of the images (10 images) were reevaluated for the interobserver agreement.

The data were analyzed with Statistical Package for Social Sciences (SPSS) for Windows Version 23 (SPSS V23; IBM® Corporation, Armonk, New York, U.S.A). Interobserver agreement was calculated using kappa statistics. Descriptive and chi-square analyses were used to compare the categorical data. Categorical data was expressed as frequency. The significance level was taken as $p<0.05$.

Results

The study sample was included 52 impacted lower third molars from 45 patients (27 female, 18 male) with an average age of 29.2 years (ranging from 18 to 67 years). The kappa value between the two observers was 0.78 which can be defined as moderate agreement level.

The descriptive statistics, and the relation with the mandibular canal and the accuracy of this relation with CBCT images were summarized in table 2.

Table 2. Descriptive statistics

	n	%
Angulation		
Distoangular	8	15.4
Horizontal	15	28.8
Mesioangular	9	17.3
Vertical	20	38.5
Depth		
A	11	21.2
B	23	44.2
C	18	34.6
Ramus relationship		
Class1	4	7.5
Class2	29	54.7
Class3	20	37.7
Radiolucency at the end of the root		
+	13	25
-	39	75
Loss of the lamina dura		
+	25	48.1
-	27	51.9
Interruption of the canal wall		
+	44	84.6
-	8	15.4
Difficulty index		
Very difficult	14	26.9
Moderately difficult	38	73.1
Relationship with inferior alveolar canal in CBCT		
+	41	78.8
-	11	21.2

According to the Pederson Difficulty Index, 14 teeth were classified as very difficult, and the remaining 38 were classified as moderately difficult. Most of the distoangular and horizontal teeth were classified as very difficult, whereas all the mesioangular and vertical teeth were determined as moderately difficult (Table 3).

Table 3. Comparisons by angulation

	Angulation				
	Distoangular	**Horizontal**	**Mesioangular**	**Vertical**	**p**
Radiolucency at the end of the root					
+	1 (12.5)	6 (40)	1 (11.1)	5 (25)	0.335
-	7 (87.5)	9 (60)	8 (88.9)	15 (75)	
Loss of the lamina dura					
+	3 (37.5)	8 (53.3)	4 (44.4)	10 (50)	0.896
-	5 (62.5)	7 (46.7)	5 (55.6)	10 (50)	
Interruption of the canal wall					
+	7 (87.5)	11 (73.3)	7 (77.8)	19 (95)	0.321
-	1 (12.5)	4 (26.7)	2 (22.2)	1 (5)	
Difficulty index					
Very difficult	6 (75)	8 (53.3)	---	---	<0.001*
Moderately difficult	2 (25)	7 (46.7)	9 (100)	20 (100)	
Relationship with inferior alveolar canal					
+	8 (100)	12 (80)	7 (77.8)	14 (70)	0.376
-	---	3 (20)	2 (22.2)	6 (30)	

p<0.05

When the panoramic radiographs of 52 teeth were examined, a relation with the mandibular canal wall was observed in 44 teeth. When the CBCT images of 44 teeth with interruptions in the mandibular canal wall were examined, seven of these teeth showed no relation with the mandibular canal and it was found that 37 teeth has relation at first examination.

On the other hand, when the CBCT images of the eight teeth, which were classified as 'no relationship' according to PR images, were examined, it was determined that four of them had relation with the mandibular canal. At the end of examinations, 41 of the 52 teeth were related to the mandibular canal.

Of the 41 teeth, 14 (34.2%) were classified as very difficult, and 27 (65.8%) were classified as moderately difficult. According to this evaluation, no statistically significant difference existed between the interruption of the mandibular canal wall and the degree of difficulty, radiolucency in the apical root and loss of the lamina dura (Table 4). The position of the IAN relative to the roots was described in table 5.

Discussion

Neurosensory deficit of the IAN can reduce the patient's quality of life and lead to functional, social, and psychological distress.[9,16] Therefore, assessing the position and proximity of IAN and impacted lower third molar roots is essential before the surgery.[9] PRs are standard diagnostic tools to identify this proximity. PRs can display the dentition and mandible simultaneously, and they have other benefits such as low cost, low radiation dose and convenience.[17]

Table 4. Interruption of the canal wall and the difficulty index relationship

	Interruption of the canal wall		p
	+	-	
Difficulty index			
Very difficult	14 (34.2)	4 (36.3)	1.000
Moderately difficult	27 (65.8)	7 (63.7)	
Radiolucency at the end of the root			
+	9 (21.9)	5 (45.5)	0.396
-	32 (78.1)	6 (54.5)	
Loss of the lamina dura			
+	21 (51.2)	7 (63.6)	1.000
-	1 (12.5)	4 (26.7)	2 (22.2)

$p<0.05$

The radiological signs of this relation were identified by Rood and Shehab.[6] In studies investigating the association of radiological signs in PR and IAN exposure, radiolucency at the root tip was the most significant sign of the IAN exposure and injury.[6,10,18]-21 In this study the most seen radiographic sign of this relation was interruption of the canal wall in accordance with other studies.[6,22]

Table 5. Position of the relationship of the IAN and the roots (CBCT)

	n	%
Inferior	18	43.90
Lingual	12	29.27
Buccal	11	26.83

PRs are very useful and the main technique for IAN examination. However, crucially structures outside the center of rotation of the radiological source and the detector are not sharply imaged and distorted proportionally. Impacted third molars are outside of this center so they may be visualized incorrectly.[23] To visualize the IAN and root relation in a 3D way and make an exact diagnosis CBCT is necessary.[23-25]

In studies comparing the accuracy of panoramic radiographs and CBCT in detecting the relation between the IAN and the impacted lower third molars, CBCT gave better results than panoramic radiographs.[23-27] Similar results were obtained in this study. Relationships that could not be determined by panoramic radiography were determined by CBCT, and the position of the nerve respective to the roots was determined to obtain information to guide the surgeon during the operation.

Another criteria effecting the complication rate and surgery planning that can be obtained from PR is the difficulty of the extraction of the impacted lower third molars.[28,29] Evaluating the difficulty of the surgery is difficult because of the variations of teeth. Several classification systems exist to estimate the surgical difficulty of impacted third molar extraction.[28,29] Pederson proposed a difficulty index for the extraction of the impacted third molars based on radiographic factors.[15] In this study, teeth in which the relationship between IAN and tooth roots were seen in CBCT images were classified as very difficult or difficult according to the Pederson index. Therefore, CBCT, for teeth classified as difficult or very difficult according to the Pederson index, is recommended.

Roeder et al[11]., Peixoto et al[30]. and Akter at al[12].'s studies, the necessity of CBCT before the extraction of impacted lower third molars, reported that the high radiation dose resulting from tomography and did not eliminate the risk of IAN injury. These studies also stated that CBCT should be taken before the extraction of high-risk impacted lower wisdom teet.[11,12,30] In this study, tomography was taken for very difficult and partially difficult teeth for preoperative planning, which supports previous studies.

The position of the impacted lower third molar root relative to the IAN could be a significant risk factor for IAN damage or paresthesia. Some studies, examining the position of the IAN and the impacted lower third molar root on CBCT images, found that the IAN was more often positioned lingually to the roots of third molars than buccally.[31,32] Some found more IANs positioned buccally.[10,17,21,33-35] According to these studies, the risk of exposure increases when the IAN is positioned at the lingual side of the root or interradicular area.[10,33] This could be because surgeons always begin surgery on the

buccal side of the tooth which may cause applying unfavorable extra forces to the lingual side.[10] In this study the IAN was positioned on the inferior (43.9%), lingual (29.27%) and buccal (26,[83]%) sides of the roots. Therefore, the surgeons in this study were especially careful during the extraction of lingual-sided teeth.

Ghaeminia et al[10]. and Roeder et al[11]. compared CBCT to PR, and found that CBCT was not superior to PR. They also reported that CBCT should be performed only in high-risk situations. Other studies[12,23-25,30,36,37], comparing CBCT to PR stated that CBCT is necessary in cases where proximity between the IAN and impacted lower third molar roots was seen. Ghaeminia et al[24]. evaluated the role of CBCT in the treatment of impacted lower third molars that have a relation with the IAN. They concluded that CBCT is necessary in such cases to reclassify a lower risk for IAN injury. Peixoto et al,[30] compared panoramic signs with CBCT images and stated that PR is not the ideal method to evaluate the relation between the impacted lower third molar roots and IAN. Orhan et al.[37] evaluated mandibular third molar region in a Turkish population with CBCT in their study and stated that CBCT images provide useful and unique information regarding impacted lower third molar operations. In this study, in four cases, which were classified as 'no relationship' according to PR images, CBCT images determined that they had a relation with the IAN. Although this was seen in a small number of cases, considering the complications that may occur, it raises the question of whether PRs are the ideal method to evaluate impacted lower third molars.

Conclusion

Before impacted lower third molar extractions, in cases of teeth determined to be high risk for IAN damage, and teeth classified as difficult or very difficult according to Pederson's Difficulty Index, PRs can cause misdiagnosis in some cases as seen in this study so PRs should not be used without the aid of CBCT.

Conflict of interest

None of the authors of this article has any relationship, connection or financial interest in the subject matter or material discussed in the article.

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Aesthetics and Gingival Harmony in Fixed Prosthetic Dentistry

Sabit Protetik Diş Tedavilerinde Estetik ve Diş Eti Uyumu

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ABSTRACT

Objectives: The aim of this study was to evaluate the PES and WES values of fixed metal ceramic restoration treatments according to gingival phenotype in a certain population.

Materials and Methods: Pre- and post-treatment conditions of metal-ceramic restorations containing 263 anterior and premolar teeth in 63 patients were evaluated photographically. PES/WES scores were used for an objective aesthetic evaluation. Gingival phenotypes were classified as 'thin' and 'thick'. All values were examined statistically.

Results: While the average of PES was found to be 11.36, the average of WES was 5.41. The 'thick' phenotype constituted the majority with 80.3% whereas the 'thin' phenotype constituted 19.7% of cases. No significant relationship was observed between PES and WES values for either 'thin' or 'thick' phenotypes.

Conclusion: No significant relationship has been observed between the initial aesthetic values of metal-ceramic restorations and the gingival phenotype when the correct treatment protocol is followed, but further and longer follow-up studies are needed.

Keywords: *Aesthetics, Periodontal indexes, Permanent dental restorations*

ÖZET

Amaç: Bu çalışmada belirli bir populasyonda sabit metal seramik restorasyon tedavilerinin PES, WES değerlerinin diş eti fenotipine göre değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntemler: 63 hastada 263 anterior ve premolar dişleri içeren metal seramik restorasyonların tedavi öncesi ve sonrası durumu fotoğrafik olarak değerlendirildi. PES/WES skorlamaları objektif bir estetik deeğerlendirme için kullanıldı. Diş eti fenotipleri 'ince' ve 'kalın'olarak sınıflandı. Tüm değerler istatistiksel olarak incelendi.

Bulgular: PES ortalama 11,36 WES ortalama 5,41 bulunmuştur. Kalın" fenotipi %80,3 ile çoğunluğu oluştururken, "İnce" fenotipi vakaların %19,7'sini oluşturmuştur. İnce ve kalın fenotipler için PES ve WES değerleri arasında anlamlı bir ilişki gözlemlenmemiştir.

Sonuç: Doğru tedavi protokolü izlendiğinde metal-seramik restorasyonların başlangıç estetik değerleri ile dişeti fenotipi arasında anlamlı bir ilişki gözlenmemiştir ancak daha ileri ve uzun takip çalışmalarına ihtiyaç vardır.

Anahtar kelimeler: *Estetik, Periodontal göstergeler, Kalıcı diş restorasyonları*

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Introduction

The use of appealing and aesthetically pleasing restorations that closely resemble the original tooth structure, particularly in the anterior region, is an essential aspect of modern dentistry.[1] The color, shape, size, and other aesthetic aspects of the restoration, among others, should all be considered. Orofacial aesthetics is based on the harmony of the grin and smile lines when they are in line with the facial features.[2] The needs of patients in terms of aesthetics have recently taken center stage.

In contemporary times, the most common treatment approach for producing fixed prosthodontic restorations is metal-ceramic restorations which involve the use of metal-ceramic materials as substructures. Ensuring sufficient mechanical resistance against occlusal forces is one of the key characteristics that influences the long-term prognosis of fixed prosthodontic restorations. However, due to the limited resistance of delicate and fragile feldspathic porcelain against stress, especially in posterior restorations, it is recommended to restore such areas with metal or highly durable ceramic substructures. Metal-ceramic systems offer some advantages such as durability and support for ceramics. Among the frequently used options for metal substructures, Ni-Cr alloys offer advantages such as high tensile strength, high hardness, low cost, and low density.[4]

Technology has advanced in response to the growing demand from patients for aesthetic dental care and as a result of dentists' shift toward dental and restorative materials that mimic the visual characteristics of real teeth.[5]

Traditionally, dentists often primarily focus on the tooth when addressing patient's aesthetic demands, frequently neglecting the gum tissue and the surrounding soft tissues. However, up to now, attention must also be given to these aspects in order to achieve superior aesthetic outcomes and to address conditions that naturally exist or develop over time due to wear, attrition, and erosion within the oral cavity. Frequently, the pink component or soft tissue component can be compromised due to various factors such as gum and periodontal surgical procedures, trauma, resorption, traumatic incidents, or trauma resulting from occlusion.[6,7] Furhauser et al.[8] introduced a valuable index called the Pink Aesthetic Score (PES) for evaluating the soft tissue surrounding implant-supported crowns, which can serve as a valuable index for observing soft tissue changes over an extended period. Belser et al.[9] later introduced the White Aesthetic Score (WES) to specifically focus on the visible portion of implant-supported restorations. Lanza et al.[1] confirmed the validity of PES and WES evaluations for both natural teeth and implant restorations. Numerous studies have reported that the PES/WES scoring system can function as a standard objective assessment tool. The conducted studies claim that PES/WES analysis satisfies criteria for reliability, reproducibility, and validity.

Lanza et al.[1] confirmed the validity of PES and WES evaluations for both natural teeth and implant restorations. The PES/WES scoring system has been shown in numerous research to be a useful standard objective assessment instrument.[10] According to the studies, PES/WES analysis meets standards of validity, repeatability, and reliability.[11]

PES is based on seven variables: mesial papilla, distal papilla, soft tissue level, soft tissue contour, alveolar process, soft tissue color, and texture. Additionally, WES is based on five variables: tooth form, outline and volume, color, surface texture, and translucency. Accordingly, each variable is assessed with a 2-1-0 score, where two is the best and zero is the worst score, resulting in a maximum possible score of 14 for PES and 10 for WES.

'Dental phenotype' is a term that defines the combination of three-dimensional gingival volume and bone. For its measurement, a standardized and repeatable assessment of periodontal phenotype is recommended using a periodontal probe. To achieve this, the periodontal probe should be placed into the sulcus and the gingival tissue should be observed transparently. Therefore, it is assumed that the probe will be visible when the periodontal phenotype is thin (≤1 mm) and not visible when it is thick (>1 mm).[12] Studies have reported a relationship between tooth shapes and dental phenotype. Specifically, teeth with long crowns and short contact surfaces are associated with thin gingival architecture and maxillary alveolar bone, while teeth with square crowns and long contact surfaces are associated with thick gingival architecture and maxillary alveolar bone. Considering the phenotype is important during treatment planning because a thin gingival margin is more prone to gum recession and may result in a higher failure rate and less stability with prosthetic margins after periodontal treatment.[13]

While studies assessing implant restorations using PES/WES analysis and gingival phenotype are

present in the literature[14-19], no study has been found that includes the evaluation of PES / WES analyses of fixed metal-ceramic restorations on natural teeth together with gingival phenotype. The aim of the study is to determine the aesthetic results of metal-ceramic restorations on natural teeth in the anterior and premolar regions and their relationship with gingival phenotypes. Our null hypothesis is that there is no correlation between PES/WES values of restorations and gingival phenotype.

Materials and Methods

Our study was conducted with the approval of the Hamidiye Scientific Research Ethics Committee of the University of Health Sciences, numbered 2023/2. The assessment of PES and WES values was performed on the initial and final photographs of 63 patients, 263 teeth who applied to the University of Health Sciences Faculty of Dentistry for metal-ceramic restoration treatments. The patients gave their consent in accordance with the ethical permission. Additionally, for the determination of dental phenotype, measurements were taken using a periodontal probe based on the transparency of the gingiva in the photographs, and the gingival phenotypes were classified as 'thick' and 'thin'. The photographs were taken using a single iPhone 13 Pro device. The evaluation of the photographs was conducted by a prosthodontist and periodontist.

The sample size for this study was calculated based on the primary outcome of measuring the agreement between the probe visibility method and clinical measurements. Lee et al. 20 found a kappa value of 0.17 (95% CI: 0.06-0.28) for incisors, 0.19 (95% CI: 0.03-0.36) for canines, and 0.20 (95% CI: 0.10-0.31) for premolars. In this study, the sample size calculator developed by Arifi was used.[21,22] When the minimum acceptable kappa value is used as 0.4 and the expected kappa value is taken as 0.2, the significance level (α) is adjusted as 0.05 and the significance power as 90%; the sample size for this study was calculated to be a minimum of 221 samples.

For each type of data used in the study, the necessary descriptive statistics (mean, standard deviation, minimum, maximum, median, frequencies, and percentage values) were calculated. The normality of quantitative variables was examined using the Shapiro-Wilk test. Non-normally distributed quantitative variables were compared between two groups using the Mann-Whitney U test. While Pearson's correlation analysis was used to examine relationships between quantitative variables that were regularly distributed, Spearman's correlation analysis was used to examine relationships between non-normally distributed quantitative variables. The logistic regression model is used to predict the binary categorical dependent variable based on several predictor variables. SPSS® 26 (IBM® Corp. Released 2019. IBM® SPSS® Statistics for Windows, Version 26.0. Armonk, NY: IBM® Corp) was used for all statistical evaluations in the study.

Results

The PES variable exhibited an average value of 11.36 with a standard deviation of 1.55, while the median was 12, ranging from six to 14. For the WES variable, the mean was 5.41, accompanied by a standard deviation of 2.01. The median was five, spanning from zero to 10. In the categorical data, the "Thick" phenotype constituted the majority at 80.3%, while the "Thin" phenotype accounted for 19.7% of the cases (Table 1).

Table 1. Distirbution of the variables.

		Mean+SD	Med (Min-Max)
Pes		11.36±1.55	12- (6-14)
Wes		5.41±2.01	5- (0-10)
		N	**%**
Phenotype	**Thin**	52	19.7%
	Thick	212	80.3%

Both z-scores are close to zero, indicating that the medians of the two groups were not significantly different. The p-values for both tests were relatively high (0.969 and 0.750), suggesting that there was no statistically significant difference between the groups in both cases (thin and thick). This means that, based on these tests, there is insufficient evidence to reject the null hypothesis that the distributions of the two groups are similar for the given variables (Table 2, Figure 1).

Table 2. Comparisons according to phenotype.

	Thin Phenotype Mean+SD Med (Min-Max)	Thick Phenotype Mean+SD Med (Min-Max)	z	p
Pes	11.29±1.71 12- (6-14)	11.38±1.52 12- (6-14)	-0.038	0.969
Wes	5.44±2.15 5- (2-10)	5.4±1.98 5- (0-9)	-0.318	0.750

Mann-Whitney U test

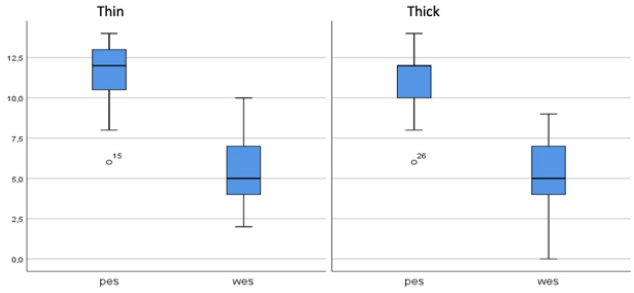

Fig 1. Comparisons according to Phenotype.

There was no strong evidence to suggest a significant monotonic relationship between the PES and WES variables for either the "thin" or "thick" phenotypes, as well as when considering both phenotypes together (Table 3, Figure 2).

Table 3. Correlation analysis.

		Pes		
		Thick Phenotype	Thick Phenotype	Total
Wes	**r**	-0.076	-0.047	-0.050
	p	0.592	0.499	0.418

Spearman's rho test

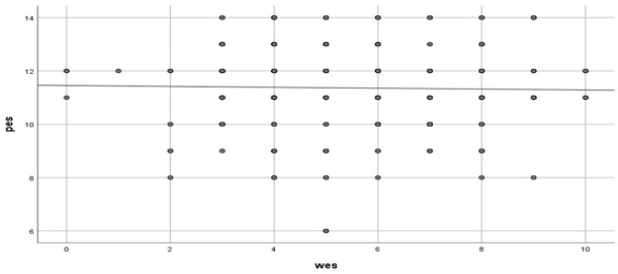

Fig 2. Correlation Analysis.

In the Logistic Regression Analysis, phenotype was taken as the dependent variable and PES, WES as independent variables. Since Hosmer-Lemeshow p=0.006<0.05, the model was not appropriate for interpretation and p=0.918>0.05 the model was not statistically significant (Table 4).

Table 4. Logistic regression analysis

	p	OR	Lower %95 CI	Upper %95 CI
Pes	0,699	1,039	0,856	1,262
Wes	0,889	0,989	0,851	1,150

For either the "thin" or "thick" phenotypes, as well as when taking both phenotypes into account, there was no strong evidence to support a substantial monotonic association between the "Pes", "Wes", and "Age" variables. (Table 5).

Table 5. Correlation between age, Pes, and Wes (Overall and by phenotype).

Phenotypes		Age Thin	Thick	Total
Pes	**r**	-0,114	0,047	0,016
	p	0,419	0,496	0,797
Wes	**r**	0,243	0,082	0,116
	p	0,082	0,233	0,060

Spearman's rho test

There was a significant difference between males and females in terms of Pes in Thick phenotypes ($p<0.05$). The mean of males was found to be higher than females. There was a significant difference between males and females in terms of Wes in Thin phenotypes ($p<0.05$). The mean of males was found to be higher than females. There was a significant difference between males and females in terms of Wes in overall ($p<0.05$). The mean of males was found to be higher than females (Table 6).

Table 6. Comparisons between gender, Pes and Wes (Overall and by phenotype).

		Male Mean+SD Med (Min-Max)	Female Mean+SD Med (Min-Max)	z	p
Pes	Thin	11,41±1,12 11- (9-13)	11,23±1,94 12- (6-14)	-0,179	0,858
	Thick	11,69±1,51 12- (8-14)	11,19±1,49 11- (6-14)	-3,300	0,001
	Overall	11,64±1,45 12- (8-14)	11,2±1,59 12- (6-14)	-1,866	0,062
Wes	Thin	6,94±2,59 6- (2-10)	4,71±1,47 4- (2-8)	-2,124	0,034
	Thick	5,58±2,24 6- (0-9)	5,28±1,8 5- (2-9)	-1,468	0,142
	Overall	5,81±2,34 6- (0-10)	5,16±1,74 5- (2-9)	-2,758	0,006

Mann-Whitney U test

Discussion

The null hypothesis was accepted and no significant relationship between dental phenotype and PES/WES values of restorations was found at the conclusion of the study. Among the participants, 80.3% had a thick phenotype, while 19.7% had a thin phenotype. The average PES value was observed to be 11.36 ± 1.55, and the average WES value was observed to be 5.41 ± 2.01.

Lanza et al.[1] observed the initial and final PES/WES values in a case study of aesthetic restorations in the maxillary anterior region and reported an increase in values in the restoration. Chen et al.[23] conducted a photographic analysis for 306 natural teeth and observed the mean PES and WES values to be 12.92 and 8.75, respectively. In addition, 47 male and 55 female ranging from 18 to 53 years old patients were observed in their studies; reported that PES and WES values were higher in male patients. They also observed higher PES/WES values in younger patients in their study. However, the age range of the patients in our study ranged between 17 and 70 years. Age: No statistically significant correlation was found between PES WES values and gingival phenotype. In our study, 39 female and 24 male patients were examined, and the PES and WES values of males were statistically higher than females. This difference may be due to the number of subjects in our study and the observed tooth numbers.

Wadigal et al.[14] evaluated PES and WES values by examining images of immediately placed implants in the anterior maxilla. In their study involving 53 patients, the reported mean PES value was 8.63 ± 2.4, and the mean WES value was 6.92 ± 1.67. Björn et al. 16 observed PES and WES values over a five-year follow-up in single implant treatments. The initial and final total PES values were reported as 9.61 and 11.49, respectively, and the average WES was reported as 6.48. In a similar study involving 45 patients, the PES/WES values were observed to be 14.7 ± 1.18 and 6.9 ± 1.47.9 The PES and WES values in these studies are generally comparable to our study results. Vanlıoğlu et al.[19] (47 patients) evaluated PES and WES values for 55 maxillary anterior region implants placed in patients with metal-ceramic restorations over a period of two to four years. Overall aesthetic outcomes were achieved in their study, with WES values reported to surpass PES values. Similarly, satisfactory aesthetic results were obtained in our study. However, in our study, PES values yielded higher results than WES values. These disparities may stem from our focus on supra-restorations rather than implant-supported restorations, as in the mentioned studies. Given the limited number of studies that have conducted PES/WES evaluations on natural tooth restorations, we also compared our results with implant-supported restoration studies. Furthermore, our study examined a greater number of cases compared to similar studies, although a long-term follow-up study was not conducted. Bernal et al.[15] assessed PES/WES values and dental phenotype on images taken before and after single implant placement in the anterior maxilla for 25 patients. They reported no statistically significant relationship between WES values and dental phenotype. Bittencourt et al.[17] In

their studies, they evaluated 26 implant-supported crowns with metal-ceramic and zirconia-ceramic frameworks using ceramic and titanium abutments. They focused on the correlation between PES and WES scores, dental phenotype, and the correlation between PES score and dental phenotype. They obtained statistically significant results between PES values and dental phenotype, reporting higher PES values in cases with thick phenotypes. Tatum et al.[18] evaluated PES and WES scores and periodontal phenotype assessment during immediate single implant placement in 41 patients. They stated that there was no significant difference between thick and thin phenotypes when the correct treatment protocol was followed. In the present study, no statistically significant results were found between PES, WES values, and dental phenotype. This discrepancy may be related to the nature of our study involving natural teeth and the absence of a long observation period for cases, relying on evaluation based on photographs taken at the completion of the procedure. Despite the limited number of studies that have examined PES and WES values on natural teeth,[1,20] there is no study that has evaluated dental phenotype in restorations on natural teeth. Hence, we could not fully compare our results statistically in terms of dental phenotype.

The limitations of the study include the fact that immediate post-treatment images were obtained and analyzed, and long-term outcomes were not considered. Additionally, numerous restorations, including anterior and premolar teeth, were included in the evaluation in the same patient, rather than just one tooth group, and a variety of age groups were evaluated in the study.

Conclusion

Initial aesthetic values (PES/WES) of metal aesthetic restorations made on natural teeth were within acceptable values. There was no statistically significant relationship between initial aesthetic values of restorations and gingival phenotype. It is thought that this study will contribute to physicians' understanding of the aesthetic results of the planning and finishing stages of routine metal-ceramic restoration treatments in the clinic. More detailed and long-term controlled clinical studies are needed on this subject.

Conflict of interest

None of the authors of this article has any relationship, connection or financial interest in the subject matter or material discussed in the article.

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Assessment of the Eruption Stages of Permanent First Molars According to Body Mass İndex in A Six-Year-Old Child Population Living in Afyonkarahisar, Turkey

Afyonkarahisar'da Yaşayan Altı Yaş Çocuk Popülasyonunda Daimi Birinci Büyük Azı Dişlerinin Sürme Evrelerinin Vücut Kitle Indeksine Göre Değerlendirilmesi

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ABSTRACT

Objective: This study aimed to evaluate the eruption stages of permanent first molars (PFMs) and their association with body mass index (BMI) in a 6-year-old child population living in Afyonkarahisar, Turkey. The H0 (null) hypothesis was established as "There is no difference between the eruption stages of PFMs in children with different BMI".

Materials and Methods: The study was a cross-sectional study of 700 systemically healthy, six-year-old Turkish children (311 females, 389 males) living in Afyonkarahisar. The children were divided into three groups (underweight, normal weight, overweight/obese) according to individual BMI values by age. The eruption stages of PFMs were recorded. The comparison of the mean number of teeth at each stage according to gender and BMI was evaluated. Statistical analysis was performed using SPSS. Comparisons were done by Mann-Whitney U and Kruskal-Wallis tests.

Results: The mean number of fully erupted PFMs was 1.4±1.65, partially erupted PFMs was 0.9±1.17, and unerupted PFMs was1.7±1.87 per individual. The mean number of fully erupted PFMs was 2.4±1.53 in females and 0.6±1.23 in males. Females had more fully erupted PFMs than males, significantly (p=0.000). Overweight children had more mean erupted PFMs than normal weight children (p=0.000), and normal weight children had more mean erupted PFMs than underweight children (p=0.000). Overweight children had no unerupted PFMs.

Conclusion: It was found that there was a difference between the eruption stages of PFMs according to the BMI of a group of children. Preventive dental procedures may need to be performed at earlier chronologic ages, in overweight/obese children.

Keywords: *Body mass index, Obesity, Permanent teeth, Tooth eruption.*

ÖZET

Amaç: Bu çalışmanın amacı Afyonkarahisar'da yaşayan 6 yaş çocuk popülasyonunda daimi birinci azı dişlerin (DBA) sürme aşamalarını ve bunların vücut kitle indeksi (VKİ) ile ilişkisini değerlendirmektir. H0 (başlangıç) hipotezi "Farklı VKİ'ye sahip çocuklarda DBA'ların sürme evreleri arasında fark yoktur" şeklinde kurulmuştur.

Gereç ve Yöntem: Çalışma, sistemik olarak sağlıklı, altı yaşında, Afyonkarahisar'da yaşayan 700 Türk çocuğu (311 kadın, 389 erkek) üzerinde yapılan kesitsel bir çalışmadır. Yaşa göre bireysel VKİ değerlerine göre çocuklar üç gruba ayrılmıştır (Zayıf, normal kilolu, fazla kilolu/obez). Daimi birinci molar dişlerin sürme aşamaları kaydedilmiştir. Her aşamadaki ortalama diş sayısının cinsiyet ve VKİ'ye göre karşılaştırılması değerlendirilmiştir. İstatistiksel analiz SPSS kullanılarak yapıldı. Karşılaştırmalar Mann-Whitney U ve Kruskal-Wallis testleri ile yapıldı.

Bulgular: Kişi başına ortalama tam sürmüş DBA sayısı 1,4±1,65, kısmi sürmüş DBA sayısı 0,9±1,17, sürmemiş DBA sayısı 1,7±1,87 idi. Ortalama tam sürmüş DBA sayısı kadınlarda 2,4±1,53 iken erkeklerde 0,6±1,23'tür. Kadınlarda erkeklere kıyasla daha fazla tam sürmüş DBA bulunmaktadır (p=0.000). Aşırı kilolu çocukların normal kilolu çocuklara göre (p=0.000) ve normal kilolu çocukların zayıf çocuklara göre (p=0.000) daha fazla ortalama sürmüş DBA vardı. Aşırı kilolu çocuklarda hiç sürmemiş DBA yoktu.

Sonuç: Bir grup çocuğun VKİ'sine göre DBA'ların erüpsiyon aşamaları arasında fark olduğu bulunmuştur. Aşırı kilolu/obez çocuklarda koruyucu dental prosedürlerin daha erken kronolojik yaşlarda uygulanması gerekebilir.

Anahtar Kelimeler: *Vücut kitle indeksi, Obezite, Daimi dişler, Diş sürmesi.*

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Introduction

Tooth eruption is the emergence of a tooth from within its follicle in the alveolar process of the jaws into the oral cavity and the eruption process continues until the tooth has contact with the antagonistic teeth.[1] The eruption order of permanent dentition may differ between the upper and lower jaw. However, permanent teeth eruption usually starts with permanent first molars (PFMs) at about the 6th year of age.[1,2]

The emergence of PFMs is an essential developmental milestone with crucial implications for the development of functional occlusion, and the timing of orthodontic and preventive treatments.[3] Also, a systematic review reported that eruption times of permanent teeth were a predictor for caries development, and they emphasized that PFMs being at higher risk of occlusal caries within the first year of the eruption.[4] Although there may be variations in the age range in different populations, it was found that the first emergence of the PFM is between the ages of 5.9 and 6.9 among children living in different regions of Turkey.[5-7]

The eruption of teeth in the oral cavity occurs over a wide chronological age range and is influenced by a number of factors, including nutritional status.[8-11] Body mass index (BMI) is one of the most common and simplest methods to assess an individual's nutrition status.[12] For children, BMI is age and sex-specific because the amount of body fat changes with age and differs between boys and girls. The Centers for Disease Control and Prevention (CDC) provides growth charts and calculators that take these factors into account. In the literature, the relationship between tooth eruption and BMI was evaluated in different populations.[10,13-18] In a study in India, the authors found that overweight children had earlier eruption ages than those with lower BMI.[16] In the study by Must et al, the authors found that permanent teeth in obese children tended to erupt earlier than in non-obese children, with an average of 1.44 more teeth erupting than in non-obese children.[10] In addition, a longitudinal study showed that 11-year-old overweight children had five more teeth than lean children.[15] Lailasari et al. found a significant association between the number of permanent teeth erupted and the nutritional status of six-seven year old children in Indonesia.[13] However, Khan found no significant association between BMI and dental eruption in Pakistani children.[14] In the study of Anu et al., they found that there is a statistically significant association between BMI and central incisor teeth eruption status but, there is no association between BMI and molar teeth eruption status.[18] In the available literature, there are a limited number of studies evaluating the relationship between BMI and oral health in Turkish children,[19-22] but no study was found that examined the relationship between BMI and the eruption time of PFMs.

This study aimed to evaluate the eruption stages of PFMs according to BMI in a six-year-old child population living in Afyonkarahisar, Turkey. For the purposes of the study, the H_0 (null) hypothesis was established as "There is no difference between the eruption stages of PFMs in children with different BMI".

Materials and Methods

This study was approved by the Local Ethics Committee of Medicine Faculty (No: 2019.247). Informed written consent was obtained from the parents, and age-appropriate assent documents were used for all children.

The study was designed as a cross-sectional study. Children who lived in Afyonkarahisar and were referred to the pediatric dentistry department of the university hospital from August 2019 to December 2020 were evaluated. A detailed medical and drug history was taken.

The sample size was estimated using the G Power software program (version 3.1.9.6, HHU, Dusseldorf, Germany). Since there is no similar study in the literature analyzing BMI and eruption of PFMs among six years old children, the sample size was calculated based on the total number of erupted teeth between six-year-old obese and non-obese children in the study of Must et al.[10] The sample size estimation was performed based on a type I error (α) of 0.05 and power of the study at 90%, which indicated that a total of 658 patients was required for a two-tailed hypothesis (Effect size:0.369). Based on this result, 700 participants were selected for the study, allowing for loss due to incomplete examination.

Inclusion criteria were as follows: children aged 6 years without genetic disorders or developmental delay, systemically healthy, cooperative during clinical examination, and willing to participate in the study. Children with Frankl scale 123 (definitely negative), history of facial trauma, premature birth, previous or current orthodontic appliance, restricted mouth opening, oral cleft, genetic/acquired teeth anomalies, and systemic/genetic disorders were

excluded.

The age of the children was calculated by subtracting the date of birth from the examination date, and children aged 72-84 months were included in the study. The anthropometric measurements were done on participants who were in lightweight clothes and without shoes. The children's height was measured using a calibrated tape attached to a wall, with the subjects' backs and knees straight and feet together. Weight was calculated for each child using a digital weighing machine. Height was determined as meters; weight was determined in kilograms. A single researcher collected all anthropometric measures and performed twice consecutively, and the mean value was used for analysis.

The BMI (kg/m^2) was determined for each child from the collected data on body height and weight. Among children, take the growth- and gender-specific differences into account. Specific BMI values are referred to as "BMI for age," as given by the Centers for Disease Control and Prevention (2021).[24]

Based on individual BMI for age values, the children were divided into three groups, which were:

- Underweight (BMI for age <5th percentile)
- Normal-weight (BMI for age 5th–85th percentile)
- Overweight/obese (BMI for age >85th percentile)

An intraoral examination was conducted after the anthropometric assessment. The intraoral examination was performed on a dental unit with a standard white light, using a sterile mouth glass and probe, starting from the posterior right side of the maxilla and ending on the right side of the mandible.

The criteria of Ekstrand et al.[25], which were used to record the eruption stages of each PFMs were:

- Stage 0: The teeth are not visible in the oral cavity.
- Stage 1: At least one cusp is visible in the oral cavity.
- Stage 2: The entire occlusal surface is visible but has not reached the occlusal level.
- Stage 3: The tooth in occlusion or at the occlusal plane level if the antagonistic tooth was not fully erupted.

In cases of doubt about stages two and three, a thin sheet of paper was held in place by the occlusion. For analysis, stages one and two were recorded as partially erupted and stage three as fully erupted.

After cleaning and drying the teeth, a single calibrated examiner recorded the caries lesions. Clinical assessment of dental caries (dft: decayed, filled teeth for deciduous dentition) was done according to World Health Organization guidelines.[26] Caries status of PFM was coded as 1 = caries present and 0 = caries absent. No radiographs were used for ethical reasons.

Statistical analysis was performed using the Statistical Package for Social Sciences Program (SPSS® Inc., Version 26, Chicago, IL, USA). Categorical variables were presented as percentages and numbers (n). The Chi-square test of association was used to compare proportions. Normality was assessed using a graphical method and confirmed using the Kolmogorov–Smirnov test. Numerical data were presented as mean with standard deviations (Std), median, minimum (Min) and maximum (Max) values. The comparison of the mean number of erupted PFMs according to gender was done using the Mann-Whitney U test. The comparison of the mean number of erupted PFMs according to BMI was done using the Kruskal-Wallis test. For intra-examiner calibration, 5% of total children were reassessed one day after the first examination. The intra-examiner Cohen's kappa value was found as 0.92 for evaluating the eruption stages. The level of significance was set at $p<0.05$.

Results

There was no patient loss at the end of the study and post-hoc analysis showed that the study was completed with a power value of 0.986 (Degree of freedom:518, Effect size:0.369). A total of 700 patients who met the inclusion criteria were included in the study, divided by gender into 311 (44.4%) females and 389 (55.6%) males. The mean age of the children was 77.74±3.19 months. There were 283 children (40.4%) in the normal weight group, 180 children (25.7%) in the underweight group and 237 children (33.9%) in the overweight/obese group. The distribution of the groups according to gender was found to be statistically significant and was shown in Table 1 (p=0.000).

Table 1. The distribution of the BMI percentile of participants according to gender

Groups according to BMI percentile	Female %(n)	Male %(n)	Total %(n)	p value
Underweight	2.9% (9)	44% (171)	25.7% (180)	p=0.000
Normal weight	Male	0.50	0.00*	
Overweight	67.8% (211)	6.7% (26)	33.9% (237)	

*Pearson Chi-square test, BMI: Body mass index

The mean number of fully erupted PFMs was 1.4±1.65, partially erupted PFMs were 0.9±1.17, and unerupted PFMs were 1.7±1.87 per individual. According to gender, the mean number of fully erupted PFMs was 2.4±1.53 in females and 0.6±1.23 in males. Females had more fully erupted PFMs than males, significantly (p=0.000), (Table 2).

The distribution of the mean number of PFMs according to BMI is shown in Table 3. Overweight children had more mean erupted PFMs than normal weight children (p=0.000), and normal-weight children had more mean erupted PFMs than underweight children (p=0.000). Overweight children had no un-erupted PFM.

Table 2. The distribution of the eruption stages of PFMs according to gender

Eruption stages	Gender	Mean±Std	Median (Min-Max)/ Mean rank	Test statistics	p value
Fully erupted PFM	FEMALE (n=311)	2.4±1.53	3 (0-4)/478.12	-16.114	p=0.000
	MALE (n=389)	0.6±1.23	0 (0-4)/248.47		
Partially erupted PFM	FEMALE (n=311)	1.3±1.36	1 (0-4)/416.16	-8.672	p=0.000
	MALE (n=389)	0.5±0.83	0 (0-3)/298		
Un-erupted PFM	FEMALE (n=311)	0.3±0.94	0 (0-4)/211.08	18.037	p=0.000
	MALE (n=389)	2.9±1.62	4 (0-4)/461.97		

*Mann-Whitney U test, Std:Standard deviation, Min:Minimum, Max:Maximum, PFM: Permanent first molar

Table 3. The distribution of the eruption stages of PFMs according to BMI

Eruption stages	BMI percentile	Mean±Std	Median (Min-Max)	Test statistics	p value
Fully erupted PFM	Underweight (n=180)	0.1±0.22a	0 (0-1)	456.618	p=0.000
	Normal weight (n=283)	0.7±1.25b	0 (0-4)		
	Overweight (n=237)	3.2±0.97c	4 (1-4)		
Partially erupted PFM	Underweight (n=180)	0.2±0.87A	0 (0-4)	119.634	p=0.000
	Normal weight (n=283)	1.3±1.27B	1 (0-3)		
	Overweight (n=237)	0.8±0.97C	0 (0-3)		
Un-erupted PFM	Underweight (n=180)	3.8±0.89x	4 (0-4)	416.540	p=0.000
	Normal weight (n=283)	1.9±1.27y	2 (0-4)		
	Overweight (n=237)	0z	0 (0-0)		

*Kruskal-Wallis test, Std=Standard deviation, Min=Minimum, Max=Maximum, PFM: Permanent first molar, BMI: Body mass index, Each subscript letter (a-c, A-C, x-z), denotes a subset of group categories whose column properties differ significantly from each other at the 0.05 level.

The mean number of fully erupted PFMs was 0.8±0.92 in the maxilla and 0.8±0.88 in the mandible. The mean number of fully erupted PFMs was found to be statistically different between the BMI groups in both the mandible and maxilla (p=0.000), (Table 4). The mean number of fully erupted right PFMs was 0.7±0.89, and the mean number of fully erupted left PFMs was 0.7±0.84.

The children's mean dft score of the children was 5.16 ±6.452. Of the partially erupted PFMs (n=601), 0.7% had caries; of the fully erupted PFMs (n=972), 4.8% had caries.

Table 4. The distribution of the fully erupted maxillary and mandibular PFMs according to BMI.

Eruption stages	BMI percentile	Mean±Std	Median (Min-Max)	Test statistics	p value
Fully erupted maxillary PFM	Underweight (n=180)	0.1±0.22a	0 (0-1)	466.04	p=0.000
	Normal weight (n=283)	0.4±0.68b	0 (0-2)		
	Overweight (n=237)	1.8±0.42c	2 (1-2)		
Fully erupted mandibular PFM	Underweight (n=180)	0A	0 (0-0)	277.815	p=0.000
	Normal weight (n=283)	0.7±0.94B	0 (0-2)		
	Overweight (n=237)	1.5±0.73C	2 (0-2)		

*Kruskal-Wallis test, PFM: Permanent first molar, Each subscript letter (a-c, A-C), denotes a subset of group categories whose column properties differ significantly from each other at the 0.05 level.

Discussion

The eruption time of the PFMs, which have a very important place in many areas such as function, supporting facial structure, and occlusion in children, can be affected by many factors. Some of the previous studies have reported that there may be a relationship between the eruption of PFMs and BMI. However, in most of these studies, the results were interpreted based on the total number of erupted permanent teeth, and eruption stages were not included, but only categorized as erupted or unerupted.[10,13]-18 Also, in the accessible literature no study was found to assess the relationship between BMI and eruption time of PFMs among a group of children living in Turkey. In this study, the eruption stages of PFMs in a group of 6-year-old children living in Afyonkarahisar province in Turkey were evaluated according to the BMI of the children and it was found that there was a difference between the eruption stages of PFMs according to the BMI of the children. Thus, the null hypothesis (H0) was rejected.

The eruption times of PFMs were at about the 6th year of age but can be changed in different populations. In Denmark, the eruption of PFM begins at the age of 5.2, while 7.3 in Northern Ireland.[25,27] Studies conducted in Turkey have found that the first emergence of the PFM is between the ages of 5.9 and 6.9.5-7 So, only six-year-old children (72-84 months) were selected for the study to standardize the age factor.

One of the critical factors involved in the timing of tooth eruption is gender.[7,28,29] In the studies carried out in Turkey, the eruption times of the permanent teeth were earlier in females than in males.[6,7] In the present study, females had more fully erupted PFMs than males, similar to previous literature.[3,30]-32 The age of eruption has gender differences potentially caused by hormonal changes, genetics, and diet.[27,28] This study reinforces previous findings that females are more overweight than males, which may contribute to early tooth eruption.[31,32]

The number of fully erupted PFMs was positively associated with BMI in our population. Overweight/obese children had a significantly higher number of fully erupted PFMs compared to normal-weight and underweight children. These findings concur with the previous studies.[3,8,34] Must et al., found that obese children were more likely to have a high number of erupted teeth than non-obese children.[10] In a longitudinal study, it was found that among 110 Mexican children, obese children had more erupted teeth than non-obese children after accounting for gender and age at baseline.[15] Moreover, Eid et al. found no significant correlation between dental maturation and BMI in 6-14 years old Brazilian children.[35] The different results can be attributed to different study methods, ethnicity, or the age of the study population.

Psoter et al. stated that chronic malnutrition extending beyond early childhood is correlated with delayed tooth eruption.[9] In this study, all six-year-old underweight children had almost no fully erupted PFMs. The finding that decreased BMI is associated with delayed emergence is also in agreement with the study of Kjellberg et al.[36]

In the present study, the mean number of fully erupted PFMs was similar among the localization (both mandible, maxilla, and right/left side) of the jaws. But different from the studies that reported that the mandibular teeth erupted earlier.[27,29,37] The different results can be attributed to the method of the study and racial differences.

Nutrition, socioeconomic status, fluoride intake, caries, premature extraction of primary teeth, gender, and environmental factors affect permanent tooth eruption.[34,38] To eliminate significant variables, this study selected children living in the same region.

However, tooth eruption is a complex process, and as such, this study is limited in its ability to exclude the involvement of other potentially contributing factors. Longitudinal studies in large populations, in which all factors are considered, are therefore needed in future studies. It is possible to determine the status of tooth eruption either through clinical observation or radiography. In this cross-sectional study, only a clinical examination was done due to ethical reasons. Therefore, the study is limited as it only evaluates clinical eruption stages and does not include dental development of teeth.

Conclusion

Within the limitations of the study, it was found that overweight/obese children included in the study had more fully erupted PFMs than normal-weight children, and fewer PFMs were fully erupted in underweight children than in normal-weight children. The results have important implications for pediatric dentistry, orthodontics, forensic studies, and anthropology. It is essential for a thorough diagnosis, treatment planning, preventive and therapeutic interventions. Preventive dental procedures may sometimes need to occur at earlier chronologic ages, on average, in overweight/obese children than in their normal-weight counterparts.

Conflict of interest

None of the authors of this article has any relationship, connection or financial interest in the subject matter or material discussed in the article.

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Effects of Oral Findings on Quality of Life in Patients Using Complete Denture

Tam Protez Kullanan Hastalarda Oral Bulguların Yaşam Kalitesine Etkisi

Merve Ünal[1*], Gamze Paken[2]

ABSTRACT

Objectives: The aim of this study was to investigate the relationships between soft and hard tissue oral findings of complete denture wearers and their oral health related quality of life (OHRQoL).

Materials and Methods: In the study, 200 patients treated with complete dentures were included in the study. The OHIP-14 scale was applied to the patients and oral findings were recorded after clinical and radiographic examination. Analyzes were performed in IBM SPSS Statistics 25.0 (IBM Corp. NY), ($p<0.05$).

Results: Oral findings were found in 67% of 200 edentulous patients participating in this study. There was a significant difference between oral findings and OHRQoL ($p=0.00$). While there was a significant difference between age and OHRQoL ($p=0.00$), no significant difference was found with gender ($p>0.05$). There was a statistically significant difference in bone undercuts ($p=0.00$), and traumatic ulcerations ($p=0.00$) between patients with oral findings and patients without oral findings groups according to the OHIP-14. The resorbed crests were significant only in the physical pain subgroup ($p=0.01$).

Conclusion: According to the results of this study, oral mucosal findings adversely affect OHRQoL. Therefore, dissatisfied patients should undertake a comprehensive clinical and radiographic examination after insertion.

Keywords: *Complete Denture, Edentulous, Quality of Life*

ÖZET

Amaç: Bu çalışmanın amacı, geleneksel tam protez kullanan hastaların yumuşak ve sert doku ağız bulguları ile ağız sağlığı ile ilişkili yaşam kaliteleri (OHRQoL) arasındaki ilişkileri incelemektir.

Gereç ve Yöntemler: Çalışmaya 200 tam protez ile tedavi edilen hasta dahil edildi. Hastalara OHIP-14 ölçeği uygulandı ve oral bulgular klinik ve radyografik muayene sonucu kaydedildi. Analizler IBM SPSS Statistics 25.0 (IBM Corp. NY) programında yapıldı ($p<0,05$).

Bulgular: Bu çalışmaya katılan 200 dişsiz hastanın %67'sinde oral bulgular görüldü. Oral bulgular ile OHRQoL arasında anlamlı fark bulundu ($p=0.00$). Yaş ile OHRQoL arasında anlamlı fark bulunurken ($p=0.00$), cinsiyet ile anlamlı fark bulunmadı ($p>0.05$). Ayrıca, kemik andırkatları ($p=0.00$), travmatik ülserasyonlar ($p=0.00$) ile OHRQoL arasında istatistiksel olarak anlamlı fark vardı. Kret rezorpsiyonu bulgusu yalnızca fiziksel ağrı alt grubunda anlamlıydı ($p=0.01$).

Sonuç: Bu çalışmanın sonuçlarına göre oral bulgular ağız sağlığı ile ilişkili yaşam kalitesini olumsuz etkilemektedir. Bu nedenle, protezlerinden memnun olmayan hastalar protez teslimi sonrasında kapsamlı bir klinik ve radyografik muayeneden geçirilmelidir.

Anahtar Kelimeler: *Dişsiz, OHIP-14, Tam Protez, Yaşam kalitesi*

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Introduction

After insertion of complete dentures for edentulous patients, adaptation to the prostheses is a process that may be uncomfortable for patients.[1] During function and parafunction of complete dentures may occur painful red ulcerated lesions, such as traumatic mucosal ulcerations, epulis fissuratum (EF), and prosthetic stomatitis (PS); therefore, postinsertion of prostheses follow-ups are required to assess both patient acceptance and adaptation of the denture.[2,3]

Complete denture treatment has positively affected chewing, esthetics, and oral status.[4-6] However, poor design and/or fabrication, parafunction, diet, mental status, oral hygiene, and acute or chronic reactions of bacterial plaque adhering to denture bases may result in mucosal findings related to complete dentures.[7-9] Soft tissue hyperplasia, called EF, is a hyperplastic condition of the oral mucosa caused by low-grade chronic trauma from poor fitting dentures.[10] Bone undercuts covered with thin atrophic mucosa may cause pain. Therefore, in the maxilla and mandible, tori are prominences of bone that may adversely affect the function and comfort of dentures.[11] Also, traumatic mucosal ulcers may cause pain, and have been found to be the most common complaint in the post-insertion period in people wearing complete dentures.[3,12,13] Inflammatory changes in the oral mucosa of the denture bearing area are associated with chronic exposure of the soft tissues to denture plaque and are described as PS.[7]

Oral health-related quality of life (OHRQoL) is a significant aspect of defining treatment results in individuals with edentulism who receive a new removable denture.[14] OHRQoL describes a specialized condition that indicates how pain and discomfort in the orofacial area affect an individual's well-being in terms of functional, psychological, and social factors.[15] Oral Health Impact Profile (OHIP-14) is a quality of life scale belonging to the oral and dental health family that can be used in all medical conditions involving the mouth area.

When examining databases, the effect of general health, nutritional status, and socio-demographic backgrounds on OHRQoL in complete denture wearers have been investigated.[15,16] To the authors' knowledge, there is not enough data on the association between oral findings and OHRQoL of complete denture wearers. Therefore, the aim of this study was to evaluate the relationship between oral findings and OHRQoL in complete denture wearers using the OHIP-14 scale. The null hypothesis was that oral findings have no effect on OHRQoL.

Materials and Methods

This retrospective study was carried out with edentulous patients who applied to the Usak University Faculty of Medicine, Non-invasive Clinical Research Ethics Committee for complete dentures of the maxilla and mandible. It was approved by the ethics committee of the university (Protocol No: 57-11). A power analysis was used for the minimum size of the sample. In this study 200 patients (106 male, 94 female) who had previously completed complete dentures in the Usak University, Faculty of Dentistry and used their prostheses and shown oral findings were included. The inclusion criteria were patients who had adequate general health and mental health, worn complete dentures, attend to the clinic after denture insertion. The exclusion criteria were patients who had orofacial motor disorders, psychological or psychiatric disorders and did not attend follow-up sessions after dental treatment.

After radiological and clinical examinations, oral findings such as EF, bone undercuts, resorbed crests, traumatic ulcer, Type 1-2-3 PS, torus, and angular cheilitis were researched. Clinical differences between PS and allergic stomatitis should be known for diagnosis. Clinically, allergic stomatitis may occur as severe erythema, erosions, ulcers, or a combination that may expand beyond the denture bases contact zone and is usually associated with pain, burning mouth, or itchiness.[17] PS classification was graded according to Newton:18

- Newton Type 1: Mild inflammation (hyperemia, localized spots)
- Newton Type 2: Moderate inflammation (generalized erythema)
- Newton Type 3: Papillary hyperplasia with severe inflammation

Subsequently, oral findings such as EF, traumatic ulcer, crest undercut were recorded as present or absent by visual inspection. The residual crest quality was determined according to the Atwood classification:19 High and well-rounded crests were good, resorbed and rounded or depressed to bone level were poor. In this study, if alveolar ridge classification was poor, resorbed crests was marked. Also, radiological examination with panoramic x-rays (PCH-2500 Digital X-Ray Imaging System, PAX-I Panoramic, Gyeonggi, Korea) was used to detect hard tissue findings.

The OHIP-14 scale was administered to the patients by one researcher. The validity and reliability of the Turkish version of the OHIP-14 scale was conducted by Mumcu et al.[20] Statistical analysis was performed with the IBM SPSS Statistics 25.0 (IBM Corp., Armonk, NY) program. Descriptive statistics (number, percentage, mean, standard deviation, minimum, and maximum) of the data are given. The normality assumption was checked with the Shapiro-Wilk test. The Mann-Whitney U test was used to examine the mean difference between two independent and non-normally distributed groups ($p<0.05$).

Results

One hundred twenty-four patients (74 male, 60 female) of 200 patients had oral findings. Average age of participants of 68.7±9.7 years. There was a significant difference between participant age and the existence of oral findings (p=0.00), however, according to gender, no statistically significant difference was found (p>0.05). The frequency of oral findings is presented in Table 1. In the patients, resorbed crests (3.0%) was observed the least, Type 1 PS (15.0%), characterized as palatal localized spots was detected the most. There were no findings of Type 3 PS, angular cheilitis, or torus during the clinical examinations for all participants. The comparison of the OHIP-14 and oral findings is shown in Table 2.

Table 1. The number and frequency of oral findings

Oral Findings	N (%)
EF	23 (11.5%)
Bone Undercuts	22 (11.0%)
Resorbed Crests	6 (3.0%)
Traumatic Ulcer	21 (10.5%)
Type 1 PS	30 (15.0%)
Type 2 PS	9 (4.5%)
Total Oral Findings	134 (67.0%)

Table 2. Comparison of OHIP-14 and subgroups according to oral findings

OHIP-14 Scale	Total Oral Findings	EF	Bone Undercuts	Resorbed Crests	Traumatic Ulcer	Type 1 PS	Type 2 PS
Functional limitation	0.00*	0.17	0.00*	0.35	0.00*	0.96	0.66
Physical pain	0.00*	0.50	0.00*	0.01*	0.00*	0.59	0.71
Psychological disturbance	0.00*	0.61	0.00*	0.32	0.00*	0.36	0.27
Physical Disability	0.00*	0.37	0.00*	0.55	0.00*	0.37	0.21
Psychological disability	0.00*	0.68	0.00*	0.18	0.00*	0.88	0.16
Social disability	0.00*	0.60	0.00*	0.58	0.00*	0.85	0.56
Handicap	0.00*	0.45	0.00*	0.39	0.00*	0.36	0.40
OHIP Total Score	0.00*	0.40	0.00*	0.36	0.00*	0.76	0.23

*p<0.05

Considering the mean scores obtained from patients with symptoms of oral findings and patients without oral findings, a statistically significant difference was found between the groups according to the OHIP-14 (p=0.00). Those patients with oral findings had higher total score averages than did those patients without. When the OHIP-14 was evaluated according to the EF, no statistically significant difference was found (p>0.05). There was a statistically significant difference between the OHIP-14 and bone undercuts (p=0.00). A statistically significant difference was found between the mean scores of the OHIP-14 subgroup, physical pain (p=0.018), for patients with resorbed and non-resorbed crests (p<0.05). When the OHIP-14 were evaluated for traumatic ulcers, the difference was statistically significant (p=0.00). In

the Type 1 and Type 2 PS, no statistically significant difference was found between the groups in mean OHIP-14 scores ($p>0.05$).

Discussion

The oral findings of the complete denture wearers in the study were examined, and patients with findings of EF, bone undercuts, crest resorption, traumatic ulcers, and PS were identified. It was concluded that oral findings affected OHRQoL. According to the results, the OHRQoL values of patients with oral findings were found to decrease. Therefore, the null hypothesis was rejected.

The health of the soft tissues that provide support to complete dentures is considered an important factor contributing to OHRQoL.[4,21] In this study, OHRQoL was seen to be lower in patients with oral findings. Various factors, such as dental prostheses that are incompatible with the underlying mucosa, poor oral hygiene, and wearing prostheses all day and all night, may cause EF.[10,22] EF generally asymptomatic but sometimes occur severe inflammation and ulceration.[10] In this study, it was determined that the EF had no effect on OHRQoL. This may be because most of the EF findings are asymptomatic.

In this study, a significant relationship was found between bone undercut irregularities and OHRQoL. It could be said that the quality of life of patients with bone undercuts is lower than without. Bone undercuts in the residual crests covered by thin atrophic mucosa may affect OHRQoL due to pain during chewing.[11] Also, Limpuangthip et al.[23] stated that poor alveolar ridge morphology may be a predisposing factor for impaired chewing ability; thus, a visual inspection and palpation of the residual ridge should be performed before complete denture treatments.

Cerutti-Kopplin et al.[24] reported that residual crests affect patient satisfaction. In the present study, it was found that crest resorption associated with the physical pain subscale of the OHIP-14. Problems such as insufficient retention and stability of the prosthesis due to alveolar crest resorption and pain during chewing explain the physical pain. Hence, there is a decrease in patient satisfaction.[25]

Kivovics et al.[12] concluded that excessive length of complete denture flanges poses a great risk of traumatic injury to the mobile mucosa. According to a study by Sadr et al.[26], the highest incidence of maxillary ulcerations was observed in the posterior palatal area, and the second highest frequency was observed in the buccal slope of the residual crest in the maxillary canine and molar regions. Brunello and Mandikos[13] determined that the most common complaints after the insertion of complete dentures were pain and discomfort due to mucosal injuries and traumatic ulcerations. In the present study, a statistically significant difference was found between traumatic ulcerations and OHRQoL. It found that individuals with traumatic ulcerations reported low OHRQoL. Furthermore, Martori et al.[27] reported that patients with resorbed residual crest had a higher risk of developing traumatic ulcers. From the present study, the existence of resorbed crests was also recorded in denture-induced traumatic ulcers.

In this study, the OHRQoL of patients with Type 1 and Type 2 PS were evaluated. It was found that the Type 1 and Type 2 PS had no effect on OHRQoL. Similarly, Perea et al.[8] was found no relationship was found between the OHRQoL of patients and PS. They concluded that this might be that individuals with PS did not be able to recognize prosthesis-related disorders since they have other serious diseases such as cancer, and their daily use of pain medication.[8]

The limitations of this study could be overcome by increasing the number of individuals using complete dentures, increasing the diversity of oral findings, and considering to the parameters, such as oral health and general health, which affect quality of life.

Conclusion

According to results of this study there were significant differences in patients with oral findings and the OHRQoL in complete denture wearers. The results of this study indicated that bone undercut, resorbed crests, and denture-induced traumatic ulcers were important risk factors for QHRQoL in complete denture wearers. Results from this study can guide clinicians and patients before and after complete denture treatment.

Conflict of interest

None of the authors of this article has any relationship, connection or financial interest in the subject matter or material discussed in the article.

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Effect of Abutment Design and Methods for Controlling on the Amount of Residual Luting Agent Around the Margins of Implant Restorations

Abutment Tasarımı ve Siman Kontrol Yöntemlerinin İmplant Üstü Kuronlarda Oluşan Artık Siman Üzerine Etkisi

Gamze Paken[1*], Bengisu Yildirim[2], Irem Karagozoglu[3]

ABSTRACT

Objectives: The aim of this study was to investigate the amount of excess cement after cementation using three different cement application methods and to compare the effect of two different abutment designs on the residual cement in cement-retained implant restorations.

Material and methods: A maxillary cast was used to simulate implant placement in the lateral incisor region. Implant analogs were embedded in the maxillary cast. The right lateral custom abutment was designed non-anatomically, and the left lateral custom abutment was designed anatomically with computer-aided design. After the screw channels were closed, a total of 80 monolithic translucent zirconia crowns were fabricated. Crowns were cemented with three different cementation techniques and without any technique in the control group. The amount of residual cement was measured by the computerized planimetric cement evaluation method.

Results: The lowest residual cement area was observed in the anatomic-teflon group, and the highest residual cement area was observed in the non-anatomic control group. In the anatomic abutment design group, there was no significant difference between the control and rubber dam group ($p>0.05$), but a significant difference was found between the control and other groups ($p<0.05$). In the non-anatomic group, statistically significant differences were found between the control and other groups ($p<0.05$).

Conclusions: The anatomic abutment design significantly reduced the amount of residual cement compared to the non-anatomic abutment design. It was concluded that PVS replica technique was the most effective cementation technique in terms of residual cement.

Keywords: *Abutment design, Cement-retained restoration, Excess cement, Residual cement.*

ÖZET

Amaç: Bu çalışmanın amacı, üç farklı simantasyon yönteminin artık siman miktarına etkisini araştırmak ve iki farklı abutment tasarımının siman tutuculu implant restorasyonlarında artık siman üzerindeki etkisini karşılaştırmaktır.

Materyal ve metot: Lateral kesici diş bölgesinde implant yerleşimini simüle etmek için bir maksiller model kullanıldı. İmplant analogları alçı model içine gömüldü. Sağ lateral bireysel abutment anatomik olmayan şekilde, sol lateral bireysel abutment ise bilgisayar destekli tasarım ile anatomik olarak tasarlandı. Vida kanalları kapatıldıktan sonra toplam 80 adet monolitik translusent zirkonya kron üretildi. Kronlar üç farklı simantasyon tekniği ve kontrol grubunda herhangi bir teknik kullanılmadan simante edildi. Artık siman miktarı bilgisayarlı destekli siman değerlendirme yöntemi ile ölçüldü.

Bulgular: En düşük artık siman alanı anatomik-teflon grubunda, en yüksek artık siman alanı ise anatomik olmayan kontrol grubunda gözlendi. Anatomik abutment tasarımı grubunda, kontrol ve rubber dam grubu arasında anlamlı fark bulunmazken ($p>0,05$), kontrol ve diğer gruplar arasında anlamlı fark bulundu ($p<0,05$). Anatomik olmayan grupta, kontrol ve diğer gruplar arasında istatistiksel olarak anlamlı farklar bulundu ($p<0,05$).

Sonuçlar: Anatomik abutment tasarımı, anatomik olmayan abutment tasarımına kıyasla artık siman miktarını önemli ölçüde azaltmıştır. PVS replika tekniğinin artık siman açısından en etkili simantasyon tekniği olduğu sonucuna varıldı.

Anahtar Kelimeler: *Dayanak tasarımı, Siman tutuculu restorasyonlar, Artık siman, Rezidüel siman.*

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Introduction

Implant-supported fixed prosthetic restorations can be retained to abutments either cement or screws. Both abutment options have advantages and disadvantages. In cement-retained restorations, the passive fit is easier to achieve because of the cement layer between the implant abutment and the restoration. In general, the risk of technical complications is higher for screw-retained implant restorations and the risk of biological complications is higher for cement-retained implant restorations. The higher risk of biological complications in cement-retained restorations has been associated with excess cement around the abutment. In a study on this subject, excess cement was detected in eighty percent of patients diagnosed with periimplantitis, and in the clinical follow-up of these patients, periimplantitis symptoms were completely resolved in 78 percent of the patients, although they did not apply any other periodontal treatment after removing only the cement remnant.[1] According to the consensus decision of the European Federation of Periodontology, it has been accepted that there is a connection between periimplantitis and excess cement.[2]

In cement-retained fixed restorations, the depth of the abutment is the most important factor affecting the amount of residual cement. If the abutment margins are below one mm. or more from the free gingiva, the risk of remaining cement residue increases. However, especially in the anterior region, the supragingival or gingival margin creates a problem in terms of aesthetics. In addition, vestibule and proximal gingival heights are not the same in the anterior region. Therefore, using a standard abutment will cause residual cement to remain in the proximal area, it is almost impossible to remove cement from this area. It is critical to produce a custom abutment with the right parameters, following the free gingiva, to avoid any residual cement.

For the cementation of implant-supported fixed restorations, some applications have been suggested in order to completely remove the residual cement or to prevent residual cement release around the abutment. Many studies have reported the positive effect of the extra-oral cementation technique to reduce the amount of excess cement.[3-5] A replica of the abutment was fabricated from materials such as pattern resin, thermoplastic materials, silicone, bis-acrylic, composite, and the crown was placed on this replica abutment prior to intraoral cementation. With this technique, it was tried to obtain the minimum amount of cement required for the retantion of the restoration. In addition, techniques such as isolating the surface of the abutment in contact with the soft tissue with materials such as teflon tape or rubber-dam have also been suggested by some researchers.[6-9] In the extra-oral cementation technique, the amount of excess cement can be minimized, but retention problems may occur in the implant crown. In order to reduce the decementation of the crown, it is necessary to prepare the resistance and retention of the abutment correctly. Resistance and retention can be adjusted in abutments that are individually manufactured using CAD-CAM technology. Preparing the abutment in the anatomical tooth form with an interoclusal angle will greatly increase the retention. Thus, the probability of decementation of the crown will decrease by using less cement. As in natural tooth preparation principles, when the surface area of a tooth covered with a cement film layer is greater, the retention of the restoration will be greater. Therefore, preparing the anatomical abutment both increases retention and allows less cement application.

The first aim of this study is to compare three different cementation methods in terms of residual cement in cement-retained implant restorations. The secondary aim of the study is to evaluate the relationship between abutment design and the amount and distribution of residual cement. The null hypothesis was abutment design and different cementation methods do not affect the amount of residual cement.

Materials and Methods

For sample size calculation, a power analysis was performed, and the required minimum specimens' size was N=10 (the 0.05 level with 80% power). A model obtained with a dental resin (Zortrax Resin Dental Model, Zortrax S.A, Poland) was used to simulate implant placement in the maxillary lateral incisor region. Implant analogs (MegaGen Anyone) were embedded in the maxillary cast. Custom wax patterns were fabricated for the gingival profile. Scan bodies were inserted and the cast was scanned, the right lateral custom abutment was designed non-anatomically, and the left lateral custom abutment was designed anatomically with computer-aided design (CAD), (Figure 1). Ti-base zirconia abutments' finish line was epigingivally. Abutments screwed onto implant analogs with a 35-Ncm torque according to the manufacturer's instructions. The screw channels were closed with

polytetrafluoroethylene (PTFE) tape and sealed with provisional restorative material (Cavit, 3M ESPE). Monolithic translucent zirconia crowns (Noritake Katana UTLM) were fabricated with a 25-µm cement space to standardize the cement amount (American Dental Association ADA specification No. eight for dental zinc phosphate cement guide to dental materials devices ADA, Chicago (1974), pp. 18-193). Monolithic translucent zirconia crowns were sintered in a high-temperature furnace.

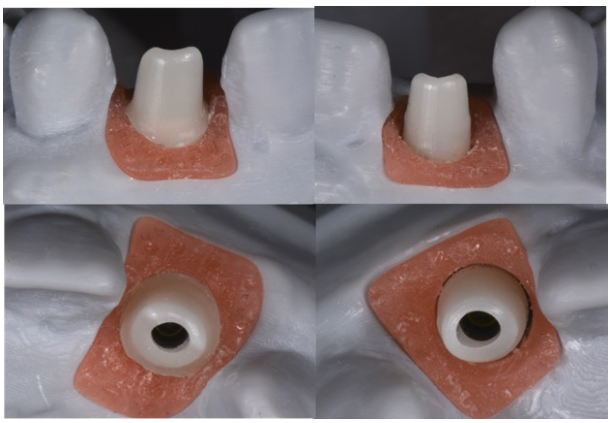

Fig 1. Occlusal and lateral views of anatomic and non-anatomic abutments

According to the abutment design and methods for controlling the amount of residual luting agent, the groups were set as follows:

Group 1: anatomic abutment design with no controlling technique (control group)

Group 2: anatomic abutment design and rubber dam

Group 3: anatomic abutment design and PTFE tape

Group 4: anatomic abutment design and polyvinyl siloxane replica

Group 5: non-anatomic design with no controlling technique (control group)

Group 6: non-anatomic abutment design and rubber dam

Group 7: non-anatomic abutment design and PTFE tape

Group 8: non-anatomic abutment design and polyvinyl siloxane replica

For the control group, none of the controlling techniques were used.

To fabricate a silicon replica, a light body form of polyvinylsiloxane (Affinis, Coltene) was placed into the crowns. After setting, the putty was removed. The internal surfaces of the crown were cleaned with a cotton swab soaked in 95% alcohol. The replica was modified with a surgical blade (No. 15; Swann Morton) in accordance with the protocol of Wadhwani et al.[10] The crowns were also filled with cement and cemented onto the silicone replica. The silicone replica was then removed.

For the rubber dam technique, a square sheet of rubber dam material was prepared and a hole was punched in the center of the sheet. The abutment was pushed through the hole in the rubber dam sheet and placed under the cementation margin of the crown abutment.

For the PTFE technique, a two-three cm long, 100 µm thick PTFE tape (UL yellow gas line tape; Seal Tape Inc) was used as a retraction cord. The PTFE band is wrapped under the gingival margin of the abutment and tied buccally to lingually.

After each technique, the zirconia crowns were cemented on the zirconia abutments with zinc polycarboxylate cement (Poly-F Plus, Dentsply, Germany). The cement was mixed and prepared according to the manufacturer's recommendations, and then the crowns were filled by using a syringe to standardize the amount. Each crown was seated with constant vertical finger pressure and waited for two minutes to allow to set the cement. Excess cement was removed using a dental floss and a probe (3CH Cowhorn; Hu-Friedy). After 24 hours, a hole for screw access was prepared on the palatal surface of each crown to retrieve the abutment with the crown. The screw was loosed using a screwdriver (Abutment Removal Driver, MegaGen), and the crown- abutment was removed.

A computer-assisted planimetric cement evaluation method described by Linkevicius et al.[9] was used. The same researcher (B.Y.) performed all cementation procedures. After cement removal, the photographs were taken with a digital camera (D3200; Nikon Corp) of all aspects (mesial, distal, buccal, and lingual) of the retrieved crown-abutment to asses the residual cement. All photographs were obtained at a constant magnification of 3:1 and same distance from the object. The photographs were imported and analyzed in a photoshop program (Adobe® Photoshop® CS5 Extended Version 12.0.4 ×64) with pixel area calculation. The number of pixels in each area was recorded and the percentage of the cement residual area of the total implant crown-abutment surface area was calculated. Remnant cement ratio (%) = (Remnant cement surface area/total abutment

surface area) × 100

The data were analyzed using a software program (SPSS V22.0 software, IBM Corp; Armonk, New York). The data were not distributed normally according to the Shapiro-Wilk test. Therefore, Kruskal Wallis, and a Mann-Whitney U test were performed to determine whether there were significant differences between the groups (α = .05).

Results

The total surface area values covered by the cement residues are shown in Table 1 for each group. The lowest residual cement area was observed in the anatomic-teflon group, and the highest residual cement area was observed in the non-anatomic control group. According to the results of the statistical analyses, there was a significant difference between non-anatomic control and anatomic control, non-anatomic teflon and anatomic teflon, non-anatomic rubber dam, and anatomic rubber dam groups (p=0.001). There was no significant difference between non-anatomic PVS and anatomic PVS groups (p=0.318).

Table 1. Amounts of excess cement for each group

Main group	Sub-group	N	Mean	Std. Deviation
Non-anatomic	CONTROL	10	181,72	91,53
	TEFLON	10	69,38	34,76
	RUBBER DAM	10	58,67	14,90
	PVS	10	11,72	8,98
Anatomic	CONTROL	10	17,52	5,08
	TEFLON	10	6,78	5,87
	RUBBER DAM	10	11,42	8,02
	PVS	10	7,28	5,58

When the non-anatomic group was evaluated within itself, statistically significant differences were found between the control and teflon group (p=0.004), control and rubber dam group (p=0.001), control and PVS group (p=0.01). There was no significant difference between the teflon and rubber dam groups (p=0.71). There was a statistically significant difference between teflon and PVS group (p=0.002) and rubber dam and PVS group (p=0.001). The amount of residual cement was lower in the PVS technique.

Considering the anatomic group within itself, statistically significant differences were found between the control and teflon group (p=0.007), between the control and PVS group (p=0.004). There was no significant difference between the control and rubber dam group (p=0.128). There was no statistically significant difference between the teflon and rubber dam group (p=0.165), teflon and PVS group (p=0.902), rubber dam and PVS group (p=0.383).

Discussion

The fabrication process, the low cost and the similarity of cement-retained implant restorations to tooth-supported restorations have led many clinicians to prefer these cement-retained crowns for implant restorations. Despite all these advantages, the main disadvantage of these restorations is the cement residue that flows into the surrounding soft tissue cannot be completely removed. Many techniques have been proposed to remove the residual cement, and most of these techniques have been shown to significantly reduce the amount of residual cement. However, the most effective and the easiest to apply clinically among these techniques has not yet been defined. Therefore, three different cementation methods were compared in this study. Statistically significant differences were found between the different techniques and the null hypothesis was rejected.

In the literature, creating a hole in the restoration for cement escape[11], and applying cement only on the occlusal or cervical third of the inner part of the restoration[12] are some methods that have been tried. The use of a gingival cord around the crown has been applied to prevent subgingival cement flow, but this method was found to be unsuccessful because the cord may enlarge the sulcus and cause the cement to flow deeper.[13] Therefore, the Teflon tape method, which is similar to the gingival cord method, was used in our study. Teflon tape does

not widen the sulcus because it occupies less than 50 μm when stretched. In addition, the Teflon tape surface can be easily removed from the peri-implant sulcus by adhering to the cement. The extra oral cementation technique uses a copy of the abutment. In this technique, the restoration is filled with cement and the restoration is placed on the copy abutment model. Excess cement is wiped off and the restoration is cemented onto the abutment in the mouth.[10] Chee et al.[14], using PVS replicas before cementation, reported that the least amount of residual cement was observed in the PVS mould technique. In the study by Bukhari et al.[15], the combination of PVS mould and rubber dam resulted in the lowest amount of residual cement. In our study, similar to other studies, the lowest amount of cement in the non-anatomic group was observed in the PVS technique.

In the present study, both different cementation techniques and two different abutment designs produced by CAD/CAM were compared. Especially in the anterior region, standard abutments are not preferred for aesthetic reasons and have a higher risk of cement residue. Linkevicius et al. reported that standard titanium abutments are usually too narrow, which leads to undercuts and makes cleaning difficult.[7,9] However, in a prospective randomized pilot study, Kappel et al.[16] compared full ceramic custom abutments with standard abutments in terms of cement residue. When comparing cement residue by surface, 68% of custom abutment surfaces and 30% of standard abutment surfaces were found to have residual cement. One reason for the higher amount of undetected cement in this study may be that custom abutments have larger surfaces, which may lead to more pressure on the gingiva during placement of the abutment and crown. Several in vitro and in vivo studies have shown that standard abutments cause more problems in cleaning the cement at the crown-abutment interface and lead to periodontal disease.[7,9,17] It has been reported that the amount of residual cement can be reduced with an anatomical CAD/CAM abutment design because it has a natural emergence profile and creates a marginal shoulder/chamfer edge.[18] Therefore, in this study, the effect of anatomic and non-anatomic CAD/CAM abutment designs on residual cement was compared. There is no previous study in the literature about the design of the abutment. In vitro and in vivo studies[7,9,19] have shown that deeper restoration margins are associated with greater amounts of subgingival residual cement, but these studies have always used standard abutments. Wasiluk et al. reported that custom abutments were more advantageous in terms of residual cement compared to standard abutments.[20] In our study, the amount of residual cement was significantly lower in the anatomic CAD/CAM group compared to the non-anatomic group.

Different methods have been reported in the literature to determine the amount of residual cement.[9,11,19] The radiographic evaluation method has been used in clinical studies, but it is not possible to see the residual cement on the buccal and lingual surfaces on radiographs. Therefore, it has been reported that dental radiographs should not be considered as a reliable method for cement residue assessment.[9,16] Other methods include taking microscopic images of the samples and making digital measurements, taking standard photographs, and calculating surface area values in pixels, and weighing the residual cement. The two-dimensional nature of microscopic and photographic measurements is the main disadvantage of the studies. In our study, we used two-dimensional area measurements over photographic images. In two-dimensional imaging, some of the cement seen in one region is also seen in the other region, which can lead to incorrect calculations. In order to eliminate this disadvantage, studies using three-dimensional measurements with more advanced techniques are needed.

The properties of the cement used also have a major impact on the relationship between cement residue and peri-implant disease. Agar et al.[21] showed that resin-based adhesive cements are more difficult to clean from the abutment surface than glass ionomer and zinc phosphate cements. Temporary cements have disadvantages such as higher solubility and lower retention compared to permanent cements. Therefore, polycarboxylate cement, which is easier to clean than resin cement and which is frequently used in the clinic for cementation of implant restorations, was preferred in the present study.

Conclusion

Within the limitations of this study; It was concluded that anatomic abutment design significantly reduced the amount of residual cement compared to the non-anatomic abutment design. In anatomic abutment design Teflon tape technique was the most effective cementation technique in terms of residual cement. However, in both the anatomic and non-anatomic abutment groups the least residual cement was found in PVS replica technique. In the control group, which was cemented without any cementing technique,

residual cement was observed significantly more than in other groups. Therefore, according to the results of this study, it can be recommended to apply any cementation technique for all abutment types in clinical conditions.

Conflict of interest

None of the authors of this article has any relationship, connection or financial interest in the subject matter or material discussed in the article.

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The Effect of Clinical Education Levels of Undergraduate Dental Students on Dental Anxiety and Empathy Levels

Diş Hekimliği Lisans Öğrencilerinin Klinik Eğitim Düzeylerinin Dental Anksiyete ve Empati Düzeylerine Etkisi

Merve Candan[1*], Melike İdacı[1], İmran Gökçen Yılmaz Karaman[2]

ABSTRACT

Objectives: The social dentistry approach includes not only solving the problems of patients, as in the biomedical model, but also investigating the causes of their problems.It is crucial to have a thorough understanding of the patients, to have empathy for them, to consider the anxiety they will experience, and to be enlightening during treatment.The aim of the present study is to evaluate the dental anxiety(DA) and empathy levels of students at various levels of clinical education.

Materials and Methods: A questionnaire form was created using a digital platform. The questionnaire tool used in the research consists of three parts: 1.Questions about sociodemographic data; 2.Dental Anxiety and Fear Index(IDAF-+4C+) Turkish version; and 3.Jefferson Scale of Physician Empathy-S version.

Results:510 dentistry students were included in the study. There was no difference between the DA levels of the clinician, observer and preclinical student groups(p=0.765). However, there was a significant difference between empathy scores(p<0.001), and the lowest mean empathy scores were found in the clinician-student group. No correlation was found between DA and the empathy scores of students(rho=0.026, p=0.557).

Conclusion: There is no significant difference between the DA levels of students at various stages of undergraduate education. This may be an indication that the theoretical, practical, and clinical education of dentistry is not effective in inducing or reducing students' DA levels. In addition, it can be thought that the decrease in empathy levels in the clinician-student group may be related to the difficulty of dental clinical education, the intense workload, and the stress induced by clinical responsibilities.

Keywords: *Dental anxiety, Dental education, Dental students, Dentistry, Empathy*

ÖZET

Amaç: Sosyal diş hekimliği yaklaşımı, biyomedikal modelde olduğu gibi sadece hastaların sorunlarının çözülmesini değil, aynı zamanda sorunlarının nedenlerinin araştırılmasını da içermektedir. Tedavi sırasında hastaları iyi anlamak, onlarla empati kurmak, yaşayacakları kaygıyı dikkate almak ve aydınlatıcı olmak çok önemlidir. Bu çalışmanın amacı klinik eğitimin çeşitli kademelerindeki öğrencilerin diş hekimliği kaygısı (DA) ve empati düzeylerini değerlendirmektir.

Gereç ve Yöntemler: Dijital platform kullanılarak anket formu oluşturuldu. Araştırmada kullanılan anket aracı üç bölümden oluşmaktadır: 1. Sosyodemografik verilere ilişkin sorular; 2. Dental Kaygı ve Korku İndeksi (IDAF-+4C+) Türkçe versiyonu ve 3. Jefferson Hekim Empati Ölçeği-Öğrenci versiyonu.

Bulgular: Çalışmaya 510 diş hekimliği öğrencisi dahil edildi. Klinisyen, gözlemci ve klinik öncesi öğrenci gruplarının DA düzeyleri arasında fark yoktu (p=0,765). Ancak empati puanları arasında anlamlı fark vardı (p<0,001) ve en düşük ortalama empati puanları klinisyen öğrenci grubunda bulundu. DA ile öğrencilerin empati puanları arasında ilişki bulunamadı (rho=0,026, p=0,557).

Sonuç: Lisans eğitiminin çeşitli aşamalarındaki öğrencilerin DA seviyeleri arasında anlamlı bir fark yoktur. Bu durum diş hekimliği teorik, pratik ve klinik eğitiminin öğrencilerin DA düzeylerini yükseltmede veya düşürmede etkili olmadığının göstergesi olabilir. Ayrıca klinisyen öğrenci grubundaki empati düzeylerinin azalmasının diş hekimliği klinik eğitiminin zorluğu, yoğun iş yükü ve klinik sorumlulukların yarattığı stres ile ilişkili olabileceği düşünülebilir.

Anahtar Kelimeler: *Dental anksiyete, Diş hekimliği eğitimi, Diş hekimliği öğrencileri, Diş Hekimliği, Empati*

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Introduction

Anxiety is a natural response to stress. On the other hand, dental fear or anxiety is defined as the anxiety that individuals of all ages experience in response to a threat associated with dental treatment or the dental environment, which can affect individuals of all ages.[1] Dental anxiety (DA) is a prevalent issue among children and adolescents aged three to 18 worldwide. In addition, it has been stated that anxiety decreases with age and that school-aged and primary children experience it more frequently than adolescents.[2] However, cultural, social, and economic differences between populations as well as individual disparities might be responsible for the occurrence of DA at all ages.[3] According to a study, the level of DA among adult patients who attended to dental clinics was quite high.[4] In the long run, DA can contribute to more serious dental problems and complex treatment requirements,[5] as it causes patients to delay dental treatment and avoid routine checkups. According to studies, treating patients with DA is a significant source of stress for dentists.[6]

Patients today expect their physicians to be considerate, tolerant, and helpful. Physicians' humanistic approaches can be utilized to address this situation. Respect, concern, empathy, and an understanding of the patient are a few of the components of this approach. Empathy is one of the most significant factors that influence the physician-patient relationship. Empathy, which is defined as "the act of correctly accepting the emotional state of another person without experiencing that situation," is one of the most important factors affecting the physician-patient relationship. Understanding patient complaints, previous physician experiences, and previous illnesses or symptoms, as well as effectively communicating this comprehension to patients, are essential components of clinical empathy. The treatment compliance of patients is increased by the health professionals' positive attitude and empathic behavior.[7]

In many countries around the world, training medical students to be empathic physicians has become a stated learning objective in recent years. Empathy in the context of care and treatment has extensive benefits for both physicians and patients, according to research.[8,9] Although there are studies examining the relationship between clinical experience and empathy levels among medical school students, there are limited studies on the education levels and empathy or DA levels of dental students (DSs).

The aim of this study is to evaluate the DA and empathy levels of DSs at various levels of dental education.

Materials and Methods

The present study was carried out with the approval of Eskişehir Osmangazi University Non-Interventional Clinical Research Ethics Committee (Approval Date/Number: 20.06.2023/57). The research was conducted with DSs from the Faculty of Dentistry at Eskişehir Osmangazi University. Students participated in the study by completing the questionnaire created by the "Google Form" free web-based virtual survey generator. Students who participated in the survey were classified based on their level of education and clinical relationship with the patient. These groups include the preclinical (first and second year DSs), observer (third year DSs), and clinician (Fourth and fifth year DSs) categories.

The questionnaire is composed of three sections. In the first section of the questionnaire, sociodemographic information (age, gender, undergraduate class, prior dental treatment experience) about DSs was questioned. In the second part of the questionnaire, the Turkish version of the Dental Anxiety and Fear Index (IDAF-+4C+) was used. The IDAF-4C+ has three independent modules. In the present study, DA levels were determined using the IDAF-4C module of the IDAF-4C+, which grades the level of anxiety associated with dental stimuli. IDAF-4C item responses consist of 8 questions ranging from "disagree" one to "strongly agree" five, and higher scores show more dental fear. The categorization of the scale scores[5] is shown in Table 1.

Table 1. The categorization of the scale scores

Score Range	Category
1-1.5	No or very little dental fear
1.51-2.5	Low dental fear
2.51-3.5	Moderate dental fear
>3.5	High dental fear

The Student Version of Jefferson Scale of Physician Empathy was used in the third section of the questionnaire. This version was created to assess medical students' attitudes toward doctor-patient empathy in the context of patient care. The scale consists of 20 items (10 items with positive statements and 10 items with negative statements) answered on a seven-point Likert scale from one (strongly disagree) to seven (strongly agree). The score range is 20-140, higher scores indicate higher

empathic consistency.[10]

IBM® SPSS® version 27 was used for data analysis. The student's age, which is continuous data from descriptive data, was presented as mean and standard deviation, and categorical data was presented as frequency and percentage. The normal distribution of DA and empathy scores was checked with the Kolmogorov-Smirnov test. In the examination of the relationship between DA and empathy scores and sociodemographic factors, since the data did not show a normal distribution, the Spearman correlation test was used to analyze the relationship between two continuous data sets, the Mann Whitney U test was used to compare the median values of two independent groups, and the Kruskal-Wallis test was used to compare the median values of three independent groups. In cases where a difference was detected between the groups in the Kruskal Wallis test, pairwise comparisons were made to determine which groups the difference originated from. Statistically significant p value was determined as 0.05.

Results

510 dental students participated in the study. One participant was excluded due to missing data. Statistical analyzes were performed with data from 509 participants.

The sociodemographic characteristics of the participants is presented in Table 2.

The students' mean DA score was 2.32 ± 0.79, and the mean empathy score was 100.46 ± 22.75. When the dental anxiety and empathy levels of male and female students were compared, it was determined that female students' dental anxiety and empathy levels were statistically significantly higher than those of male students ($p<0.001$). Also, it was determined that the status of education of dentistry students did not affect their dental anxiety scores ($p>0.05$). Significant differences were observed between the empathy scores of dentistry students according to their educational level ($p<0.001$). The clinician student group had the lowest empathy scores (Table 3). In addition, the dental treatment history of dental students was found to have no effect on their dental anxiety and empathy levels.

Table 2. Sociodemographic characteristics of dentistry students

		Mean	Standard deviation
Age		Mean	Standard deviation
		Mean	Standard deviation
Gender	Mean	Standard deviation	57.2
	Mean	Standard deviation	42.8
Education level in the faculty of dentistry	Mean	Standard deviation	25.7
	Mean	Standard deviation	24.0
	Mean	Standard deviation	17.7
	Mean	Standard deviation	16.1
	Mean	Standard deviation	16.5
Having a history of dental treatment	Mean	Standard deviation	91.6
	Mean	Standard deviation	8.4
Dental anxiety level*	Mean	Standard deviation	19.1
	Mean	Standard deviation	42.6
	Mean	Standard deviation	30.8
	Mean	Standard deviation	7.5

* According to the Turkish version of the Dental Anxiety and Fear Index (IDAF-+4C+)

No correlation was found between DA and empathy scores (rho=0.026, p=0.557). As the age of the dental students increased, their level of DA and empathy decreased (rho=-0.116, p=0.009; rho=-0.257, $p<0.001$, respectively). The comparison of dental anxiety and empathy scores according to the sociodemographic characteristics of the students is shown in Table 3.

Table 3. The comparison of dental anxiety and empathy scores according to the sociodemographic characteristics of the students

		Dental anxiety scores	Statistical analysis	Empathy scores	Statistical analysis
Gender	**Female**	2.40 (2.00- 2.90)	L=25221.000	104 (81-124)	U=24747.000
	Male	2.10 (1.60- 2.70)	p<0.001	85.50 (80- 116)	p<0.001
Educational status in the faculty of dentistry	**Preclinical (a)**	2.30 (1.75- 2.90)	kW=0.537	108 (83-125)	kW=70.670
	Observer (b)	2.20 (1.77-2.80)	p=0.765	110 (90.25- 123.25)	p<0.001
	Clinician (c)	2.20 (1.80- 2.90)		80.50 (80.00- 96.00)	
					ac: p<0.001
					bc: p<0.001
Having a dental treatment history	**Yes**	2.30 (1.80- 2.90)	L=11282.000	98 (80-121)	U=9394.500
	No	2.00 (1.40- 2.90)	p=0.171	106 (81-121)	p=0.498

Discussion

The social dentistry approach is a method that not only solves the problems of the patients, as in the biomedical model, but also investigates the causes of their problems.[11] In this context, it is very important for the physician to adequately understand her or his patients, to empathize, to take into account the fear they will experience, and to be enlightening during the treatment.

Clinical empathy is challenging to measure due to its multidimensional nature. Despite the fact that numerous empathy measurement instruments are utilized in research, it has been reported that each instrument has shortcomings. In this context, the relatively well-known and validated Jefferson Physician Empathy Scale can be used to assess physician empathy.[7,8] As a result, we utilized the Jefferson Scale of Physician Empathy-Student version to evaluate the levels of empathy of DSs in the present study.

Numerous studies have investigated the clinical empathy levels of physicians and physician candidates. However, the literature reveals that studies investigating the empathy levels of medical faculty students have yielded divergent results. Examining the studies, it was found that some participants' empathy levels decreased as their education progressed,[12–14] while others' empathy levels increased, particularly as their contact with patients increased.[15,16] In the literature, gender and level of education stand out as two of the factors that contribute to differences in students empathy levels. In line with a study conducted in the United States of America, a study conducted in Japan revealed that female medical students had higher empathy scores than male students.[17,18] Similarly, in the present study, empathy scores of female DSs were found to be statistically significantly higher than male DSs. In addition, it was also found that clinician DSs had lesser empathy scores than observer and preclinical students. However, a reexamination of research in this area revealed no firm evidence of a decline in empathy during undergraduate medical education, only a very slight decline.[19]

The outcomes of studies evaluating the empathy levels of students at two different dental faculties in Turkey are divergent.[20,21] According to a study, the fourth and fifth graders had the highest levels of empathy compared to the other grades.[20] On the other hand, in a study comparing the empathy levels of third, fourth, and fifth grade students, a decrease was observed in empathy levels towards the last grade.[21] Contrary to the study of Hepdeniz et al.,[20] in this study, the empathy scores of the clinician DSs were observed to be higher than those of the preclinical DSs. Despite the fact that Kaya and Oztan did not evaluate the preclinical student group in their study, they observed that the DSs in the final year had the lowest empathy levels compared to the other classes.[21] This result is similar to the fact that the clinician student group in the present study had lower empathy levels compared to the other groups. Another explanation for this circumstance may be the limited education in clinical dentistry education, which incorporates social disciplines such as communication skills, behavioral sciences, and psychiatric.

Anxiety is defined as apprehension about an event whose outcome is uncertain. Despite the development of modern dentistry, the prevalence of dental problems, which is one of the most important public health problems affecting the quality of life of

individuals, may increase due to DA.[1] DA generally refers to individuals' fear of dental procedures, an unusual reaction to dental procedures caused by a lack of understanding. Prior dental treatment experience, fear of injections, the sounds of dental instruments, a lack of control, painful procedures, anesthesia-induced numbness, and feelings of shame can all contribute to DA.[5]

Previous research has demonstrated that being female is a predictor of higher DA.[22,23] Similarly, in this study, female participants had a significantly higher level of DA than male participants($p<0.001$).

According to a number of studies evaluating the DA levels of DSs, the average level of DA was high in the first year.[24–27] The authors concluded that over time, the increase in patient interaction among DSs and their awareness of dental procedures were effective on the reduction of DA. Also, the DA levels of university students who did not receive health education were observed to be higher than those of medical and DSs in a previous study. The authors attribute this situation to the fact that other students did not receive sufficient dental health education.[23] The present study's findings differ from those of studies evaluating the DA levels of students at two different dental faculties in Turkey. According to studies, the DA levels of first-year DSs DSs are higher than those of DSs in different classes.[25,26] On the contrary, the DA levels of the preclinical, observer, and clinical student groups were found to be similar, and it was observed that increasing clinical education levels among DSs did not affect DA levels. We believe this is due to the participants' current low levels of DA across all levels of undergraduate education.

The limitations of the present study are that the population of this research consists of a single dentistry faculty student, and it is still unclear whether the results of the tools measuring empathy levels are an indicator of the physician's efficiency in providing patient care. Moreover, both empathy and dental anxiety have multifactorial etiologies. Therefore, it is impossible to evaluate all of the variables that will influence these two parameters in our investigation.

Conclusion

There is no significant difference between the DA rates of students at various stages of undergraduate education. This may be an indication that the theoretical, practical, and clinical education of dentistry is not effective in inducing or reducing students' DA levels. In addition, it can be thought that the decrease in empathy levels in the clinician student group may be related to the difficulty of dental clinical education, the intense workload, and the stress induced by clinical responsibilities.

Conflict of interest

None of the authors of this article has any relationship, connection or financial interest in the subject matter or material discussed in the article.

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Is YouTube™ an Adequate Source of Information Regarding Endocrowns? A Content-Quality Analysis

YouTube™ Endokuronlarla İlgili Yeterli Bir Bilgi Kaynağı mıdır? İçerik-Kalite Analizi

Gulhan Yıldırım[1*], Yelda Erdem Hepsenoglu[2]

ABSTRACT

Objectives: This study aimed to evaluate the content quality and adequacy of information related endocrowns on YouTube™.

Materials and Methods: Using the keyword "endocrown", we searched YouTube™; consequently, 193 videos were included in the study. Only 49 videos met the inclusion criteria and were evaluated for the quality of information using the Video Information Quality Index (VIQI) and Global Quality Scale (GQS).

Results: Most of the videos were uploaded by healthcare professionals (79.2%). Overall, 21% and 28% of the videos were classified as high-content (HC) and low-content (LC) videos. The commonest topic included the types of materials (75.5%), and the least mentioned topic (22.4%) included psychological and psychosocial effects. The HC group showed significantly higher GQS and VIQI scores. A positive correlation was noted between the total content (TC) and VIQI ($p<0.001$) and GQS ($p<0.001$) scores.

Conclusions: The quality of video content about ECs on YouTube™ was found to be insufficient. While most videos include indications for ECs, there are very few videos that mention the complications of ECs.

Keywords: *Dental, Esthetics, Education, Root canal treatment*

ÖZET

Amaç: YouTube sağlıkla ilgili pek çok video içermektedir. "Endokuron" YouTube™'da sıklıkla aranan bir kelimedir. Ancak YouTube™'un endokronlar hakkında bilgi arayan kişiler için yararlı olup olmadığı belirsizdir. Bu çalışma, YouTube™'daki endokronlar ile ilgili bilgilerin içerik kalitesini ve yeterliliğini değerlendirmeyi amaçlamıştır.

Gereç ve Yöntemler: "Endokuron" anahtar kelime olarak kullanıldı ve YouTube™'da arama yapıldı. Sonuç olarak çalışmaya 193 video dahil edildi. Bu videolardan yalnızca 49 video dahil edilme kriterlerini karşıladı ve Video Bilgi Kalitesi İndeksi (VIQI) ve Küresel Kalite Ölçeği (GQS) kullanılarak bilgi kalitesi açısından değerlendirildi. Videolar düşük ve yüksek içerik gruplarına ayrıldı. İstatistiksel analizde Shapiro-Wilk, Mann-Whitney U ve Pearson ki-kare testleri kullanıldı.

Bulgular: Videoların çoğu (%79,2) sağlık çalışanları tarafından yüklenmiştir. Genel olarak videoların %21'i ve %28'i yüksek içerikli ve düşük içerikli videolar olarak sınıflandırıldı. En sık konu materyal türleri (%75,5) olurken, en az bahsedilen konu ise psikolojik ve psikososyal etkileri (%22,4) oldu. Yüksek içerikli grubun GQS ve VIQI puanları önemli ölçüde daha yüksekti. Toplam içerik ile VIQI ($p<0,001$) ve GQS ($p<0,001$) puanları arasında pozitif korelasyon görüldü.

Sonuç: Endokuronlarla ilgili YouTube™ videolarının içeriği yeterli bir bilgi kaynağı olarak değerlendirilemez. Çoğu video endokuronlara ilişkin endikasyonları içerirken ve az sayıda videoda komplikasyonlardan bahsedilmekteydi.

Anahtar Kelimeler: *Dental, Estetik, Eğitim, Kök kanal tedavisi*

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Introduction

Prosthetic rehabilitation of endodontically treated teeth (ETT) with severe coronal damage is a complex treatment procedure due to impaired resistance and retentive properties.[1] Endocrowns (EC) constitute a good treatment method due to their mechanical performance and aesthetic benefits in the treatment of ETT with insufficient structural integrity. In literature, these restorations have been described as bonded overlay restoration with anchorage using the internal portion of the pulp chamber.[2] ECs constitute a relatively easy and inexpensive treatment method that is generally recommended for molars.[3] Compared to traditional post-core retained restorations, the risk of infection is minimized since no procedure is performed in the root canal.[4,5] However, ECs have some limitations. Problems with retention are observed with ECs when the depth of the pulp chamber is less than three mm or the cervical margin is less than six mm.[6] Materials, such as resin composite, nanoceramic resins, lithium disilicate ceramic, zirconia-reinforced ceramic, and hybrid and feldspathic ceramics have been recommended in the production of ECs.[2,7]

YouTube™ (www.YouTube™.com; Google®, San Bruno, California) is one of the largest video-sharing platforms on the internet with almost two billion users. It provides free access to videos for people around the world so that they can search for any information that they are seeking.[9] People benefit from visual presentations during their learning; consequently, YouTube™ has become an alternative educational platform that is used by educators to improve the learning process.[10] In comparison to other social media platforms, on average, YouTube™ users visit the site nine times daily, thus ranking it the second most-visited website worldwide.[11]

As more health-related videos are uploaded daily, the importance and potential effects of these videos have become more apparent.[12] The ease of access helps persons achieve health information literacy. Although individuals trust their clinicians, it is human nature to look for a second opinion.[9] Digital information raises the question of whether it helps or hinders clinical care.[13] In recent years, the number and frequency of uploading health-related videos to YouTube™ has increased considerably, and researchers focus on its importance and potential impact.[12] As an alternative education platform, its use among educators or easy access to information by internet users are very important advantages, but researchers argue that the lack of a standardization for uploading YouTube™ videos will cause serious information pollution.[12,14] Individuals, company or groups can easily upload misleading content on YouTube™.[14] The viewers are unaware of the accuracy, biases, or quality of information. Therefore, uploaders need to be careful about the quality of the content to avoid misleading the viewers.[15] There are various studies in the literature on the quality and relevance of health-related content and whether this open access platform is beneficial and adequate.[12,14,15]

To the best of our knowledge, no study has investigated YouTube™ videos as a source of information on ECs. Therefore, in this study, we aimed to evaluate the quality and adequacy of YouTube™ videos related to ECs.

Materials and Methods

In this study, internet-based videos were evaluated cross-sectionally. To search for the keyword "endocrown" on YouTube™, the Google Trends website data (Google® Trends 2022) was evaluated for a period of one year until June 13.2022. The objective was to examine the content, as well as the quality and sufficiency of information in videos related ECs. To avoid any restrictions due to user history and cookies of the device were cleared. The search criterias have been limited to the "last five years" and "worldwide" settings have been chosen to get more comprehensive results. The resultant videos were included in a playlist on YouTube™ for consistency.

In this study, a total of 193 videos were evaluated. In the literature, it was reported that YouTube™ users generally (95%) focus on the first three pages of search results and detected that a user does not need to watch more than the "first 60 to 200" videos.[16,17] Therefore, the search results in this study were limited to the first 193 videos.

The exclusion criteria were as follows: no audio/no subtitles, languages other than English, not related, >30min, duplicates. Multi-part videos were counted as a single one.

Video characteristics such as time since upload date, country origin, duration minutes, number of likes/dislikes, and comments were recorded. The interaction level of the viewers was calculated based on the interaction index and viewing rate, according to previous study.[18]

The content evaluation of the videos were made on the following subjects: (1) definition of endocrowns,

(2) indications (3) contraindications (4) type of cavity preparation (5) advantages/disadvantages (6) complications, (7) impression technique, (8) materials, (9) manufacturing technique, (10) cement, (11) clinical survival, (12) restoration satisfaction, (13) aesthetic expectation, (14) eating performance, (15) psychological and psychosocial impact. Each content's existence was scored as one point, for a total of 15 points which was determined as TC score of the video. Videos rated as 8-15 points were identified HC, 0-7 points as LC videos. While determining the video contents, the evaluation criteria of previous studies on endocrowns were taken into account.[3,4] In addition, it was evaluated as content on topics frequently mentioned in YouTube™ videos related ECs.

Content assessment of the videos was performed independently by two reviewers to measure the cross-review reliability. (GY, YEH). The intraclass correlation coefficient (ICC) was above 90% both between observers and within observers in the evaluation of GQS and VIQI scores.

The analysis of the videos included the target audience (professional, layperson, or both) as well as the source of upload, which could help the viewer gather knowledge (Healthcare professionals, hospital/university, commercial and other). The general quality of the videos was evaluated using the Video Information and Quality Index. The VIQI scale consists of four evaluation criteria, with videos scored on a five point Likert scale for each: information flow, accuracy of information, quality, and precision. Additionally, assesment of the audio-visual quality and the educational quality of videos was evaluated using the Global Quality Scale criteria (Table 1).[19]

Table 1. Global Quality Scale (GQS)

Score	Description
1	Poor quality, poor flow of the video, most information missing, not helpful for patients
2	Generally poor quality and poor flow, some information listed but many important topics but of limited use to patients
3	Moderate quality, suboptimal flow, some important is adequately discussed but others poorly discussed, somewhat useful for patients
4	Good quality generally good flow, most relevant information is covered, useful for patients
5	Excellent quality and flow, very useful for patients

The videos that caused the disagreements of the researchers were watched again and resolved by consensus. Institutional review was not required because the study included only publicly available data and did not involve human subjects.

Number Cruncher Statistical System 2020 was used for statistical analysis. Shapiro-Wilk test, Mann-Whitney U, Pearson Chi-square, and Fisher-Freeman-Halton exact tests were used. Statistical significance was determined as $p<0.05$. Inter-observer reliability was measured by Cronbach's alpha statistic.

Results

The initial search results included 193 videos; of them, 144 videos were excluded for the following reasons: no audio (37.5%; n=54), not in English (46.5%; n=67), > 30 min (9.7%; n=14), or not related to the topic (6.3%, n=9). Most of the videos were released in each USA and India (14.3%) followed by Saudi Arabia and Egypt (8.2%). Of the videos observed, 2% were sourced from Turkey (Table 2).

Table 2. Country origin

Country origin	n	%
Other	7	14.3
USA	7	14.3
Germany	1	2.0
Saudi Arabia	4	8.2
Australia	1	2.0
Bosnia	1	2.0
France	1	2.0
India	7	14.3
Iran	1	2.0
Israel	1	2.0
Switzerland	2	4.1
Italy	1	2.0
Egypt	4	8.2
Nepal	1	2.0
Peru	2	4.1
Singapore	1	2.0
Turkey	2	4.1
UK	2	4.1
Ukraine	3	6.1

Table 3 presents the demographics characteristic of videos. Videos obtained showed a mean length of 5.77 minutes on ECs. Other video features such as uploaders, target audience, contents are summarized in Table 4. In the HC group, VIQI, GQS, and TC scores were higher in all subcategories than in the LC group.

Table 3. Descriptive analysis of the YouTube videos

Country origin	Min	Max	Mean	SD	Median
Video characteristics					
Number of views	5.00	383416.00	20911.41	61478.97	4356.00
Number of likes	0.00	891.00	111.28	182.53	46.00
Number of dislikes	0.00	0.00	0.00	0.00	0.00
Number of comments	0.00	519.00	22.61	78.54	2.00
Duration in minutes	0.10	26.62	5.77	5.74	3.62
Number of days since upload	128.00	5002.00	1119.24	952.05	849.00
Interaction index	1.00	891.00	132.99	192.40	75.00
Viewing rate	0.07	12292.91	1055.49	2079.54	320.29
Total content score	0.00	15.00	7.41	4.61	6.00
GQS	1.00	5.00	2.65	1.44	2.00
VIQI Content assessment					
Flow	1.00	5.00	3.10	1.46	3.00
Information accuracy	1.00	5.00	3.04	1.52	3.00
Quality	1.00	5.00	2.67	1.49	2.00
Precision	1.00	5.00	2.88	1.59	3.00
Total score	4.00	20.00	11.69	5.76	11.00

Table 4. Distribution of YouTube video uploaders, target audience, and contents in high- and low-content video groups

	High content (n=21)	Low content (n=28)	Total (n=49)	p
	n (%)	n (%)	n (%)	
Source of upload				a0.908
Healthcare professionals	17 (85)	21 (75)	38 (79.2)	
Hospital/University	2 (10)	5 (17.9)	7 (14.6)	
Commercial	0 (0)	1 (3.6)	1 (2.1)	
Other	1 (5)	1 (3.6)	2 (4.2)	
Target audience				b0.215
Professionals	9 (42.9)	17 (60.7)	26 (53.1)	
Professionals+Layperson	12 (57.1)	11 (39.3)	23 (46.9)	
Content				
Definition of Endocrowns	14 (66.7)	4 (14.3)	18 (36.7)	b<0.001*
Indications	18 (85.7)	6 (21.4)	24 (49)	b<0.001*
Contraindications	15 (71.4)	3 (10.7)	18 (36.7)	b<0.001*
Type of cavity prep	20 (95.2)	16 (57.1)	36 (73.5)	b0.003*
Advantages/disadvantages	16 (76.2)	3 (10.7)	19 (38.8)	b<0.001*
Complications	14 (66.7)	3 (10.7)	17 (34.7)	b<0.001*
Impression technique	20 (95.2)	15 (53.6)	35 (71.4)	b0.001*
Materials	19 (90.5)	18 (64.3)	37 (75.5)	b0.035*
Manufacturing technique	19 (90.5)	17 (60.7)	36 (73.5)	b0.020*
Cement	20 (95.2)	11 (39.3)	31 (63.3)	b<0.001*
Clinical survival	13 (61.9)	2 (7.1)	15 (30.6)	b<0.001*
Restoration satisfaction	19 (90.5)	7 (25)	26 (53.1)	b<0.001*
Aesthetic expectation	19 (90.5)	7 (25)	26 (53.1)	b<0.001*
Eating performance	14 (66.7)	0 (0)	14 (28.6)	b<0.001*
Psychological and psychosocial impact	11 (52.4)	0 (0)	11 (22.4)	b<0.001*

aFisher-Freeman-Halton exact te, bPearson chi-square test *p<0.05

Most of YouTube™ videos on ECs were uploaded by healthcare professionals (79.2%, n=38). The target audience of the most of analyzed videos was professionals (53.1%, n=26) rather than hospitals/universities (14.6%). The definition of EC and materials was the most mentioned topic (75.5%) followed by the manufacturing technique (73.5%), type of cavity preparation (73.5%), and impression technique (71.4%). The least common content was the psychological and psychosocial impact of ECs (22.4%). There was a statistical relationship in all content sub dimensions according to the content level ($p<0.05$). In the HC group, the incidence rates of all categories were significantly higher (Table 4). Of the videos, 21 (52.4%) were classified as HC, and 28 (69.0%) as LC (Table 4).

There was a statistical difference between the HC and LC groups in terms of the GQS scores, total VIQI, and subgroup scores; higher scores were noted in the HC group than in the low-content group ($p<0.001$), (Table 5).

Table 5. Comparison of variables between high-content and low-content videos

	High content (n=21)	Low content (n=28)	p
	Median (Q1, Q3)	Median (Q1, Q3)	
Video characteristics			
Number of views	6246 (1165, 10552)	1763 (142.5, 13498.5)	0.467
Number of likes	64 (5, 161)	31 (1.8, 150)	0.346
Number of dislikes	0 (0, 0)	0 (0, 0)	0.999
Number of comments	3 (0, 9)	0.5 (0, 15.5)	0.548
Duration in minutes	4.5 (2.57, 7.28)	3.23 (1.56, 5.95)	0.391
Number of days since upload	836 (431, 1582)	905.5 (449.5, 1457.5)	0.904
Interaction index	97 (17, 190)	68.5 (17, 200)	0.764
Viewing rate	660.43 (47.25, 1112.41)	155.78 (6.48, 547.38)	0.157
GQS	4 (3, 5)	2 (1, 2)	<0.001*
VIQI Content assessment			
Flow of information	4 (4, 5)	2 (1, 3)	<0.001*
Information accuracy	4 (4, 5)	2 (1, 3)	<0.001*
Quality	4 (3, 5)	2 (1, 2)	<0.001*
Precision	4 (3, 5)	1 (1, 3)	<0.001*
Total score	16 (15, 18)	8 (4, 10)	<0.001*

Mann-Whitney U test, results are reported as median (first quartile, third quartile). *p<0.05

Correlations between all parameters such as TC score, VIQI, GQS score, and video demographics are presented in Table 6. A statistically significant positive relationship was noted among the TC score and GQS (r=0.778, p<0.001) and VIQI (r=0.739, p<0.001) scores. Additionally, a statistically significant correlation was observed among GQS scores, VIQI (r=0.823, p<0.001), and duration of the videos (r=0.324 p=0.023). The number of views, likes, comments, and duration minutes demonstrated a correlation with VIQI scores (r=0.289, p=0.047; r=0.297, p=0.040; r=0.387, p=0.007; r=0.420, p=0.003). No correlation was observed among the TC score, VIQI, and GQS scores, video demographics, interaction index, and viewing rate (p>0.05).

Table 6. Pearson correlation coefficient scores between total content score, GQS, VIQI, and YouTube demographics

	Total content		GQS		VIQI	
	r	p	r	p	r	p
Total content	1.000	-	0.778	<0.001*	0.739	<0.001*
GQS	0.778	<0.001*	1.000	-	0.823	<0.001*
VIQI	0.739	<0.001*	0.823	<0.001*	1.000	-
Number of views	0.065	0.657	0.200	0.167	0.289	0.047*
Number of likes	0.110	0.453	0.163	0.264	0.297	0.040*
Number of dislikes	-	-	-	-	-	-
Number of comments	0.148	0.310	0.250	0.083	0.387	0.007*
Duration	0.147	0.315	0.324	0.023*	0.420	0.003*
Number of days since upload	-0.083	0.571	0.075	0.607	0.142	0.336
Interaction index	0.028	0.860	0.106	0.510	0.250	0.114
Viewing rate	0.172	0.237	0.225	0.119	0.271	0.063

Spearman correlation coefficient **p<0.01

Discussion

Many people search for more information about dental treatments and prefer YouTube™ instead of scientific platforms that professionals actively use.[5] YouTube™ is one of the most preferred video-based social media platforms due to its ease of use and accessibility on computers, tablets, and mobile phones. This platform contains numerous educational videos, but some of the information in these videos can be outdated and incorrect.[20] Unfortunately, this results in patients receiving incorrect information about treatment options and procedures. Studies have evaluated the accuracy and quality of YouTube™ videos previously.[15,16,21] The current study is the first to investigate the accuracy and quality of YouTube™ videos regarding ECs. According to the results of the study, YouTube™ is not an adequate and appropriate source of information about ECs.

In this study, YouTube™ videos were categorized into HC and LC videos. According to their results, most YouTube™ videos had low content.[15,22,23] Consistent with these results, the proportion of LC videos was also higher in this study.

It is thought that reviewing and auditing the content quality of videos on YouTube™ will contribute positively to Pearson's professional experience and knowledge about different treatment options for severely damaged teeth after endodontic treatment. With advances in technology, the methods of individual access to information are changing. In this virtual age where the use of mobile phones, tablets, and computers has increased significantly, social media platforms with fast and easy access are the first choice of information.[24] Previous studies have indicated that sharing information on YouTube™ will be more effective in increasing the knowledge of people compared to other communication methods.[15,24] The results of the study revealed that the videos uploaded on the use of EC in the root canal treated teeth with multiple material loss have insufficient information content.

None of the videos included in this study had all the video demographics. The definition of EC, materials used, manufacturing technique, type of cavity preparation, and impression technique were the most mentioned topics. In contrast, the least mentioned content was the psychological and psychosocial effects of ECs. The reason for these topics being the most mentioned topics is believed to be that the videos are uploaded by health professionals, such as dentists/specialists (79.2%). To evaluate the psychosocial effects of the treatment, the videos in which the individuals expressed their opinions should also be uploaded.[21] Another topic that was rarely mentioned in the study was the clinical survival rate of ECs. Data on the clinical survival rate of these restorations are rare, and the available data are limited to retrospective and prospective cohort studies.[25] Further mention of this topic in YouTube™ videos will contribute to the literature regarding the survival rate and long-term success of ECs.

Consistent with previous studies, it was observed that HC videos had higher total VIQI and GQS scores than low-content videos in this study.[15,26] These results indicated that the flow of information, accuracy, and the general quality of videos were rated higher. Furthermore, a positive correlation was noted among the TC, GQS scores, and VIQI. The positive relationship among the GQS scores and TC indicates that the video content is diverse, and the information flow is better.

Previous studies have reported that viewers' interest in videos decreases in cases of very long videos.[15,26] In this study, the mean duration of videos was 5.77 minutes, while the median duration of HC and LC videos were 4.5 and 3.23 minutes. However, no statistically significant differences were detected among the groups. It can be concluded that whether the content of the video is high or low is not related to the duration of the video.

YouTube™ users actively communicate with each other using parameters such as likes, dislikes, and comments regarding their positive/negative thoughts or experiences about the videos.[15] This study evaluated their demographic characteristics. Accordingly, a statistically significant difference was not detected in the likes, dislikes, number of comments, interaction index, or viewing rate. However, these parameters may vary with the interactions between advertisements and followers of social media.

In this study according to results, the number of YouTube™ videos about ECs was insufficient and should be increased in terms of quality. Healthcare professionals need to play an active role in sharing content on YouTube™ to convey accurate and up-to-date information to patients.

The first limitation of this study was the short duration of data collection. Additionally, viewers' interests, video viewing times, and search results

can change, which makes it difficult to follow video streams and sequences.

Conclusions

Although there was a wide variety of videos regarding ECs on YouTube™, most of them were inadequate in terms of content quality. Most of the videos about ECs discussed the production materials, manufacturing technique, type of cavity preparation required, and cementation, while few videos mentioned the psychological and psychosocial effects, clinical survival, and definition of ECs. Furthermore, most videos were uploaded by healthcare professionals. Considering the widespread use of social media, the clinical survival of ECs, and the requirement for long-term follow-up, providing accurate and useful professional information regarding ECs on YouTube™ is critical.

Conflict of interest

None of the authors of this article has any relationship, connection or financial interest in the subject matter or material discussed in the article.

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Evaluation of Soft Palate Morphological Types in Cone Beam Computed Tomography Using Need's Ratio

Konik Işınlı Bilgisayarlı Tomografide Yumuşak Damak Morfolojik Tiplerinin Need's Oranı Kullanılarak Değerlendirilmesi

Aslıhan Akbulut[1], Kübra Gündüz Baltaci[1*]

ABSTRACT

Objectives: The aim of this study is to determine the soft palate morphology in several age and gender groups and to find its relationship with Need's ratio, Velum Length, Velum Width and Pharyngeal Depth with using Cone Beam Computed Tomography (CBCT).

Materials and Methods: 122 CBCT scans were analyzed for velar morphology and classified into different types. Velum Length, Velum Width, and Pharyngeal Depth were measured on CBCT. Need's ratio was calculated by dividing Pharyngeal Depth to Velum Length.

Results: Of all the types of soft palates in the study, rat tail shaped was most commonly found. While the mean soft palate length and width were higher in males, the Need's ratio was higher in females. There was a significant relationship between the mean velar length and various age groups and the values increased with increasing age. There was no significant difference between the mean velar width and Need's ratio between age groups.

Conclusion: Morphometric analysis of the soft palate in the CBCT scan helped us understand the diversity in types of palate morphology. This study may be a source for research on the etiological causes of velopharyngeal insufficiency and Obstructive sleep apnea syndrome.

Keywords: *Cone-Beam Computed Tomography, Morphology, Soft palate*

ÖZET

Amaç: Bu çalışmanın amacı, Konik Işınlı Bilgisayarlı Tomografi (KIBT) kullanarak çeşitli yaş ve cinsiyet gruplarında yumuşak damak morfolojisini belirlemek ve Need's Oranı, Velum Uzunluğu, Velum Genişliği ve Faringeal Derinlik ile ilişkisini bulmaktır.

Gereç ve Yöntemler: 122 KIBT taraması velar morfoloji açısından analiz edildi ve farklı tiplere göre sınıflandırıldı. KIBT'de Velum Uzunluğu, Velum Genişliği ve Faringeal Derinlik ölçüldü. Need's oranı, faringeal derinliğin velum uzunluğuna bölünmesiyle hesaplandı.

Bulgular: Çalışmadaki tüm yumuşak damak tipleri arasında en yaygın olarak sıçan kuyruğu şekli bulundu. Erkeklerde ortalama yumuşak damak uzunluğu ve genişliği daha fazla iken, Need's oranı kadınlarda daha yüksekti. Ortalama damak uzunluğu ile çeşitli yaş grupları arasında anlamlı bir ilişki vardı ve değerler yaş arttıkça arttı. Yaş grupları arasında ortalama damak genişliği ve İhtiyaç oranı arasında anlamlı bir fark yoktu.

Sonuç: KIBT taramasında yumuşak damağın morfometrik analizi damak morfolojisi türlerindeki çeşitliliği anlamamıza yardımcı oldu. Bu çalışma velofaringeal yetmezlik ve Obstrüktif uyku apne sendromunun etiyolojik nedenleri konusunda yapılacak araştırmalara kaynak olabilir.

Anahtar Kelimeler: *Konik Işınlı Bilgisayarlı Tomografi, Morfoloji, Yumuşak damak*

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Introduction

The soft palate or velum is a mobile muscle flap situated behind the hard palate that separates the oral and nasal parts of the pharynx.[1,2] It participates in velopharyngeal opening and closing by taking part in most oral functions such as blowing, sucking, deglutition, respiration, and pronunciation.[1]

The velopharyngeal mechanism includes the posterior and lateral pharyngeal walls, the velum, and a muscular valve named the velopharyngeal port. By separating the oral and nasal cavities, the velopharyngeal mechanism forms a sphincteric system between the velar and pharyngeal regions.[3] Failure of the velopharyngeal mechanism to function causes velopharyngeal insufficiency (VPI).[4,5] Cleft palate, grown adenoids, obstructive sleep apnea (OSA) and skeletal malocclusions are usually reasons for VPI.[1,6,7] Therefore, examination of soft palate shape, length, and width is important to assess for velopharyngeal regurgitation.

The association between velum length (VL) and pharyngeal depth (PD) can determine velopharyngeal function.[8] PD divided by VL is named Need's ratio (NR). According to Subtelny,[8] the NR should be in the range of 0.6–0.7 in normal individuals.

Various studies have been conducted using the lateral cephalogram to examine the morphological variations of the velum. You et al.[6] observed that the soft palate configuration occurs in various ways in normal individuals and classified morphological variations into six velar shapes; Type 1: Leaf-shaped, 2: Rat-tail, 3: Butt-like, 4: Straight-line, 5: S-shaped, 6: Hook-shaped. According to Pepin et al.'s 9 research, a soft palate that is "Hooked or S-shaped" is a risk factor for Obstructive Sleep Apnea Syndrome (OSAS).

According to the literature review, Cone Beam Computed Tomography (CBCT) studies are limited to examining soft palate morphological types. Thus, the purpose of this research is to ascertain the different morphological velum types in CBCT according to several age and gender specific groups and to detect their relation with Need's Ratio (NR), Velum Length (VL), Velum Width (VW), and Pharyngeal Depth (PD).

Metarials and Methods

This retrospective study was conducted with a study sample consisting of a total of 122 CBCT scans of age range 15–77 years who applied to the Istanbul Medipol University School of Dentistry Department of Dentomaxillofacial Radiology for various reasons between 2015 and 2021. Patients under the age of 15, patients with cleft palate, soft palate syndromes, systemic disease, and head and neck fractures were excluded. This current study was accepted by the Research Ethics Committee of the Istanbul Medipol University (E-10840098-9047). Soft palate morphologies were analyzed into seven types according to their radiographic appearance[6,11] (Fig. 1-a, 1-b, 1-c, 1-d, 1-e, 1-f, 1-g). The VL was measured as the straight distance from the posterior nasal spine to the end of the soft palate (Fig. 2-a). The VW measurement is a straight measurement of the thickest part perpendicular to soft palate length (Fig. 2-b). PD is linearly measured from the posterior nasal spine to the posterior pharyngeal wall[10](Fig. 2-c). NR was calculated by dividing PD by VL for all cases. The CBCT images were obtained using an i-CAT 17-19 Imaging System (Imaging Sciences International, Inc., Hatfield, PA, USA) with a tube potential of 120 kVp and 20.27 mAs, a field of view of 16×6 cm, a voxel size of 0.25, and an exposure period of 14.7 seconds. The patients were placed on the CBCT device in a vertical position with the horizontal plane parallel to the ground and the head and chin stabilized.

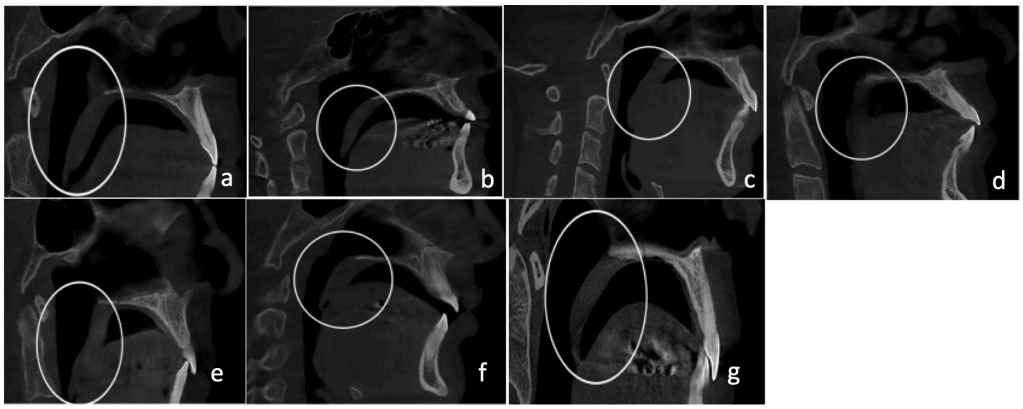

Figure 1. Leaf shape of velum (a), Rat Tail shape of velum(b), Butt shape of velum(c), Straight line shape of velum(d), S-shape of velum(e), Crook shape of velum(f), Handle shape of velum(g).

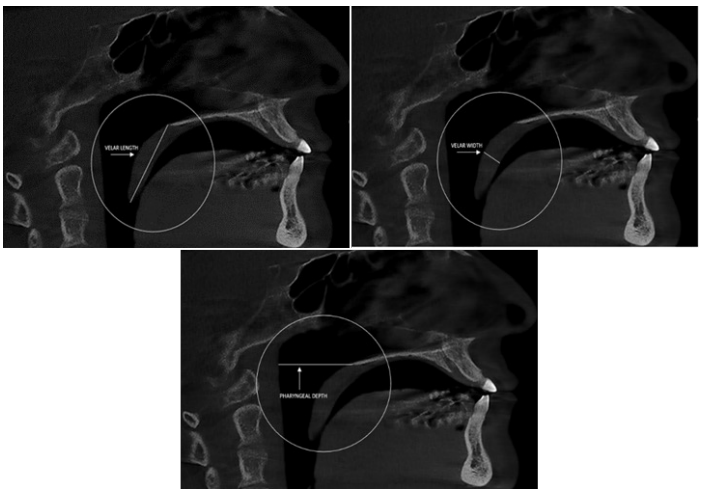

Figure 2. Image showing velar length(a), velar width(b), pharyngeal depth(c).

The data was analyzed using the IBM® SPSS® Statistics 22 statistical software. The Kolmogorov-Smirnov and Shapiro-Wilks tests were used to evaluate the parameters' consistency for the normal distribution, and it was determined that the parameters were consistent for the normal distribution. The one-way ANOVA test was used to compare the parameters among more than two groups in the comparison of quantitative data. If the variances of the groups were homogeneous, the Tukey HDS test was used, and if they were not, the Tamhane's T2 test was used. The Student t-test was applied to compare the parameters of two groups. To compare qualitative data, a chi-square analysis was performed. The $p<0.05$ level was used to determine significance.

Results

This study was carried out with a total of 122 subjects, 61 (50%) males and 61 (50%) females, aged between 15 and 77. The mean age is 41.11±15.88 years (Table[1]).

The rat tail shape (type two) was most prevalent (74, 60.7%) in the current study, followed by the butt shape (type three), (14, 11.5%). Leaf shape (type one), (10, 8.2%) was the third most common soft palate type. The new morphological type handle found in the study by Agrawal et al.[11] was nine (7.4%) in this study. S-shaped was the least common type of soft palate (3.3%), (Table 1).

Table 1. Distributions of demographic characteristics

		n	%
Gender	Male	61	50
	Female	61	50
Age	15-20	18	14.8
	21-30	19	15.6
	31-40	17	13.9
	41-50	32	26.2
	51-60	24	19.7
	61 and above	12	9.8
Soft Palate Types	Type 1	10	8.2
	Type 2	74	60.7
	Type 3	14	11.5
	Type 4	5	4.1
	Type 5	4	3.3
	Type 6	6	4.9
	Handle	9	7.4

There is a statistically considerable diversity among the age groups in terms of the distribution of soft palate types (p:0.029; p<0.05). The incidence of Type teo and Type three in the 41–50 age group is remarkably higher than in the 15-20 age group. It is not statistically significant among other age groups (p:0.007; p<0.05). According to statistical data, gender was not an important factor affecting soft palate shape (p>0.05). Therefore, it is concluded that gender cannot be determined from soft palate types (Table 2).

Table 2. Evaluation of soft palate types according to gender and age

		Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Handle	p
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Gender	**Male**	7 (%11.5)	30(%49.2)	9 (%14.8)	3 (%4.9)	3 (%4.9)	4 (%6.6)	5 (%8.2)	0.288
	Female	3 (%4.9)	44(%72.1)	5 (%8.2)	2 (%3.3)	1 (%1.6)	2 (%3.3)	4 (%6.6)	
Age	**15-20**	2 (%11.1)	7 (%38.9)	1 (%5.6)	1 (%5.6)	0 (%0)	5 (%27.8)	2 (%11.1)	0.029*
	21-30	3 (%15.8)	11(%57.9)	2 (%10.5)	0 (%0)	1 (%5.3)	0 (%0)	2 (%10.5)	
	31-40	1 (%5.9)	10(%58.8)	2 (%11.8)	2 (%11.8)	0 (%0)	1 (%5.9)	1 (%5.9)	
	41-50	1 (%3.1)	24 (%75)	5 (%15.6)	1 (%3.1)	1 (%3.1)	0 (%0)	0 (%0)	
	51-60	2 (%8.3)	15(%62.5)	3 (%12.5)	1 (%4.2)	0 (%0)	0 (%0)	3 (%12.5)	
	61+	1 (%8.3)	7 (%58.3)	1 (%8.3)	0 (%0)	2 (%16.7)	0 (%0)	1 (%8.3)	

Chi-square test *p<0.05

A statistically significant result was obtained when the mean VW was compared according to the soft palate types. The mean VW of Type three was found to be significantly higher than Type two and Type four (p_1:0.004; p2:0.005; p<0.05). The mean VW of Type six was found to be significantly higher than Type four (p_1:0.037; p<0.05). There is no statistically considerable discrepancy among the means of VL, PD and NR according to velum types (p>0.05) (Table 3).

Table 3. Correlation of mean velar length, velar width, pharyngeal depth, and Need's ratio with morphological types of soft palate

	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Handle	p
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
VL	34.83±4.85	38.54±4.77	38.69±5.14	36.85±3.55	39.9±6.08	34.4±2.7	35.88±5.43	0.084
VW	10.40±1.5	10.01±1.83	11.86±3.57	8.69±1.53	10.59±2.08	11.41±2.07	10.19±2.42	0.043*
PD	24.92±1.49	26.06±3.27	26.42±4.06	24.65±2.66	26.44±2.21	25.73±3.49	26.71±2.77	0.827
NR	0.73±0,.[1]	0.68±0.1	0.69±0.09	0.67±0.1	0.68±0.12	0.75±0.09	0.76±0.11	0.280

Oneway ANOVA test, VL: Velar Length, VW:Velar Width, PD: Pharyngeal Depth, NR: Need's Ratio *p<0.05

VL and VW mean values were significantly higher in males (p:0.002; p<0.05)- (p:0.008; p<0.05). There was no important diversity among the mean PD of females and males (p>0.05). The mean NR is notably higher in females (p:0.023; p<0.05), (Table 4).

While the mean VL and PD are statistically considerable among age groups (p<0.05), there is no considerable correlation between the mean VW and NR (p>0.05). The VL of the 15-20 and 21-30 age groups was concluded to be notably lower than the other age groups. The mean PD of the 15-20 age group was found to be notably lower than that of the 51–60 and over 61 age group. The mean PD of the 31–40 age group was found to be significantly lower than that of the over-61 age group. There was no statistically remarkable diversity among other age groups (p>0.05), (Table 5).

Table 4. Correlation of mean velar length, velar width, pharyngeal depth, and Need's ratio with gender

	Male	Female	p
	Mean±SD	Mean±SD	
VL	39.17±5.16	36.48±4.26	0.002*
VW	10.82±1.82	9.78±2.42	0.008*
PD	26.17±3.14	25.82±3.2	0.541
NR	0.67±0.09	0.72±0.11	0.023*

Student t test VL: Velar Length, VW: Velar Width, PD: Pharyngeal Depth, NR: Need's Ratio *p<0.05

Table 5. Correlation of mean velar length, velar width, pharyngeal depth, and Need's ratio with age groups

	15-20	21-30	31-40	41-50	51-60	61+	p
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
VL	34,55±4,48	35,34±3,5	36,12±4,87	39,38±5,35	39,89±3,43	40,8±3,91	0,000*
VW	10,2±1,68	9,59±1,47	10±1,81	10,79±3,01	10,35±2,29	10,6±1,34	0,533
PD	24,28±2,88	25,57±2,46	24,98±3,6	25,87±3,47	27,29±2,31	28,39±2,57	0,002*
NR	0,72±0,13	0,73±0,09	0,7±0,12	0,67±0,1	0,69±0,08	0,7±0,07	0,316

Oneway ANOVA test < VL: Velar Length, VW:Velar Width, PD: Pharyngeal Depth, NR: Need's Ratio *p<0.05

Discussion

There are several methods to assess velopharyngeal morphology and function, such as videofluoroscopy, nasopharyngeal endoscopy, lateral cephalometrics, magnetic resonance imaging (MRI), and computed tomography (CT). The benefits of CBCT scanning include minimal superimposition of structures, correct identification of landmarks, and better visualization. Therefore, various morphological measurements of the soft palate were obtained using CBCT to assess pharyngeal and soft palate morphology in the median sagittal plane.

In this study and Dahal et al.'s[12] study the most prevalent velum shape found was type two (60.7%

cases, 42.4% cases), whereas You et al.[6], Niu et al.[13], Kumar and Gopal[14] and Verma et al.[15] found that type one (leaf shape) was the most prevalent in their researches. Type six was seen at 4.9% and it was found only in the 15–20 and 31–40 age groups. Agrawal et al.[11] found that the new soft palate shape, which they defined as the handle shape, was found at 7.4% in the current study.

OSAS is characterized by recurrent occlusion of partial or complete airway obstruction as a result of the collapsing back of the pharyngeal walls while sleeping.[16-18] Nighttime sleep deprivation due to reduced airflow results in excessive sleepiness during the daytime. Common symptoms of OSAS include attention deficit disorder, daytime sleepiness, headache, and loss of activity. OSAS is also associated with cardiac, pulmonary, and nervous system diseases.[19] Pepin et al.[9] reported that the risk of OSA is high in patients with a soft palate morphology defined as type five (S-shaped). In this study Type five (S-shaped) velar shape was found in 3.3% of cases. Comparative studies were conducted by You et al.[6] and Guttal et al.[20]. They found that Type five (S-shaped) accounts for 3.5% and 1.5% of cases respectively.

The separation of the oral and nasal cavities occurs through the velopharyngeal port. The most important muscle for velopharyngeal closure is the levator veli palatini.[1] If the velopharyngeal port does not fulfil its function, VPI occurs.[3] Hoopes et al.[21] suggested that the VL/PD is 1.35 in normal adults. Schendel et al.[22] and Simpson and Austin[23] concluded in their cephalometric study that a NR greater than 1 is an indicator of VPI. According to Subtelny[8], NR greater than 0.7 causes VPI. In this study, the average NR, which is higher in females than in males, was reported as 0.72 in females. This result contrasted with the results of Simpson and Colton,[10] Hoopes et al.[21] and Subtelny,[8] while being similar to the results of Guttal et al.[20] Thus, as in the study of Verma et al.,[15] it was concluded that women have a higher risk of VPI than men.

In the current study, there is an increase in VL with increasing age. Similar findings were found in studies done by Verma et al., 15 Johnston and Richardson 24 and Taylor et al.[25]

In this study, males mean velar length was statistically significantly higher than females. However, the increase in VL was equal for men and women in Kollias and Krogstad's study.[26]

This study provides important information to healthcare professionals such as dentists, otolaryngologists and speech therapists by examining the diversity of soft palate types and their potential contribution to clinical practice. This information can help better guide patients' diagnosis and treatment processes and identify health problems early.

The limitations of this study include the inability to clinically evaluate the patients. The correlation between the increase in NR and the presence of OSA in the patient could not be evaluated. Studies should be conducted to compare CBCT imaging with other imaging modalities, with a larger sample size and clinical examination.

Conclusion

In this study using CBCT, the most common type two and other soft palate morphological types were emphasized. The risk of developing VPI is higher in women and in the 15–20 and 21–30 age groups. It has been observed that those with the handle type have a higher risk of developing VPI. The statistical findings in this study may be helpful in investigating the etiological causes of velopharyngeal insufficiency and obstructive sleep apnea.

Conflict of interest

None of the authors of this article has any relationship, connection or financial interest in the subject matter or material discussed in the article.

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How Competent are Dentists in the Management of Medical Emergencies?

Diş Hekimleri Tıbbi Acil Durumların Yönetiminde Ne Kadar Yeterlidir?

Adeviyye Karaca[1*], Mustafa Keşaplı[1]

ABSTRACT

Objectives: To evaluate dentists' knowledge and experience about life-threatening medical emergencies they may encounter in daily practice and question the competency of using relevant equipment.

Material and Methods: The study included a 15-question multiple-choice test aimed to evaluate dentists' medical practice based on current cardiopulmonary resuscitation (CPR) guidelines, and a 29-question survey to identify the causes of incompetence detected. The data were collected through face-to-face interviews or e-mail.

Results: In total, 475 dentists were contacted for the survey and, 363 agreed to participate. For the theoric questions, the mean score of the participants was 47.1+-15.9 (median (IQR): 46.2). The relationship between CPR training and the total score was significant (p: 0.00). There was no significant relationship between working experience and the score obtained (p: 0.14). Of respondents, 22.3% reported feeling competent in CPR, 78.8% believed dentists should know CPR, 17.9% reported being knowledgeable in automated external defibrillator (AED) use, 23.4% reported feeling competent in managing chest pain, 37.7% reported feeling competent in managing anaphylaxis, 47.9% stated that their emergency drugs and equipment were regularly checked.

Conclusions: Dentists in Turkey need to be adequately prepared for medical emergencies. Pre- and post-graduate education may not sufficient, and CPR and medical emergencies training should be repeated after graduation to ensure that knowledge and skills are maintained. In addition, it is necessary to include an AED device, to be competent in the indications of all equipment and drugs, to provide training for the personnel, and to develop and regularly monitor emergency planning.

Keywords: *automated external defibrillators, cardiopulmonary resuscitation, dentistry, emergency care*

ÖZET

Amaç: Diş hekimlerinin günlük pratikte karşılaşabilecekleri hayatı tehdit eden tıbbi acil durumlar hakkında bilgi ve deneyimlerini değerlendirmek ve ilgili ekipmanları kullanma yeterliliğini sorgulamaktır.

Gereç ve Yöntemler: Çalışma, mevcut kardiyopulmoner resüsitasyon (KPR) kılavuzlarına dayalı olarak diş hekimlerinin tıbbi uygulamalarını incelemeyi amaçlayan 15 soruluk çoktan seçmeli bir test ve tespit edilen yetersizliğin nedenlerini belirlemeyi amaçlayan 29 soruluk bir anketi içermektedir. Veriler yüz yüze görüşme veya e-posta yoluyla toplanmıştır.

Bulgular: Anket için toplam 475 diş hekimi ile iletişime geçildi ve 363'ü katılmayı kabul etti. Teorik sorular için katılımcıların ortalama puanı 47,1+-15,9'dur (medyan (IQR): 46,2). KPR eğitimi ile toplam puan arasındaki ilişki anlamlıydı (p: 0.00). İş deneyimi ile alınan puan arasında anlamlı bir ilişki yoktu (p: 0.14). Yanıt verenlerin %22,3'ü KPR'de yetkin hissettiğini, %78,8'i diş hekimlerinin KPR'yi bilmesi gerektiğine inandığını, %17,9'u otomatik harici defibrilatör (OED) kullanımı konusunda bilgili olduğunu, %23,4'ü göğüs ağrısını yönetmede yetkin hissettiğini, %37,7'sinin anaflaksi yönetmede yetkin hissettiğini bildirdi. %47,9'u acil durum ilaçlarının ve ekipmanlarının düzenli olarak kontrol edildiğini belirtti.

Sonuç: Türkiye'deki diş hekimleri tıbbi acil durumlar için yeterince hazırlıklı olmayabilir. Mezuniyet öncesi ve sonrası eğitim yeterli olmayıp, bilgi ve becerilerin devamlılığını sağlamak için mezuniyet sonrası KPR ve tıbbi acil durumlar eğitimi tekrarlanmalıdır. Ayrıca OED cihazının bulunması, tüm ekipman ve ilaçların endikasyonlarında yetkin olması, personele eğitim verilmesi, acil durum planlamasının geliştirilmesi ve düzenli olarak izlenmesi gerekmektedir.

Anahtar Kelimeler: *acil bakım, diş hekimliği, kardiyopulmoner resüsitasyon, otomatik harici defibrilatör*

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Introductions

Dentists often encounter local or systemic complications due to the invasive procedures they apply in daily practice. Especially, managing life-threatening conditions such as cardiopulmonary arrest and anaphylaxis can be difficult. Although these complications occur rarely, they pose a significant source of stress for dentists due to the possible outcomes. Many studies have shown that mortality and morbidity decrease when such life-threatening emergencies are promptly and effectively intervened. While mortality is 2.5% in patients who undergo resuscitation immediately after cardiac arrest, it increases to 8.2% when delayed.[1]

Dentist must undergo regular training to ensure that life-threatening situations can be successfully managed. There are different types of educational practices and approaches toward the management of medical emergencies in dentistry faculties all over the world. The American Heart Association (AHA) and the European Resuscitation Council (ERC), which set the guidelines for resuscitation worldwide and are the most widely accepted, recommend that dentists take basic and advanced life support courses regularly each year.[1,2]

Among different countries, there is no standard approach to emergency medical supplies that should be available in the working areas of dentists. There are different applications regarding the necessity of having automatic external defibrillators (AED), which are extremely easy to use and significantly reduce mortality, especially in cardiac arrest management.

It's important to assess dentists' knowledge and skills, as well as their competencies in necessary equipment and management. For this reason, the aim of current survey study was to evaluate the knowledge and experience of dentists about life-threatening medical emergencies that they may encounter in daily practice and to question the competency of using relevant equipment in all aspects.

Materials and Methods

Study approval was obtained from the Health Sciences University Antalya Training and Research Hospital Clinical Practices Ethics Committee (Approval no: 2018-177). The survey was developed by experienced emergency medicine specialists and dentists and pre-tested among 50 dentists prior to the study to assess intelligibility and ambiguity, who were later excluded from the study. We did not calculate the power analysis. Instead, tried to reach as many dentists as we could. The study included 475 dentists working in public and private practice in Turkey. The participants were informed about the scope of the study, and they were explained that their participation was completely confidential and that they could withdraw from the study at any time. After their written consent was obtained, they voluntarily participated in the survey. The data were collected through face-to-face interviews or e-mail throughout 2019.

The study included a 15-question multiple-choice test aimed at examining dentists' medical practice based on current cardiopulmonary resuscitation (CPR) guidelines, and a 29-question survey aimed at identifying the causes of incompetence detected because of the application. 46 questions were proportioned as the maximum score that the participants would receive was 100 and the minimum score was 0. The survey consisted of 46 questions in total:

- Questions 1-3 were about age, gender, and work experience.

- Questions 4-10 measured knowledge in basic life support based on the 2020 AHA guidelines.

- Questions 11 through 16 measured knowledge in advanced life support based on the 2020 AHA guidelines.

- Questions 17-46 included open-ended questions to measure competency and knowledge in identifying CPR, competency in medical emergencies and the ability to have and use medical emergency equipment, competency to manage specific medical emergencies, and evaluation of anamnesis and vital signs. Through these questions, it was aimed to discover the underlying causes of incompetency and to determine the steps that can be taken to prevent it.

The study data were analyzed using MedCalc and Statistical Package for Social Sciences 23.0 programs. Numerical data were expressed as mean±standard deviation and median (interquartile range (IQR)), whereas frequency data were expressed as percentages. For numerical data, the Mann-Whitney U test was used to compare two groups, and the Kruskal-Wallis test was used to compare three or more groups. The multi-well Chi-square test was used to compare three or more groups for frequency data. In the comparison of three or more groups, the Conover test was used

for numerical data as a post- hoc analysis method, and the "Cellwise Residual Analysis" method was used for frequency data.[3] Normality analysis was performed using the Kolmogorov-Smirnov test. All tests were set up bidirectionally and the alpha critical value was accepted as 0.05.

Results

In total, 475 dentists were contacted to answer the survey questions. Of these, 363 people agreed to participate in the survey. The rate of participation was 76.4%. All the respondents filled out the forms completely and were included in the study. Of the participants, 156 (43%) were male and 207 (57%) were female. The mean age of the participants was 37.6 +-10.4 and they had a maximum experience of 10-20 years (n=104, 28.7%) (Table 1).

Table 1. Demographic characteristics of the participants

	Age (year)	Gender		Professional experience			
	Mean	Female	Male	1-5 years	5-10 years	10-20 years	>20 years
Number (n)	37.64	207	156	84	81	104	94
Percent (%)		57	43	23.1	22.3	28.7	25.9

For the questions assessing efficacy in basic and advanced life support, the mean score of the participants was 47.1+-15.9 (median (IQR): 46.2 (38.5-53.9), IQR: 25%-75%). The theoretical questions and the answer rates were shown in Table 2. In terms of the relationship between gender and total score, the median total score was 46.2 (46.2-46.2) for women and 46.2 (46.2-53.9) for men, and there was no difference between genders (p: 0.78). The maximum number of correct answers was 12, and only two (0.6%) answered all questions correctly. The most correctly answered question was regarding the lying position that should be applied to the unconscious patient (81% correct response rate).

Table 2. The theoretical questions asked to the participants and the distribution of the answers given

Questions	Answers	Number (n)	Percent (%)
How should the state of consciousness be controlled?	Ask if the patient is okay in a loud voice and gently shake the patient	233	64.2
	Look at the eyes	43	11.8
	Shine a light on the eyes	87	24
	Hold a mirror to the face	0	0
Which position is given to an unconscious patient with pulse and respiration?	Recovery position	294	81
	Lay on back	53	14.6
	Head up position	15	4.1
	Face down position	1	0.3
What should be the compression/ventilation ratio in an adult patient?	Place your ears on the thorax	37	10.2
	The look-listen-feel method	241	66.4
	Hold a mirror to patient's face	57	15.7
	Listen to the sounds the patient makes	28	7.7
	15/2	101	27.8
	30/2	192	52.9
	10/3	27	7.4
	15/5	43	11.8
How many times per minute should compressions be applied?	60/minute	164	45.2
	80/minute	37	10.2
	90/minute	70	19.3
	100-120/minute	92	25.3

Which is incorrect for an automated external defibrillator (AED)?	It is easy to use, it has been developed for the use of individuals who are not healthcare professionals.	143	39.4
	It automatically analyzes the heart rhythm and recommends shock if necessary.	55	15.2
	By pressing the button, the shock is applied at any time desired.	122	33.6
	Especially when applied early, it increases the chance of survival at a high rate.	43	11.8
Which of the following arteries is most easily evaluated for heart rate?	Brachial artery	43	11.8
	Carotid artery	253	69.7
	Axillary artery	18	5
	Radial artery	49	13.5
During basic life support, what is the maximum recommended time for pulse control in seconds?	5	93	25.6
	10	171	47.1
	15	80	22
	20	19	5.2
What is the first drug to be used in cardiac arrest?	Adrenalin	286	78.8
	Atropine	46	12.7
	Lidocaine	3	0.8
	Nitroglycerine	28	7.7
Which of the following is not a basic material required to maintain the airway?	Oral airway	18	5
	Bag-valv-mask	17	4.7
	Face mask	217	59.8
	Endotracheal tube	111	30.6
What is the dose of adrenaline that should be used intramuscularly during anaphylaxis in an adult patient?	1 mg	140	38.6
	0.5 mg	98	27
	2 mg	63	17.4
	1.5 mg	62	17.1
Which of the following is not a priority during anaphylaxis?	Administering oxygen	51	14
	Administering Adrenalin	66	18.2
	Airway control	9	2.5
	To measure blood pressure	237	65.3

AED: Automated external defibrillator

Evaluation of the relationship between the length of experience and the total score obtained from correct answers showed that the median value of all four groups was 46.2, whereas IQR values were 42.3-53.9 for those with 1-5 years of work experience, 36.5-53.9 for those with 5-10 years of work experience, 38.5-61.6 for those with 20 years of work experience and 30.8-53.9 for those with more than 20 years of work experience, with no significant relationship between experience and the score obtained (p: 0.14).

There was no relationship between the total score obtained and age (Correlation coefficient: -0.109, p: 0.03).

The evaluation of the relationship between previous CPR training and the total score showed a significant relationship between those who answered yes, no and indecisive (p:0.00). The post-hoc analysis between the groups showed that the major difference was between those who received CPR training and those who did not (Table 3).

Table 3. The relationship between CPR training and feeling competent

	Feeling Competent		
	Yes	**No**	**I don't know/ Undecided**
CPR training: Yes	59 (%26.5)	82 (%36.8)	82 (%36.8)
CPR training: No	7 (%7.2)	85 (%87.6)	5 (%5.2)
CPR training: I don't know/undecided	15 (%34.9)	18 (%41.9)	10 (%23.3)

CPR: Cardiopulmonary resuscitation

There was no significant relationship between previous CPR experience and the total score (p: 0.45, median: 46.2, IQR: 38.5-61.6 for those who said yes, IQR: 38.5-61.6 for those who said no, IQR: 44.2-53.9 for those who said they were indecisive/don't know). On the other hand, evaluation of the relationship between previous CPR training and feeling competent revealed a significant difference (p: 0.00), (Table 4).

Table 4. Dentists' answers and distribution ratios regarding their competence, knowledge, skills and experience in CPR

QUESTIONS	YES (n, %)	NO (n, %)	I DON'T KNOW/ UNDECIDED (n, %)
CPR NEED RECOGNITION, EXPERIENCE, KNOWLEDGE AND COMPETENCIES			
Have you encountered a case of cardiac arrest anywhere?	67 (%18.5)	280 (%77.1)	16 (%4.4)
Have you encountered a case of cardiac arrest in your daily work area?	95 (%26.2)	260 (%71.6)	8 (%2.2)
Can you evaluate a person who has had cardiac arrest?	102 (%28.1)	162 (%44.6)	99 (%27.3)
Is gasping (agonal) breathing an adequate form of breathing?	14 (%3.9)	180 (%49.6)	169 (%46.6)
Have you ever had a cardiopulmonary resuscitation (CPR) training?	223 (%61.4)	97 (26.7)	43 (%11.8)
Did you have any training on CPR in your university education?	158 (%43.5)	170 (%46.8)	35 (%9.6)
Have you ever performed CPR?	44 (%12.1)	294 (%81)	25 (%6.9)
When performing CPR, should the thorax be allowed to relax?	182 (%50.1)	93 (%25.6)	88 (%24.2)
Do you think a dentist should know CPR?	286 (%78.8)	39 (%10.7)	38 (%10.5)
Do you consider yourself competent and sufficient in CPR?	81 (%22.3)	185 (%51)	97 (%26.7)
Can you perform CPR if needed outside the area you work in? (in public places, shopping malls, airplanes, etc.)	129 (%35.5)	148 (%40.8)	86 (%23.7)
Are you familiar with the use of an automated external defibrillator (OED)?	65 (%17.9)	238 (%65.6)	60 (%16.5)
What should be the compression/ventilation ratio in an adult patient?	15/2	101	27.8
PREPARING FOR MEDICAL EMERGENCIES			
Do your staff members have CPR training?	60 (%16.5)	255 (%70.2)	48 (%13.2)
Are emergency medications and supplies checked regularly in your clinic?	174 (%47.9)	70 (%19.3)	119 (%32.9)
Is there an emergency medical emergency application scheme and assignment for all personnel in your clinic?	76 (%20.9)	222 (%61.2)	65 (%17.9)
Do you feel competent about the use of medicines and materials in the emergency kit?	93 (%25.6)	165 (%45.5)	105 (%28.9)
PRACTICAL SKILLS AND COMPETENCIES IN EMERGENCIES			
Do you have any knowledge of automatic external defibrillator (OED)?	120 (%33,1)	200 (%55,1)	43 (%11,8)
Can you apply an oral airway?	81 (%22.3)	194 (%53.4)	88 (%24.2)
Have you ever establish an intravenous line before?	123 (%33.9)	213 (%58.7)	27 (%7.4)
Can you establish an intravenous line in an emergency?	152 (%41.9)	128 (%35.3)	83 (%22.9)
Do you consider yourself sufficient in blood pressure measurement?	254 (%70)	56 (%15.4)	53 (%14.6)
If necessary, can you ventilate the patient with the bag-valve-mask?	127 (%35)	146 (%40.2)	90 (%24.8)
Do you have any idea for what purpose the pulse oximeter is used?	247 (%68)	74 (%20.4)	42 (%11.6)

KNOWLEDGE AND COMPETENCY TO MANAGE MEDICAL PROBLEMS THAT MAY BE ENCOUNTERED IN DAILY PRACTICE			
Do you consider yourself competent in anaphylaxis management?	137 (%37.7)	151 (%41.6)	75 (%20.7)
Can you effectively use the adrenaline autoinjector in anaphylaxis?	174 (%47.9)	111 (%30.6)	78 (%21.5)
Do you consider yourself sufficient in terms of managing an asthma attack?	69 (%19)	217 (%59.8)	77 (%21.2)
Would you analyze the risk factors of systemic diseases in the first examination and change your treatment plan accordingly?	277 (%76.3)	80 (%22)	6 (%1.7)
Do you use additional measures to reduce patients' stress? (music, movies, suggestions, etc.)	250 (%68.9)	101 (%27.8)	12 (%3.3)
Do you have any additional medication or supplies for possible uncontrollable bleeding?	245 (%67.5)	55 (%15.2)	63 (%17.4)

n: Number, CPR: Cardiopulmonary resuscitation, AED: Automated external defibrillator

The number of physicians who previously encountered a cardiac arrest case was 67 (18.5%), while the number of those who encountered a cardiac arrest case in the working environment was 95 (26.2%). 102 physicians (28.1%) expressed feeling competent to handle cardiac arrest. 22.3% (n=81) of the participants reported feeling competent in CPR, 61.4% (n=223) reported having previously received CPR training, and 12.1% (n=44) reported having previously applied CPR. While 78.8% (n=286) of the participants believed that dentists should know CPR, 10.7% (n=39) believed that CPR competence was unnecessary.

While 47.9% (n=174) of the respondents stated that their emergency drugs and equipment were regularly checked in the working environment, only 20.9% (n=76) reported that there were protocols and assignments for emergency medical applications in the working environment. 17.9% (n=65) of the participants reported being knowledgeable in AED use, 22.3% (n=81) reported that they can use an oral airway, 33.9% (n=123) reported previous experience in establishing vascular access, 70% (n=254) reported being able to measure blood pressure, 23.4% (n=85) reported feeling competent in managing a patient with chest pain and 37.7% (n=137) reported feeling competent in managing anaphylaxis. 174 participants (47.9%) reported feeling competent to use an adrenaline autoinjector, 69 (19%) reported feeling competent to manage asthma attacks, 127 (35%) reported being able to apply balloon-valve-mask, and 93 (25.6%) reported feeling competent to use the medication and equipment in the emergency kit. 277 (76.3%) reported identifying risk factors for systemic diseases and changing the treatment plan accordingly, 250 (68.9%) reported using additional methods (music, movies, indoctrination, etc.) to reduce the patient's stress, 245 (67.5%) reported keeping additional medication and equipment ready for possible uncontrollable bleeding. All answers and distribution ratios regarding the proficiency, knowledge, skills and experience of dentists in CPR are shown in Table 4.

Discussion

Today, dentists are at increased risk of encountering life-threatening cardiopulmonary arrest and other medical emergencies. Training on CPR and other emergencies is provided in the regular curriculum of the faculty of dentistry. However, since most faculties do not have practical or simulative model training, practical emergency medicine internships, the learned information is often not put into practice.[4] AHA and ERC recommend regular annual basic and advanced life support courses for dentists.[1,3]

As shown in the studies evaluating the incidence of cardiac arrest encounters among dentists, 0.002 cases/physician/year were noted in England, 0.011 in America, and 0.2% in Brazil.[4,5] The incidence of cardiac arrest encounters in the workplace was reported as 4% in Iran, 4.3% in Kuwait, and 23.3% in Oman.[4,6,7] According to the studies conducted in Turkey, Canpolat et al. reported the rate of cardiac arrest encounters as 2.6% in the workplace, while Ekici reported a rate of 1.3%.5,[8] In this study, the incidence of cardiac arrest encounters in the workplace was 26.2%. In the literature, a significant difference is observed between the incidence of cardiac arrest encounters in European, American, and Asian countries. On the other hand, we determined an even higher rate in current study. We think believe that the significant difference found in this study stems from the fact that the participants took part in the emergency medicine rotation during their studies at the university and considered it as a workplace, that they encountered more cardiac arrest

there, and that the participants generally worked in hospitals with emergency services. In addition, the studies conducted by Azad et al. and Khami et al. concluded that dentists could not correctly identify real emergencies and their characteristics.[9,10] Considering the publications in the literature showing that dentists cannot adequately identify emergency situations emergencies. Also considering that nearly half of the participants (44.6%) in this study reported not feeling competent in identifying cardiac arrest. It can be said that the participants may not be able to recognize cases of cardiac arrest, and therefore the incidence of cardiac arrest encounters is high.

Studies evaluating the competency of dentists to identify patients with cardiac arrest have shown that the rate of those who could not identify cardiac arrest was 41.29% in Poland, 54.4% in Brazil, and 49% in Slovenia, while only 34.2% of the participants reported feeling competent in identifying cardiac arrest in the study of Ekici.[4,8] Although we believe that practical applications will yield higher accuracy in evaluating CPR competence, surveys clearly reveal the deficiency in this regard.

Insufficient identification of gasping type breathing, which is one of the breathing patterns emphasized in the last two international CPR guidelines, and not knowing the importance of allowing the chest to relax during compression is a major deficiency and leads to inadequacy in making and applying CPR decisions at the initial stage.[1] We could not find an available study that specifically investigated these two parameters, so we were unable to comment on it.

In this study, dentists should know CPR shows the importance they attach to this matter. The study of Smereka et al. determined that 24.82% of dentists received CPR training, and half of the participants who received CPR training only received it at university.[4] A study which is conducted in India reported that less than half of the participants received CPR training at university and after graduation.[4] In the study of Singh et al., 75.9% of the participants were found to have received CPR training.[8] On the other hand, according to a study conducted in Britain, 93.9% of dentists received CPR training at university and 98.9% after graduation, which is a significant rate.[4] In the study conducted by Ekici in Turkey, it was reported that 73.7% received CPR training.[8] Considering the importance given to the matter by dentists, both university and post-graduate CPR training should be repeated at regular intervals.

A review of the international studies evaluating the competence of dentists in CPR showed that the rate of participants who did not feel competent in CPR was 41.29% in Poland, 54.4% in Brazil, and 49% in Slovenia.[2,4] In Turkey, Komerik et al. reported the rate of dentists feeling competent in CPR as 56%, while in this study, 22.3% of the participants reported feeling competent in CPR.[11] Evaluation of the studies indicates that most dentists do not feel competent in identifying cardiac arrest and performing CPR. Although we believe that practical applications will yield higher accuracy in evaluating CPR competence, surveys clearly show the deficiency in this regard.

In the evaluation of the questions about practices that measure the level of theoretical knowledge about CPR, and which are classified as Class 1 suggestions in the literature[1],[2]

1. In the evaluation of the state of consciousness, Jamalpour et al. reported the rate of correct answers as 25%, while Canpolat et al. reported a rate of 63.6%.5

2. In the literature, the rate of correct answers to the question of how respiratory control should be performed was 40.3% and 28.8%, respectively.[12,13]

3. The rate of correct answers to the question of what should be the heart massage/artificial respiration ratio in an adult patient was found as 56%, 71.4%, and 42.4% in the literature.[4,10,12] In this study, almost half of the participants did not know the compression/respiration ratio. Almost half of the participants did not know the compression/ventilation ratio.

4. The rate of correct answers to the question of how many chest compressions should be applied per minute was reported as, 27.6%, 28.8%, and 44.2% in the literature.[8,10] In the current study, this rate is low.

5. The rate of correct answers to the question of which drug to be used primarily during cardiac arrest was reported as 67%, 51.3% in the literature.[5,8]

In conclusion, theoretical knowledge and practices recommended by the international guidelines on CPR as Class 1 were very low.

In the study conducted by Jamalpour et al. among Iranian dentists, it was shown that 39% of the participants could not answer any question correctly.[5] In the study of Irfan et al., 58.3% of the participants scored less than 50%.12 In the study of Ekici, the results were more satisfactory, and the

participants were accepted to possess theoretical knowledge since 44.7% answered more than half of the questions correctly.[8] In studies conducted in Brazil, Iran, and Kuwait, the rate of correct answers for theoretical questions was 46%, 37%, and 36%, respectively.[4,6,8] In this study, the rate of correct answers to theoretical questions was determined as 47.1%, which is significantly higher than in other studies. Many studies in the literature have reported a positive correlation between previous CPR training after graduation and theoretical knowledge.[12] Likewise, a significant relationship was found between having received CPR training and a total score.

The rate of AED possession was found to be 4.4%.9 Although we cannot prove the accuracy of the answers with practical application, it is clear that dentists have insufficient information about the AED.

Although cardiac arrest is the most important medical emergency that requires the fastest intervention, anaphylaxis progression is another emergency that dentists must be competent to manage, as it has the potential to rapidly degenerate into cardiac arrest. In the study of Smereka et al., only 44.86% of the participants felt competent in anaphylactic shock, which was reported as 20.8% in the study of Girdler and Smith.[4] Although 37.7% of the participants in this study reported feeling competent in managing anaphylaxis, the rate of correct answers to the question about adrenaline dosing in anaphylaxis was 27%, resulting in inconsistency. In the study of Kishimoto et al., the competency to diagnose and treat anaphylaxis improved dramatically after the participants took part in training programs.[15] In light of this information, we believe that it will be highly beneficial to include these subjects in the undergraduate curriculum and continue practical training such as anaphylaxis management and adrenaline autoinjector use.

In the study of Komerik et al., only 26% of the participants reported feeling competent to intervene in angina, while in the study of Arsati et al., 79.7% of the participants stated that they did not feel competent in the management of myocardial infarction.[4,11] As demonstrated both by the literature and current study, dentists also have limited competence and knowledge about important medical emergencies such as anaphylaxis and chest pain other than cardiac arrest.

In the section on competence in interventional procedures, dentists in the study of Arsati et al. found themselves competent in intramuscular and subcutaneous injections, but insufficient in establishing vascular access.[4] In the study of Canpolat et al., it was found that 71.4% of the participants had not attempted to establish intravenous access before, and the rate of those who thought that they could establish vascular access was 28.6%.5 In the study of Ekici, 30.3% of the participants stated that they could insert an oropharyngeal airway, 35.5% could use a bag-valve-mask, and 25% could insert vascular access.[8] In this study, the rate of oral airway insertion, vascular access insertion, blood pressure arterial (TA) measurement, and bag-valve-mask application were found to be similar. In the study of Tanzawa et al., it was determined that 22% of the participants could use pulse oximetry, which was 68% in the study of Ekici.[8,16] This information clearly reveals that dentists are not competent in interventional procedures and that these skills should be developed with practical training.

Providing training for the personnel in the same team, medication-equipment control, emergency protocol, and assignment are as important as the theoretical and practical training of the physician in the prevention of fatal medical emergencies. According to the 33rd Article of the Regulation on Private Health Institutions Providing Oral and Dental Health Services published in the Official Gazette dated 03.02.2015 and numbered 29256 in Turkey, an emergency kit, oxygen tube, and mask and cuffed sphygmomanometer (adult and child size) should be available in all dentist outpatient clinics, while the seventh annex of the same article specifies the equipment that should be available in the emergency kit. In the study of Stafuzza et al., it was stated that only 28% of the participants could use emergency medical supplies, while in the study of Alhamad et al., 33% of the participants felt incompetent in using medication and medical equipment.[4,17] Despite the legal requirement of specified equipment and medicine, it is a serious contradiction that the competence of dentists is rather low. On the other hand, in the study conducted by Al Hassan et al. in Saudi Arabia, it was found that 54% of the participants had an emergency protocol and only 11% of them practiced it periodically.[18] In the study of Al Ghanam et al., it was stated that 36.1% of the participants had a CPR protocol in their clinics.[7] This study, clearly shows that this issue is not taken very seriously. Although previous studies have clearly revealed the importance of periodic personnel training, creating an emergency

chart, and taking anamnesis in preventing medical emergencies.[4,7,19]

In the study of Al Iryani et al., it was reported that 96% of the dentists received detailed medical anamnesis, which was reported as 44.86% in the study of Smereka et al. and 97.6% in the study of Alkandari et al.[4,19] The importance of taking anamnesis before any kind of medical intervention is undeniable. Apart from this, we believe that applications such as music, movies, etc. can be useful in reducing the pre-procedural stress of patients.

The reason for our lengthy discussion section stems from our desire to examine all the problems that may be encountered in dental practice. Approximately 50 questions in our survey allowed us to thoroughly examine the subject in all its aspects.

Conclusion

In conclusion, we suppose that dentists in Turkey are not adequately prepared for medical emergencies, pre- and post-graduate education is not sufficient, and regular CPR and medical emergency training should be repeated after graduation to ensure that knowledge and skills are maintained at a competent level. In addition, it is necessary to include an OED device among required materials and medication, to be competent in the indications of all equipment and drugs, to provide training for the personnel in the same team, and to develop and regularly monitor emergency planning. We suppose that regular inspection and accreditation of these by health authorities will significantly decrease mortality and morbidity.

Conflict of interest

None of the authors of this article has any relationship, connection or financial interest in the subject matter or material discussed in the article.

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Evaluation of YouTube™ Videos as a Patient Education Source for Postoperative Care After Tooth Extraction

Diş Çekimi Sonrası Postoperatif Bakım İçin Hasta Eğitim Kaynağı Olarak Youtube™ Videolarının Değerlendirilmesi

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ABSTRACT

Objectives: This study will assess the quality, understandability and actionability of YouTube™ videos relating to postoperative care, using tooth extraction as a point of focus.

Materials and Methods: As keywords, 'postoperative care after tooth extraction' and 'postoperative instructions after tooth extraction' were used. After selection of the videos, a 16-point usefulness index was used in order to evaluate the content of the videos. Modified DICERN and Global Quality Scale (GQS) were used for assessing quality of the videos and in order to evaluate understandability and actionability of the selected videos, Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT-A/V) were used. The relationship and correlation between the descriptive data of the videos and the findings of scoring systems and the correlation between scoring systems were evaluated.

Results: Totally, 55 videos were selected for evaluation. Duration of the videos was the sole variable affecting the usefulness and quality of the videos ($p<0.05$). Among evaluated videos 27.3% were very useful and 54.5% were moderately useful. There was a relationship between usefulness and quality-measuring scoring systems, but no relationship between usefulness and PEMAT-A/V scores of the videos ($p<0.001$; $p=0.064$ respectively).

Conclusion: It could be concluded that videos on YouTube™ about the topic 'postoperative care after tooth extraction' might be useful in an acceptable level, but these selected videos might not be satisfyingly understandable and action-motivating.

Keywords: *Healthcare, Postoperative care, Postoperative procedures, Tooth extraction, Social media*

ÖZET

Amaç: Bu çalışmada, diş çekim işlemi sonrası postoperative bakım ile ilgili YouTube™ videolarının kalitesinin, anlaşılabilirliğinin ve eyleme geçirilebilirliğinin değerlendirilmesi planlandı.

Gereç ve Yöntemler: Anahtar kelimeler olarak, 'diş çekimi sonrası postoperatif bakım' ile 'diş çekimi sonrası postoperative talimatlar' kullanıldı. Videolar seçildikten sonra videoların içeriklerini değerlendirmek için 16 puanlık kullanışlılık indeksi kullanıldı. Videoların kalitesini değerlendirmek için Modifiye DICERN ve Global Quality Scale (GQS), seçilen videoların anlaşılabilirliğini ve uygulanabilirliğini değerlendirmek için Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT-A/V) kullanıldı. Videoların tanımlayıcı verileri ile puanlama sistemlerinin bulguları arasındaki ilişki ile korelasyonu ve puanlama sistemleri arasındaki korelasyon değerlendirildi.

Bulgular: Toplamda değerlendirme için 55 video seçildi. Videoların kullanışlılığını ve kalitesini etkileyen tek değişken videoların süresiydi ($p<0,05$). Değerlendirilen videoların %27,3'ü çok yararlı ve %54,5'i orta derecede yararlıydı. Kullanışlılık ile kalite ölçüm puanlama sistemleri arasında ilişki bulunurken, videoların kullanışlılık ile PEMAT-A/V puanları arasında ilişki bulunmadı (sırasıyla $p<0,001$; $p=0,064$).

Sonuç: YouTube™'deki 'diş çekimi sonrası postoperatif bakım' konulu videoların kabul edilebilir düzeyde yararlı olabileceği, ancak bu seçilen videoların tatmin edici derecede anlaşılır ve harekete geçirici olmayabileceği sonucuna varıldı.

Anahtar Kelimeler: *Sağlık, Postoperatif bakım, Postoperatif prosedür, Diş çekimi, Sosyal media*

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Introduction

A successful wound healing process after a surgical operation relies on several factors. Alongside the clinician's ability for performing the procedure, adequate patient education is crucial for reducing postoperative morbidity and complications, and increasing patient satisfaction during the early healing period.

Tooth extraction is the most common resective procedure in routine dental practice.[1] Giving adequate and understandable instructions to the patient after oral surgical procedures could increase patient satisfaction and reduce morbidity.[2] Such instructions include the use of the medications, care of the surgical wound in the postoperative period, and warnings regarding potential complications. Understanding of post-operative care instructions depends on how they are presented (verbal and/or written) and the socioeconomic status of the patient.[3,4] In dentistry, oral and/or written instructions after tooth extraction should be understandable, including illustrations for patients, to ensure compliance.[2,5]

Today, the Internet is frequently used because of its ability to provide easy and fast access to information about health services. Widespread use of the Internet has provided patients with the opportunity to search and collect medical information they could not obtain before; in an area whose accuracy and reliability are unknown. An estimated 74% of adults in the United States reportedly have regular internet access, and up to 80% of them search for health information online.[6] Online health information searches can also serve as an alternative to more traditional methods of obtaining health information, such as directly asking health care providers, especially for those who have trouble accessing health care immediately when needed.[7,8] Cline and Haynes report patients obtaining health information online do so in three ways; (a) seeking health information directly, (b) participating in support groups, and (c) consulting healthcare professionals.[9] The most common among these is the use of online tools, the most popular of which is YouTube™.[10,11] However, since the uploaded videos are not evaluated objectively and anyone can upload any type of video, viewers may encounter misleading or incorrect information. Studies evaluating the quality of online health-related information in the health field often report low-quality information.[12,13]

Although there are many studies in the literature that evaluate the accuracy of online information about various surgical procedures, at the time of writing, there was no other study evaluating the reliability of videos with post-surgery instructions for the simplest and most common resective procedure, namely tooth extraction. The aim of this study is to evaluate videos on YouTube™ one of the most popular online platforms---about postoperative care after tooth extraction. This study will assess the videos' quality, understandability, and actionability.

Materials and Methods

This study was designed in order to evaluate the informative qualifications, understandability, and actionability of videos regarding postoperative care after tooth extraction on YouTube™ (www.youtube.com). First, on September 3.2022, at 10:00 AM, a Google Trends search was performed to specify the keywords. The result of the keywords search was "Your search does not have enough data to display here." Because of that, keywords for searches in YouTube™ were determined as 'postoperative care after tooth extraction' and 'postoperative instructions after tooth extraction.' On September 3.2022 at 10:30 AM, a YouTube™ search was performed using keywords 'postoperative care after tooth extraction' and 'postoperative instructions after tooth extraction.' Both searches listed according to relevance and no filters were applied. For both searches, 200 videos' specific addresses, or Uniform Resource Locators (URL), (in total 400 videos) were recorded. Exclusion criteria were as follows:

i. Duplicated videos
ii. Language other than English
iii. Videos with a too general topic
iv. Videos with a too specific topic
v. Videos about complications
vi. Live surgery videos
vii. Irrelevant videos
viii. Low-quality videos

Selected videos were independently analyzed by two researchers (GMYÜ and GD) experienced in oral surgical procedures, blinded to prevent bias. Demographic data of the selected videos, including total views, video length (seconds), the total number of likes, dislikes, and comments, number of days since upload, upload source, and the target audience, were recorded. Viewer interaction and viewing rate were analyzed using the formula as previously defined:14 Interaction index=(number of likes +

number of dislikes/total number of views)×100% Viewing rate = (number of views/number of days since upload) ×100%

A usefulness index with a 16-point scoring system was created in order to analyze the videos' contents (Table 1). Video contents were labelled as very useful (12<), moderately useful (9-12), slightly useful (5-8) and not useful (4>) according to the number of the met criteria. If the criterion was met, the material got one (1) point for each criterion.

Table 1. Usefulness score criteria and the rates of the met criteria.

Criteria Number	Criteria	Point	Rate Observed (%)
1	Keep pressing folded gauze for 30-45 minutes after extraction.	1	96.36
2	Avoid rinsing with any liquid for the first 24 hours.	1	92.73
3	Do not spit.	1	90.91
4	You will probably remain numb for several hours after surgery.	1	21.82
5	Do not apply negative pressure, do not use drinking straws.	1	80
6	Take a soft or semi-liquid diet at a low or warm temperature.	1	92.73
7	Apply ice wrapped in a cloth on the outside of the face at the extraction site.	1	76.36
8	Maintain proper oral hygiene. After one day, begin brushing and rinsing.	1	81.82
9	Avoid smoking during the postoperative period and do not consume alcoholic/soft drinks during the week after.	1	87.27
10	No extreme or vigorous physical activity	1	61.82
11	Pain	1	89.09
12	Haemorrhage (Bleeding)	1	83.64
13	Oedema (Swelling)	1	61.82
14	Trismus (Difficulty in opening the mouth)	1	**3.64**
15	Postoperative Infection	1	16.36
16	Dry Socket	1	49.09

DISCERN is a scoring system intended to provide users with a consistent method to evaluate the quality of printed health information.[15] DISCERN system was modified for the evaluation of videos on YouTube™, using a scoring system consisting of five factors (Table 2).[16] These five factors are bias/balance, clarity, provision of additional information sources, reliability, and whether or not uncertainty areas aimed to be evaluated.

Table 2. Modifed DISCERN16 (Yes: 1; No:0). Observed rates of each criterion in this study.

	Questions	Rate Observed (%)
1	Are the aims clear and achieved?	85.5
2	Are reliable of information used (i.e. publication cited, speaker is a board certified practitioner)?	45.5
3	Is the information presented balanced and unbiased?	69.1
4	Are additional sources of information listed for patient reference?	1.8
5	Are areas of uncertainty mentioned?	12.7

GQS is a ubiquitous scoring system utilized for analyzing patient education contents. It consists of a five-point scale, grading the quality and content of the evaluated material. In order to evaluate overall video quality, a five-point GQS analysis was performed (Table 3).[17]

Table 3. GQS Criteria[17]

GQS Score	GQS Description
1	Poor quality, poor flow of video, most information missing, not at all useful for patients
2	Generally poor quality and poor flow, some information listed but many important topics missing, of very limited use to patients
3	Moderate quality, suboptimal flow, some important information adequately discussed but others poorly discussed, somewhat useful for patients
4	Good quality and generally good flow, most of the relevant information listed but some topics not covered, useful for patients
5	Excellent quality and flow, very useful for patients

Patient Education Materials Assessment Tool for Audiovisual Materials (PEMAT-A/V), Shoemaker et al.18 developed PEMAT, which evaluates the domains of 'understandability' and 'actionability'.18 The power of the PEMAT is that not only printed materials but also audiovisual materials (PEMAT-A/V) could be evaluated. This scoring system offers mutual and exclusive evaluation criteria for printed and audiovisual materials. PEMAT-A/V system consists of 17 scoring criteria, 13 of them are for evaluating the understandability of the audiovisual material; four of them are for evaluating the actionability of the same. In this study, PEMAT-A/V scoring criteria were applied (Table 4; Part 1, 2).

Table 4 (Part 1). PEMAT- A/V scoring criteria for understandability. Observed rates of each criterion in this study.

	Item #	Item	Response Options	Rate Observed %
	Topic: Content			
	1	The material makes its purpose completely evident.	Disagree=0, Agree=1	90.9
	Topic: Word Choice & Style			
	3	The material uses common, everyday language.	Disagree=0, Agree=1	96.4
	4	Medical terms are used only to familiarize audience with the terms. When used, medical terms are defined.	Disagree=0, Agree=1	96.4
	5	The material uses the active voice.	Disagree=0, Agree=1	50.9
	Topic: Organization			
Understandability	8	The material breaks or "chunks" information into short sections.	Disagree=0, Agree=1, Very short material=N/A	40.0
	9	The material's sections have informative headers.	Disagree=0, Agree=1, Very short material=N/A	41.8
	10	The material presents information in a logical sequence.	Disagree=0, Agree=1	83.6
	11	The material provides a summary.	Disagree=0, Agree=1	9.1
	Topic: Layout & Design			
	12	The material uses visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points.	Disagree=0, Agree=1, Video=N/A	10.9
	13	Text on the screen is easy to read.	Disagree=0, Agree=1, No text or all text is narrated=N/A	63.6
	14	The material allows the user to hear the words clearly (e.g., not too fast, not garbled).	Disagree=0, Agree=1, No narration=N/A	76.4
	Topic: Use of Visual Aids			
	18	The material uses illustrations and photographs that are clear and uncluttered.	Disagree=0, Agree=1, No visual aids=N/A	25.5
	19	The material uses simple tables with short and clear row and column headings.	Disagree=0, Agree=1, No visual aids=N/A	9.1

Table 4 (Part 2). PEMAT- A/V scoring criteria for actionability. Observed rates of each criterion in this study.

	Item #	Item	Response Options	Rate Observed %
Actionability	20	The material clearly identifies at least one action the user can take.	Disagree=0, Agree=1	90.9
	21	The material addresses the user directly when describing actions.	Disagree=0, Agree=1	38.2
	22	The material breaks down any action into manageable, explicit steps.	Disagree=0, Agree=1 Disagree=0, Agree=1	10.9
	25	The material explains how to use the charts, graphs, tables, or diagrams to take actions.	No charts, graphs, tables, diagrams=N/A	0

Data analysis was performed with IBM® SPSS® V23 (IBM®, Armonk, NY, USA). the Kolmogorov-Smirnov and Shapiro-Wilk tests were used for conformity to normal distribution. Normally distributed data according to two dependent groups was compared with a paired two-sample t-test. The Wilcoxon test was used to compare data that were not normally distributed according to two dependent groups. The relationship between non-normally distributed quantitative data was examined with Spearman's rho correlation coefficient. The intra-class correlation coefficient was used to examine the interobserver agreement. Analysis results were presented as mean ± standard deviation and median (minimum–maximum) for quantitative data and as frequency and percentage for categorical data. The significance level was determined as $p<0.05$.

Results

The aim of this study was to evaluate the usefulness, the understandability and the actionability of YouTube™ videos regarding postoperative care after tooth extraction. For both searches ('Postoperative care after tooth extraction' and 'Postoperative instructions after tooth extraction'), 400 videos were analyzed. After analyzing the videos according to exclusion criteria and the existence of duplication, 55 videos were selected for evaluation (Figure 1). Descriptive data, including total views, video length (seconds), the total number of likes, dislikes, and comments, number of days since upload, upload source, and the target group of the videos were collected. The interaction index and viewing rate were calculated. The mean of the total views of the videos was 27,977.35±118,018.21. The mean duration of the videos was 208.35±115.49 seconds. On average, 313.85 likes, no dislikes, and 52.71 comments were recorded in the videos included in this study. On average, 1,490.95 days have passed since the videos were uploaded (Standard Deviation=1,079.95). Healthcare companies uploaded [31] of the 55 videos; 19 were uploaded by individual users who were medical professionals (dentists); and five were uploaded by individual, nonprofessional users. Patients were the target audience of all the videos. The calculated interaction index of the evaluated videos was 0.01±0.03 and viewing rate of the videos was 17.5±58.94.

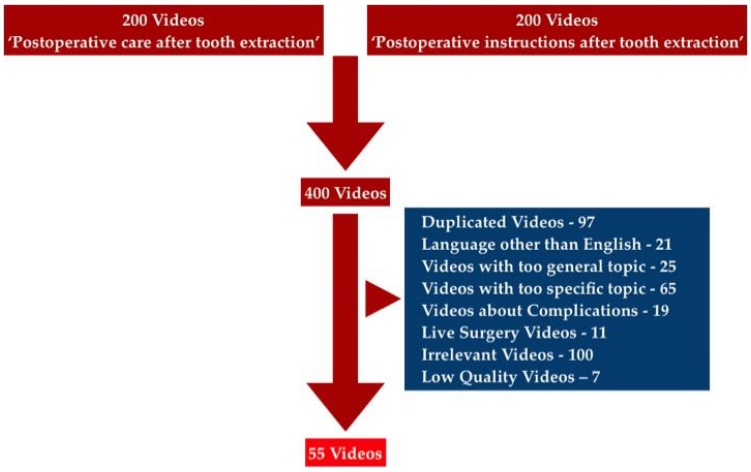

Fig 1. Videos selection process

For interobserver agreement, there was no statistically significant difference between DISCERN scores (p=0.267). There was a statistically significant agreement between the observers in terms of DISCERN scores (ICC=0.934; p<0.001). A statistically significant difference was found between the PEMAT-A/V scores according to the observers (p=0.007). While the mean PEMAT-A/V score of the 1st observer was 8.35, the mean score of the 2nd observer's PEMAT-A/V score was 7.05. There was a statistically significant and very good agreement between the observers in terms of the PEMAT score (ICC=0.964; p<0.001). For interobserver agreement of GQS, there was no statistically significant difference between the two observers (p=0.317). There was near-perfect agreement between the observers in terms of GQS scores (ICC=0.955; p<0.001), (Table 5).

Table 5. Interobserver agreement values for DISCERN, PEMAT and GQS.

	1st Observer		2nd Observer		Test Statistics	p	ICC (%95 CI)	p
	Mean ± SD	Median (min-max)	Mean ± SD	Median (min-max)				
DISCERN	2.15 ± 0.99	2 (0 - 4)	1.85 ± 1.27	2 (0 - 5)	1.143	0.267*	0.934 (0.832 – 0.974)	<0.001
PEMAT	8.35 ± 2.73	8 (3 - 15)	7.05 ± 2.26	7,5 (3 - 11)	3.040	0.007*	0.964 (0.909 – 0.986)	<0.001
GQS	2.85 ± 1.01	3 (1 - 5)	2.85 ± 1.09	3 (1 - 5)	7.500	0.317**	0.955 (0.887 – 0.982)	<0.001

* Paired two sample t test, **Wilcoxon test; Abbreviations: SD: Standart Deviation, min: Minimum, max: Maxiumum, ICC: Interclass Corelation

In order to evaluate the quality, DISCERN and GQS systems were used. In the total scoring obtained from the DISCERN scoring system, three of the 55 videos received 0 points (5.5%), 10 of them one point (18.2%), 22 of them two points (40%), 16 of them three points (29.1%) and four of them four points (7.3%). None of the videos get five points. Observed rates of each met criterion were shown in Table 2. In the GQS scoring system, five of the 55 videos received score 1 (9.1%), 15 of them score 2 (27.3%), 20 of them score 3 (36.4%), 13 of them score 4 (23.6%) and two of them score 5 (3.6%). For evaluating the understandability and actionability of the videos, PEMAT-A/V scoring system was used. Mean values and percentage values of the videos were calculated, cumulating each criterion, together for calculating the total PEMAT-A/V score, and separately for understandability and actionability. Totally, the mean PEMAT-A/V score was 8.35 ± 2.73 (49.1% ± 16.1%). Averagely, selected videos have got 53.4% ± 16.7% for understandability and 35% ± 19.6% for actionability. Observed rates of each met criterion are shown in Table 4.

According to the usefulness scoring criteria, 15 of the 55 videos were very useful (27.3%), 30 of the 55 videos were moderately useful (54.5%), nine of the 55 videos were slightly useful (16.4%) and one of the 55 videos was not useful (1.8%). The rates of each met the criteria have been shown in Table 1. The results showed that the videos had a lack of information about potential postoperative complications, e.g. dry socket, infection, numbness, oedema, and trismus. A comparison of the usefulness classes revealed a statistically significant difference between usefulness classes regarding the duration of the videos (Table 6). It has been found that longer videos were more useful than shorter videos (p=0.013). Other variables including total views, number of likes, number of comments, and views since upload, did not cause any statistically significant difference (p>0.05). Furthermore, there was no statistically significant relationship between the usefulness of the videos and the interaction index and viewing rate (p>0.05).

Table 6. Comparison of usefulness index classes with other parameters.

	MODERATELY USEFUL	SLIGHTLY USEFUL	VERY USEFUL	Test Stat.	p*
Total View	42024.87 ± 157675.03 397.5 (10 - 796857)	13408.33 ± 29938.49 504 (5 - 91885)	10488 ± 27743.96 836 (102 - 107128)	2.075	0.354
Duration	205.9 ± 88.61 176.5 (67 - 452)ab	142.11 ± 93.34 106 (59 - 360)b	261.87 ± 151.77 242 (138 - 743)a	8.681	0.013
Like	407.57 ± 1635.41 1.5 (0 - 8600)	176.89 ± 460.13 4 (0 - 1400)	229.53 ± 794.9 2 (0 - 3100)	0.455	0.796
Number of Comments	70.47 ± 287.04 0 (0 - 1491)	66.33 ± 195.26 0 (0 - 587)	12.53 ± 42.29 0 (0 - 165)	0.596	0.742
Number of Days since Upload	1616.2 ± 1158.06 1415 (9 - 4521)	956.44 ± 590.05 836 (321 - 2228)	1638.27 ± 1088.8 1587 (180 - 3148)	2.398	0.301
Interaction Index	0.01 ± 0.01 0 (0 – 0.06)	0.02 ± 0.06 0.01 (0 – 0.17)	0.01 ± 0.01 0 (0 – 0.05)	0.001	1.0
Viewing Rate	20.91 ± 74.88 0.42 (0.03 – 392.15)	16.23 ± 33.89 0.33 (0.02 – 104.06)	12.61 ± 32.47 0.57 (0.06 – 122.57)	1.627	0.443
DISCERN	2.33 ± 0.92 2 (1 - 4)a	1 ± 0.87 1 (0 - 2)b	2.53 ± 0.64 2 (2 - 4)a	13.432	0.001
PEMAT (Total)	8.97 ± 2.83 9 (4 - 15)	7 ± 2.92 7 (3 - 12)	8.13 ± 2.1 7 (5 - 13)	3.375	0.185
PEMAT - Understandability	7.03 ± 1.88 7 (3 - 11)	5.67 ± 2.4 6 (2 - 9)	6.47 ± 1.6 6 (3 - 10)	2.715	0.257
PEMAT - Actionability	2.05 ± 1.23 2 (1 - 5)	1.8 ± 1.1 1 (1 - 3)	1.27 ± 0.65 1 (1 - 3)	3.846	0.146
GQS	3.03 ± 0.85 3 (2 - 5)a	1.56 ± 0.53 2 (1 - 2)b	3.4 ± 0.74 3 (2 - 5)a	20.16	<0.001

Kruskall Wallis H test, a-b: There is no difference between classes with the same letter. mean ± s. deviation, median (min.–max)

A statistically significant difference was found between the total DISCERN scores (median values) according to the usefulness index classes (p=0.001). This difference was due to the difference in the median values between the moderately useful and very useful classes and the slightly useful class. Slightly useful videos were scored with lower DISCERN scores than other groups; this difference was statistically significant. Additionally, a statistically significant difference was found between the GQS scores (median values) according to the usefulness index classes (p<0.001). This difference was due to the difference in the median values between the moderately useful and very useful classes, and the slightly useful class. Slightly useful videos were scored with lower GQS scores than other groups and this difference was statistically significant. Finally, there was no statistically significant difference between the median values of other variables according to the usefulness index classes (p>0.05).

A statistically significant positive and moderate correlation was found between the usefulness index and the duration of the videos (r=0.496; p<0.001). A statistically significant positive and weak correlation was found between total DISCERN scores and the duration of the videos (r=0.277; p=0.041). A statistically significant positive and weak correlation was found between GQS scores and the duration of the videos (r=0.324; p=0.016). Other variables were not statistically significant (p>0.05). There was a statistically significant positive and weak correlation between the Total PEMAT score and interaction index (r=0.283; p=0.036). There was no statistically significant relationship between PEMAT scores and other quantitative variables (p>0.05), (Table 7).

Table 7. Evaluation of the relationship between quantitative demographic information and scoring systems.

	Usefulness Index		DISCERN		GQS		Total PEMAT		Understandability		Actionability	
	r	p	r	p	r	p	r	p	r	p	r	p
Total View	0.07	0.611	-0.253	0.062	-0.114	0.406	-0.012	0.928	0.002	0.99	-0.076	0.654
Duration	0.496	<0.001	0.277	0.041	0.324	0.016	0.213	0.119	0.181	0.186	0.083	0.624
Like	-0.017	0.9	-0.007	0.961	0.019	0.893	0.185	0.176	0.119	0.386	-0.03	0.859
Dislike	---	---	---	---	---	---	---	---	---	---	---	---
Number of Comments	-0.071	0.607	-0.128	0.353	-0.08	0.562	0.029	0.834	0.029	0.833	0.03	0.861
Number of Days since Upload	0.173	0.206	-0.124	0.368	0.11	0.424	-0.233	0.087	-0.215	0.115	-0.062	0.717
Interactıon Index	-0.021	0.878	0.179	0.19	0.087	0.525	0.283	0.036	0.189	0.166	-0.026	0.88
Viewıng Rate	0.076	0.581	-0.118	0.392	-0.034	0.806	0.128	0.351	0.105	0.447	-0.082	0.628

r: Spearman's rho correlation coefficient

A statistically significant positive and moderate correlation was found between the usefulness index and DISCERN scores (r=0.546; p<0.001). A statistically significant positive and high correlation was found between the usefulness index and GQS scores (r=0.679; p<0.001). A statistically significant positive and moderate correlation was found between total PEMAT and total DISCERN scores (r=0.448; p=0.001). A statistically significant positive and moderate correlation was found between total PEMAT score and GQS scores (r=0.556; p<0.001). A statistically significant positive weak correlation was found between understandability (PEMAT) and total DISCERN scores (r=0.359; p=0.007). A statistically significant positive and moderate correlation was found between understandability and GQS scores (r=0.497; p<0.001). There was no statistically significant relationship between PEMAT scores and other quantitative variables (p>0.05), (Table 8).

Table 8. Evaluation of the relationship between different scoring systems.

	Usefulness Index		DISCERN		GQS		PEMAT	
	r	p	r	p	r	p	r	p
DISCERN	0.546	<0.001						
GQS	0.679	<0.001	0.693	<0.001			0.556	<0.001
PEMAT	0.252	0.064	0.448	0.001				
Understandability	0.23	0.092	0.359	0.007	0.497	<0.001		
Actionability	-0.283	0.089	-0.199	0.238	-0.265	0.114		

r: Spearman rho correlation coefficient.

Discussion

Throughout history, many inventions have been made and these inventions have changed the way human needs are met. These innovations, which are created based on historical conditions and human expectation, in turn, shape the world and the human experience of it. With the introduction of the Internet, human needs and their manner of fulfillment changed, and have evolved over the years in parallel with this innovation. The Internet has provided a wide range of services, from ordering food or basic needs to performing academic research, and with these services, personal habits have also changed. In particular, people meet their need for information by consulting professionals with whom they have a working relationship. Due to its speed and convenience, however, this practice has largely shifted to the Internet. It does not only work for information needs alone; it also works as a

multidisciplinary tool, which enables every human being to create and share content. Some web pages provide especially simple content release for their users, e.g., YouTube™.

One of the most used sites on the internet today is YouTube™. In 2022, it was one of the top two most-visited web pages in the world and the United States.[19,20] YouTube™ is a free platform where information cannot be controlled, so users can upload the content they want. Given the free and uncontrolled sharing of health-related information, it has been seen that many researchers have conducted studies examining the quality of videos with specific health content presented on YouTube™ regarding dental and oral surgical procedures.[10-14,21-29]

Most of the studies created a usefulness index regarding the topic in a scientific-based manner.[10,14,23-26] This study applied a 16-question usefulness index scoring system in order to evaluate the content of the videos specifically about postoperative care after tooth extraction (Table 1). While dos and don'ts were included in most of the videos, it has been observed that complications or conditions such as oedema, trismus, infection, dry socket or numbness, which could be experienced by the patient during postoperative period, were mostly unaddressed. In this study, the videos were also classified according to the number of met criteria. In this study, 81.8% of the videos were very useful or moderately useful regarding their content about postoperative instructions after tooth extraction. Comparing other dentistry-related videos on YouTube™, this result was notably positive.

Among variables, duration was the sole variable that affected the level of usefulness and quality of the videos. As previously mentioned, many studies have been conducted about the qualifications of videos regarding health-related issues about oral and maxillofacial surgery. A study conducted by Gaş et al. evaluated the qualifications of YouTube™ videos targeting patients about botulinum toxin injection for bruxism.[10] In this study, the only significant variable affecting the usefulness of the videos was the duration. Similarly, longer videos were more useful than shorter videos. In another study evaluating the content of dental implant education for patients, Menziletoglu et al. observed that very useful videos were longer than less useful videos, in a statistically significant manner.[21] Based on the data in the literature and this current study, it could be interpreted that more content has been included in the videos with longer duration.

In a literature review of the studies evaluating the quality of the information for patients, specifically regarding oral and maxillofacial surgery, it has been observed that the Global Quality Scale (GQS), the modified DISCERN scoring system, The Health on the Net Foundation Code of Conduct (HONCODE) and Ensuring Quality Information for Patients (EQIP) tool were used for evaluation.[15-17,30-32] Modified DISCERN and GQS tools were commonly used in many of the studies. In order to obtain comparable data, this study primarily used these assessment tools.

Likewise, there was a significant relationship between the duration of the videos and quality assessment tools' results, according to the usefulness index. Longer videos were more qualified than shorter videos. These findings are consistent with the related literature. For other variables, there was no relationship with the videos' quality. Evaluating the scoring systems in terms of quality level, none of the videos have been scored with 5 points in DISCERN and only two videos earned a score of 5 in GQS. According to the findings of DISCERN, more than half of the videos' lacked certified practitioners or evidence-based data. Evidence-based data is crucial, because it provides the most current care, which enables better-quality patient outcomes. Patients should ideally receive the most efficient care based on the best available data. A meta-narrative systematic review by Daraz et al. evaluated the quality of health information on the Internet in general via quality assessment tools like DISCERN.[33] According to the Daraz's study, there were no excellent videos in the included 153 studies. The current study's findings were consistent with the related literature.

This study argues that in order to understand the quality level of videos about specific health conditions or recommendations like postoperative care after tooth extraction, evaluating topic-related criteria is very important. Because of that, a usefulness index was created based on the scientific data. However, assessing only the content of the audiovisual materials would be insufficient. Because of that, using internationally recognized, evidence-based scoring systems like DISCERN and/or GQS for quality control is a useful analytical approach. Furthermore, by using universally known tests, the resulting data could be understood in a wider context. Because quality assessment tools like DISCERN give a general idea of the quality, according to this study, it is also important to share

each met criterion as observed rates. In this way, factors affecting quality could be understood and discussed, and quality could therefore be improved. Therefore, in the related literature and current study, these quantitative scoring systems were used in combination with a usefulness index.

Another issue for educational materials in general and also specific for patients, whether printed or audiovisual, is understandability and actionability. Determining the general quality of content is especially important for content containing information for patients. However, no matter how accurate, thorough and high-quality the content is, its value will decrease to the extent it cannot be understood and used by the target audience. For this reason, it is important to evaluate the understandability and actionability of the examined samples, as well as the quality and content, especially in such studies. In this study, the PEMAT-A/V tool scoring developed by Shoemaker et al.[18], which was used to evaluate the understandability and actionability of audiovisual materials, was used to evaluate these two parameters[18]. The advantage of this evaluation method is that it gives a general quality level result and gives an idea to the researcher in separate criteria such as understandability and actionability. In evaluating the videos, this study found an insufficiency of visual aids. Though the steps to be taken in the postoperative period were listed, the videos lacked visual demonstrations, thereby hindering understandability (Table 4).

This study also evaluated the correlation between scoring systems. Notably, while usefulness and quality scores correlated with each other, the videos that included high usefulness and quality levels did not correlate with understandability and actionability according to the PEMAT-A/V evaluation. These findings raise the question of whether videos with high scores in terms of content and quality are understandable and motivating for action.

Last but not the least, another crucial issue is that today, sharing content such as patient education continues to be released without regulation or oversight. Because of this, patients and/or users should be educated about choosing the right information, and they should be guided as to which criteria they should look for. As a result, these scoring systems have taken their place in the scientific literature for professionals. Understandable and easy criteria for users should be determined and disseminated. Providing and controlling knowledge---especially for health-related content should be the duty of governments or educational institutions. Even if these organizations cannot control data, they should educate and inform the public on how to choose reliable information sources.

There were some limitations in this study. Firstly, this study evaluated videos only in the English language. Further studies should be conducted in order to evaluate videos in other languages so that these phenomena might be understood on a country-by-country basis. Furthermore, this study investigated a limited timeline on the Internet. Because the Internet is a dynamic source, constantly evolving, such studies regarding the same topics should be conducted in the future. Finally, via this study, it could not be evaluated the watch durations of the videos on YouTube™ by the users. In order to investigate this point, a questionnaire study should be conducted on the users which are using the Internet as a source of healthcare information.

One strength of this study is that multiple different scoring systems have been used in order to evaluate different aspects of the videos' content regarding postoperative care after tooth extraction. In this way, videos about the topic could be evaluated in terms of usefulness, quality, understandability and actionability. Furthermore, the correlation between these different evaluation methods has been investigated. This will motivate future studies in which different scoring systems will be used in order to obtain data from different aspects of Internet materials targeting patients.

Conclusion

This study has found duration was the only variable affecting the usefulness and quality of the videos regarding postoperative care after tooth extraction. Among the evaluated videos, 27.3% were very useful and 54.5% were moderately useful. There was a correlation between the usefulness of the videos and GQS and DISCERN scores, but there was no correlation between the usefulness of the videos and PEMAT-A/V scores which provides insight regarding the understandability and actionability of the videos. It could be concluded that videos on YouTube™ about the topic 'postoperative care after tooth extraction' might be useful at an acceptable level, but these videos might not be satisfyingly understandable and action-motivating.

Conflict of interest

None of the authors of this article has any relationship, connection or financial interest in the subject matter or

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Temporomandibular Eklem Bozukluklarında Alternatif Bir Tedavi Yöntemi: Akupunktur

An Alternative Treatment Method for Temporomandibular Joint Disorders: Acupuncture

Ersin Arıcan*[1], Ali Balık[1], Meltem Özdemir Karataş[1]

ABSTRACT

Although there is no standard method in the treatment of temporomandibular joint disorders which has multifactorial etiology, various alternatives can be used together depending on the patient's symptoms and etiology. The main objective of treatment is to relieve the patient's pain. Today, in addition to traditional treatment methods, alternatives such as acupuncture are gaining an increasing area of use, especially in the treatment of muscle and neurological origin pain.

In studies examining the effect of acupuncture on pain, it has been found to have a short-term analgesic effect. In recent years, it has become widespread in the treatment of temporomandibular disorders as an alternative or as an additional method to other treatments. When various studies evaluating the effectiveness of acupuncture in the temporomandibular region are examined, a wide variety of results are encountered. Along with the studies that have been observed to relieve pain in the temporomandibular region, there are also studies that have been reported to have no effect. It has been determined that this difference in results is due to the lack of a standard examination method in the studies and to a wide variety of differences in material and method.

In our study, effect of acupuncture in temporomandibular joint disorders was mentioned; It is aimed to examine different views in the literature on the subject by mentioning various studies in this field.

Keywords: *Acupuncture, Temporomandibular Joint Diseases, Therapy*

ÖZET

Multifaktöriyel etiyolojiye sahip temporomandibular eklem bozukluklarının tedavisinde standart bir yöntem bulunmamakla birlikte, hastanın semptomları ve etiyolojisine bağlı olarak çeşitli alternatifler bir arada kullanılabilir. Tedavinin temel amacı hastanın ağrısının giderilmesidir. Günümüzde geleneksel tedavi yöntemlerine ek olarak akupunktur gibi alternatifler de özellikle kas ve nörolojik kaynaklı ağrı tedavilerinde giderek artan bir kullanım alanı kazanmaktadır.

Akupunkturun ağrı üzerindeki etkisini inceleyen çalışmalarda, kısa vadeli analjezik etkisi olduğu tespit edilmiştir. Son yıllarda temporomandibular bozuklukların tedavisinde de alternatif olarak veya diğer tedavilere ek bir yöntem olarak kullanımı yaygınlaşmıştır. Akupunkturun temporomandibular bölgedeki etkinliğinin değerlendirildiği çeşitli çalışmalar incelendiğinde çok çeşitli sonuçlarla karşılaşılmaktadır. Temporomandibular bölgedeki ağrıyı giderdiği gözlenen çalışmalarla birlikte, etkisi olmadığının bildirildiği araştırmalara da rastlanmaktadır. Sonuçlardaki bu farklılığın çalışmalarda standart bir inceleme yöntemi olmaması ve gereç ve yöntemlerin çok çeşitli farklılıklara bağlı olduğu tespit edilmiştir.

Çalışmamızda, temporomandibular eklem bozukluklarında akupunkturun etki mekanizmasına değinilmiş; bu alandaki çeşitli çalışmalardan bahsedilerek konuyla ilgili literatürdeki farklı görüşlerin incelenmesi amaçlanmıştır.

Anahtar Kelimeler: *Akupunktur, Temporomandibular Eklem Hastalıkları, Terapi*

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Temporomandibular Eklem Bozuklukları

Temporomandibular eklem bozuklukları (TMB); temporomandibular eklemin (TME), çiğneme kaslarının ve bölgedeki doku bileşenlerinin ağrı ve/veya disfonksiyonu gibi çeşitli, homojen olmayan bir grup durumu kapsayan genel bir terimdir. Eklemin sert doku, yumuşak doku ve çiğneme kaslarındaki bozukluklarla ilişkili olup, klinikte en çok kas kaynaklı ağrılar şeklinde karşımıza çıkar.[1] Fiziksel, fonksiyonel ve psikososyal faktörler arasındaki etkileşimle açıklanan multifaktöriyel bir etiyolojisi olan bu bozukluklar; kronik orofasiyal ağrının en yaygın olarak görüldüğü kas-iskelet sistemi rahatsızlıklarındandır.[2]

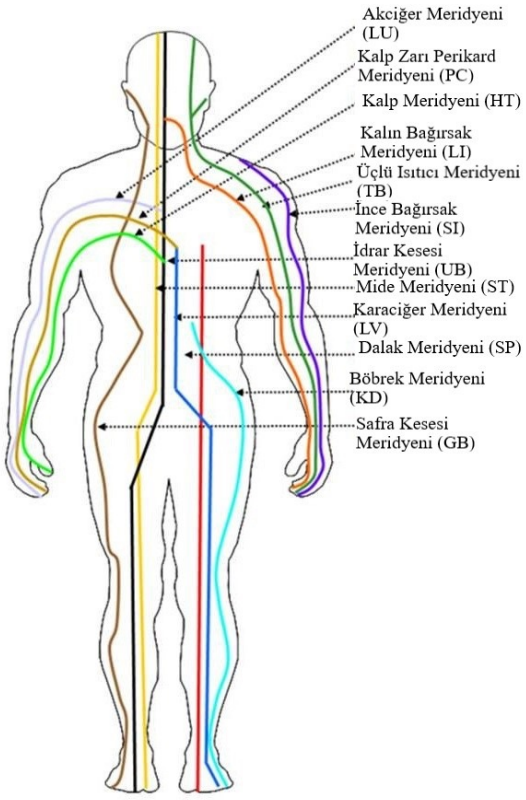
TMB'nin etiyolojisi tam olarak belirlenememiştir.[3] Yüz veya boyun travması, oklüzal travma, uzun süreli ağız açma, "entübasyonlar", çiğneme mekanizmasına yüksek ve sürekli baskı yaratan alışkanlıklar, bruksizm gibi yerel faktörler etiyolojik faktörler arasında sayılabilir.[4] Sistemik faktörler ise öncelikle zihinsel stres, anksiyete, depresyon, yorgunluk veya uyku bozukluğu[5] ve romatoid artrit veya fibromiyalji gibi sistemik hastalıklardır.[6] Her hastanın etiyolojisinin kendine özgü olduğu düşünülmektedir.

TMB'nin belirti ve semptomları; yüz ağrısı veya hareket veya istirahat sırasında temporomandibular eklemde ağrı, çiğneme kaslarının palpasyonunda ağrı, çene hareketinde kısıtlılık veya sapma, eklem sesleri, kulak ağrısı ve baş ağrısıdır. Tedavi arayan hastaların birincil şikayeti ağrıdır ve etkilenen popülasyonunun yaklaşık %75'inin en az bir semptom göstermesine rağmen, sadece %5'i tedavi arayışıyla kliniklere başvurur.[7]

TMB'nin tedavisinde standart bir yöntem yoktur ve genellikle oklüzal splint, ilaçlar, fizik tedavi ve çiğneme mekanizmasını aşırı yükleyen alışkanlıkları değiştirmek gibi davranışsal tedavinin bir kombinasyonunu içeren çeşitli yaklaşımlar vardır.[8] Geri dönüşümlü ve noninvaziv tedaviler yüksek başarı oranı ile TMB tedavisinde genellikle ilk tercihtir.[2] Bu tür tedavilerin temel amacı ağrının giderilmesidir.[9] TMB'lere bağlı ağrının klinik belirtilerinin çok çeşitli olması nedeniyle tedavi; oklüzal splint tedavisi, ilaç tedavisi, cerrahi tedavi, fizik tedavi, düşük seviyeli lazer terapisi, transkütanöz elektriksel sinir stimülasyonları (TENS), ultrason, titreşimli terapi, psikolojik tedavi ve günümüzde giderek artan bir şekilde akupunktur uygulaması gibi farklı yöntemleri içerir.[10,11]

Akupunktur

Akupunktur, "hastalıkların önlenmesi, tedavisi veya sağlığın sürdürülmesi için insan vücudunun herhangi bir yerine katı bir iğnenin sokulması" olarak tanımlanmaktadır.[12] Geleneksel Çin tıbbi teorisine göre, tüm fiziksel işlevlerimiz *"qi(chi)"* adı verilen ve hayati önem taşıyan bir enerji ile kontrol edilip devam ettirilmektedir. Bu *"qi(chi)"* enerjisi, bedenlerimizde amaçsızca dolaşmamaktadır, belli bir rotada, vücudumuzda bulunan 'meridyen' adı verilen kanallardan geçmektedir. Akupunktur enerji akışını düzenlemek ve vücudun doğal iyileşme mekanizmalarını uyarmak için "meridyenler" adı verilen enerji hatları boyunca bulunan, cilt yüzeyinde kesin bir anatomik konuma sahip belli noktalara çok ince iğnelerin sokulmasıyla gerçekleştirilir.[7] Qi'nin akışındaki bozuklukların enerji akışındaki dengesizliğe ve dolayısıyla sağlığın bozulmasına yol açtığına inanılmaktadır. Qi'nin kavramsal olarak tüm vücuttan geçen, anatomik yapılar olmayan ancak tutarlı bir anatomik rotaya sahip meridyenlerden aktığı düşünülmektedir. Tanımlanmış 12 meridyen vardır (Şekil 1).[13]



Şekil 1. Meridyenlerin vücut üzerindeki seyri

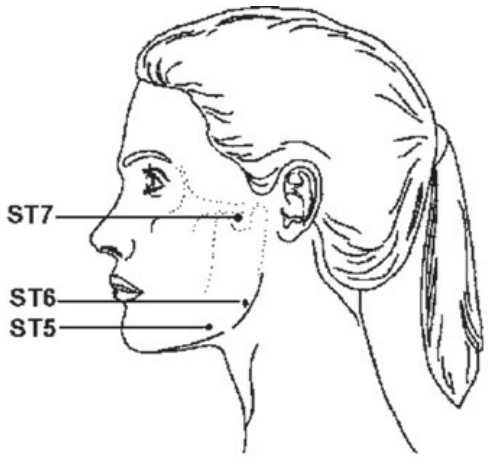
Akupunktur noktalarının çoğu, ilgili tüm noktalarını birbirine bağlayan meridyenler üzerinde bulunmaktadır. Tüm akupunktur noktalarının belirli bir ismi ve numarası vardır. Örneğin Mide

(Stomach)[5], mide meridyeni boyunca başlangıçtan itibaren beşinci noktadır ve masseter kasının insersiyonunun ön kısmında bulunmaktadır (Şekil 2 ve 3).[14]

Birkaç farklı akupunktur yöntemi vardır, ancak bunların hepsi bu temel prensibe dayanmaktadır. Çoğumuzun aşina olduğu teknik, iğnelerin bazen problemden uzak olan birkaç bölgeye deriden sokulduğu geleneksel vücut akupunkturudur.[14] Geleneksel akupunkturun yanı sıra, akupunktur noktalarını tedavi amacıyla uyarmak için elektroakupunktur, akupresür, lazer akupunktur gibi başka yöntemler de kullanılabilmektedir.[15]

Akupunktur noktasının iğne ile uyarılması, merkezi sinir sisteminden (MSS) endojen opioidlerin salınmasını sağlar.[16] Endojen opioidlerin ağrı kesici etkisinin haricinde akupunktur uygulamasının opioidlerden bağımsız antienflamatuar ve analjezik etkilere de neden olduğu düşünülmektedir.[17]

Şekil 2. Mide meridyeninin vücut üzerindeki seyri



Şekil 3. Mide meridyeninde bulunan, masseter kası üzerinde sıralanmış ST5, ST6, ST7 noktaları

İğne batırıldığı anda kanda ve beyinde B-endorfin, endomorfin, enkefalin, serotonin ve dopamin düzeyleri yükselir.[18] Ek olarak, iğnenin yerleştirilmesiyle, lipoliz sürecini artıran ve adrenalin noradrenalin salınımını etkileyen immün modülatörlerin salınımı gerçekleşir.[19]

Vücuttaki herhangi bir noktadan kaynaklı ağrılı uyaranın, omurilikteki ağrı iletiminden sorumlu bazı nöronları inhibe ettiği tespit edilmiştir. Bu olguya DNIC fenomeni (diffuz noxious inhibitör kontrol fenomeni) adı verilmektedir.[20] Bu fenomenin gerçekleşebilmesi için, A-delta ve C tipi liflerin uyarılması gereklidir. İğnenin batırılmasıyla birlikte ince sinir lifleri (A-delta ve C-lifleri) hem mekanik olarak hem de iğne ve cilt arasında oluşan elektriksel potansiyel fark ile ortaya çıkan akımla uyarılır. Bu uyarılma lokal vazodilatasyona neden olur.[21] Uyarılan A-delta lifleri sayesinde arka boynuzdaki enkefalinerjik inhibitör nöronlardan opioid peptidlerin salınmaktadır. Bununla birlikte grup IV duyusal nöronlar tarafından taşınan ağrılı uyaranın iletimi durdurulmaktadır. Bu durum akupunkturun analjezik etkisini açıklamaktadır.[16,19] Akupunktur uygulamasında iğnelenmiş akupunktur noktalarına özgü, miyelinli sinir liflerinin uyarılması ile gelişen *"de-qi"* hissi; ağırlık, uyuşukluk ve gerginlik benzeri bir durum olarak tanımlanmaktadır. Bu hissin varlığının tedavi sonucunu etkilediği, bölgedeki lokal kanlanmayı artırdığı düşünülmektedir.[21]

TMB Tedavisinde Akupunktur Uygulamaları

Dünya Sağlık Örgütü (DSÖ) 2002 yılındaki raporunda, kronik miyofasiyal ağrının akupunktur tedavisine iyi yanıt verdiğini bildirmiştir.[22]

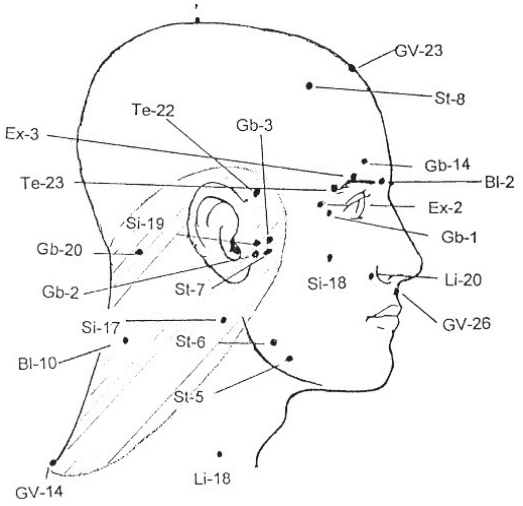
Akupunktur, dejeneratif değişiklikler ve disk

deplasmanı gibi yapısal anormalliklerden kaynaklanan TMB'nin nedenini ortadan kaldırmada yardımcı olmasa da, bu durumlarla ilişkili rahatsızlık ve ağrıyı gidermede yardımcı olabilir.[23] Çalışmalar, akupunkturun kısa vadede analjezik etkisi olduğunu ve bu nedenle kas kökenli TMB'lerin tedavisi için oklüzal splintler ile karşılaştırılabilir bir etkiye sahip olduğunu göstermiştir.[24]

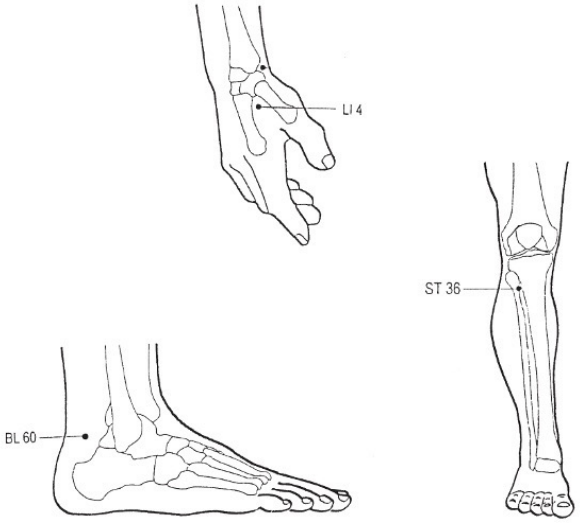
Akupunktur uygulama kararı klinik bulgular, hastanın rahatsızlığının etiyolojisi ve tanısı, olası etkinlik gibi bir dizi faktöre bağlıdır. Akupunktur tekniği oklüzal splintlere toleransı düşük olan hastalar için alternatif olarak düşünülebilir. Splint tedavisine sınırlı yanıt veren vakalarda, akupunktur tedaviyi geliştirmek için ek bir tedavi yöntemi sunar. Alternatif olarak semptomların akut dönemdeki kontrolünü sağlamak amacıyla akupunkturun kullanılması ve nokturnal bruksizm semptomlarını uzun vadede kontrol etmek için bir oklüzal splint ile devam edilmesi planlanabilir.[14]

Akupunktur tedavisinin hem akut hem kronik vakalarda etkin olduğu ve tedaviye yanıt sürelerinin geçmiş süreçle ilgili olduğu düşünülmektedir. Bu durum akut vakaların akupunktura daha hızlı yanıt verdiği ve kronik vakalarda etkin tedavi başarısının daha uzun sürede gerçekleştiği şeklinde açıklanabilir. Tipik olarak sorunun olduğu bölgedeki, yani baş ve boyun bölgesinde akupunktur noktaları kullanılmakla birlikte bazı durumlarda el ve ayaklardaki uzak noktalar da kullanılabilir.[25] Bu iğnelemeler analjezik etkiye ve kas spazmlarında azalmaya yol açarlar. Ek olarak lateral pterygoid kaslara yapılan iğnelemenin, bu kasların spazmını ortadan kaldırarak eklemin menisküsünde anterior yer değiştirme kuvvetlerini azaltabileceği ve bunun sonucunda da TME'de klik seslerinin ortadan kaldırılabileceği bildirilmiştir. Ayrıca genellikle TMB'nin etiyolojisi içinde yer alan stres ve kaygının azaltılması amacıyla GV20 noktasının kullanılabileceği ve böylelikle TMB semptomlarında iyileşmeye yardımcı olabileceği düşünülmektedir.[25]

Mevcut literatür gözden geçirildiğinde, önerilen yüz ve boyundaki yerel noktalar şunlardır: ST-6, ST-7, SI-18, GV-20, GB-20, BL-10 (Şekil 4). Uzak bir nokta olarak LI-4 önerilir (Şekil 5). Tedavi, toplam altı seans olmak üzere haftalık olarak uygulanmalı ve semptomlar düzelene kadar üç ayda bir devam etmelidir. İğneleri yerleştirdikten sonra ve de-qui hissini elde etmek için yapılan ilk stimülasyondan sonra, iğneler akupunktur bölgesinde 30 dk yerinde bırakılmalıdır.[25]



Şekil 4. Baş ve boyun bölgesindeki akupunktur noktaları



Şekil 5. Uzak akupunktur noktaları

Akupunktur tedavisinin toplam süresi için hastalığın her yılı için bir aylık tedavinin önerildiği temel bir yaklaşım bulunmaktadır. Bununla birlikte tedavisi tamamlanmış hastalarda da her üç ayda bir seans olmak üzere idame tedavisi farklı kaynaklarda önerilmektedir.[7,25]

Farklı rahatsızlıkların tedavileri sırasında uzak bir nokta olan LI4, sistemik etkileri nedeniyle çoğu araştırıcı tarafından tercih edilmektedir. Bu noktanın sempatik sinir sistemini uyardığı, ağrı kontrolünde etkili olduğu ve stres ve kaygı durumunu azalttığı düşünülmektedir.[26]

Akupunktur, ağrı tedavisi için alternatif veya tamamlayıcı bir tedavi olarak giderek daha fazla kullanım alanı bulmaktadır. Modern Batı tedavilerinde akupunktur ile ilgili ilk raporlardan biri 1950'de Rott tarafından yayınlanmıştır.[27] Dünya Sağlık Örgütü (WHO, DSÖ) raporu, TMR'leri akupunktur kullanımıyla etkili bir şekilde tedavi

edilen 28 hastalık, semptom ve durum arasında listelemiştir.[22] Bu rapor temel olarak öncü bir sistematik incelemeye[28] ve erken dönem klinik çalışmalara dayanmaktadır.[29]

Etkinliğine dair bilimsel kanıtlar zayıf olsa da, akupunktur tedavisi, splintler/tedavi uygulanmayan gruplar, sahte akupunktur ve kontrol olarak plasebo lazer akupunktur ile karşılaştırıldığında, miyofasiyal TMB hastalarında ağrının belirti ve semptomlarını hafifletiyor gibi görünmektedir.[30] Ek olarak, spesifik akupunktur tedavisi hastalar arasında ağrı derecesini azaltmada etkilidir. Tedavi hem penetran olmayan akupunktur (plasebo teleskopik künt iğnelerin cilde zar zor değdiği sham akupunktur) hem de lazer akupunktur (iğne yerine lazer kullanılan akupunktur) tedavisi ile karşılaştırıldığında, özellikle miyofasiyal ağrı semptomları olan TMB'li hastalarda ağrı derecesini azaltmada etkilidir.[31]

Akupunkturun TMB'yi yönetmedeki etkinliğini inceleyen bir dizi çalışma vardır. Akupunkturun miyofasiyal kaynaklı TMB üzerindeki etkisinin incelendiği çalışmalardan bazılarında akupunktur etkisinin oklüzal düzenlemeler, fizik tedavi ve ilaç tedavileriyle karşılaştırılabilecek etkinlikte olduğu gösterilmiştir.[29] Çifter ve ark.nın çalışmasında ise akupunktur ve oklüzal splint tedavilerinin etkinlikleri arasında fark bulunmazken, her iki tedavi yönteminin de parasetamol uygulanmasına göre üstünlüğü belirtilmiştir.[17]

Akupunktur, TMB'de ağrı tedavisinde tamamlayıcı tedavi olarak sıklıkla kullanılmaktadır.[30] Lateral pterygoid kas ağrısı olan TMB hastalarında kuru iğneleme ile metokarbamol (380 mg) ve parasetamol (300 mg) kombinasyon ilaç tedavisini karşılaştıran bir çalışmada kuru iğneleme grubunda daha iyi sonuçlar gösterilmiştir.[32] Oklüzal splintlerin kullanıldığı bir klinik çalışmada, sadece splint ile tedavi edilen bir grup ile sadece akupunktur uygulanan bir grupta ağrı azalmasında anlamlı ve benzer sonuçlar elde edilmiştir.[33] Başka bir çalışmada, oklüzal splint ve lazer akupunktur kombinasyonu ile tedavi edilen grup, oklüzal splint ve lazer plasebo ile tedavi edilen gruba göre daha hızlı ve daha fazla ağrı azalması göstermiştir.[34] Ancak akupunktur, multifaktöriyel etiyolojisi nedeniyle tek başına TMB'yi tedavi etmez; bu genellikle yalnızca ağrılı semptomatolojiyi tedavi etmekle kalmayıp aynı zamanda nedenleri ortadan kaldırmaya çalışan multidispliner yaklaşımları gerektirir.[35]

Çalışmaların çoğunda kranio-servikal-mandibular bölgenin anatomik bölgelerinde bulunan spesifik akupunktur noktaları kullanılır, ancak aynı zamanda LI4 noktası gibi distalde bulunan noktalar da kullanılmaktadır. İlginç olarak literatürde en sık kullanılan akupunktur noktasının LI4 olduğu belirtilmiştir. Yapılan bir çalışmada araştırmacılar LI4'ün uyarılmasından sonra elde edilen bir nöro-görüntü üzerinde çalışmış ve belirli anatomik bölgelerle ilgili somatosensorial serebral korteksin belirli alanlarının aktivasyonunu gözlemlemişlerdir.[26]

TMB tedavisi için kullanılan spesifik noktalar hakkında, masseter kasının miyofasiyal tetik noktalarını belirten bazı araştırmacılar vardır. Yakın zamanda yapılan bir meta-analiz, masseter kasının miyofasiyal tetik noktalarında iğneleme ile tedavinin, hiç müdahele yapılmamasından daha etkili olduğunu ve bu bölgeyi iğneleme ile kasın herhangi bir yerindeki iğnelemenin karşılaştırılmasında çelişkili sonuçlar elde edildiğini öne sürmüştür.[36]

Bir elektromiyografik (EMG) çalışmanın sonuçlarda, akupunktur kaynaklı etkilerin TMB üzerindeki olası mekanizması, akupunkturun omurilik ve beyinden serotonin, endorfinler ve anti-enflamatuar etkiye sahip nörotransmitterler gibi sakinleştirici ajanlar salınması olarak gösterilmiştir. Ek olarak, akupunktur tedavisinden sonra, EMG aktivitesinde daha iyi bir dağılım gözlenmiştir.[37] Bununla birlikte bu etkilerin hiçbiri bağımsız olarak doğrulanmamıştır.[38]

Sonuç

Akupunkturun yan etkisinin olmaması ve ağrılı TMB'de oklüzal splintler ve fizik tedavi egzersizleri gibi diğer standart tedavi prosedürleriyle kombine edilip daha iyi sonuçlar verebilmesi bu yöntemin avantajlarıdır. Ancak akupunktur, TMB'de ağrı semptomlarını önemli ölçüde azaltmasına rağmen tek başına birinci basamak tedavi olarak kullanıldığında yeterli değildir.

Akupunktur üzerine yapılan araştırmalar; akupunkturun fizyolojik etkilerinin tam olarak anlaşılmaması, grupların etkisiz körleştirildiği çalışmalar, yeterli akupunktur "dozunun" belirsizliği; uygun plasebo tedavilerin belirlenmesindeki zorluklar ve standart bir tedavi protokolü yerine yerine kişiselleştirilmiş bir tedavi protokolü uygulanması gibi metodolojik eksiklikler göstermektedir. Bu metodolojik eksiklikler nedeniyle kanıta dayalı, modern tıp standartlarına uygun gelecek çalışmalara ihtiyaç duyulmaktadır.

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CASE REPORT

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Periodontal Dokulara Taşmış Guta Perkanın Cerrahi Olmayan Yöntemle Çıkarılması: İki Olgu Sunumu

Non-surgical Removal of Gutta-Percha Extended to Periodontal Tissues: A Report of Two Cases

Gözde Özcanlı*

ÖZET

Amaç: Kök kanal tedavisi sırasında dolum materyallerinin kök kanalları ile sınırlandırılması gerektiği bilinmektedir. Taşan dolgu materyali inflamatuar yanıta sebep olabilir, böyle bir klinik tablo görüldüğünde dolgu materyali kök kanallarından ve komşu dokulardan temizlenmelidir. Bu olgu sunumunun amacı, önceden tedavi edilmiş semptomatik dişlerden periodontal dokulara taşmış guta perkanın cerrahi olmayan Resimde çıkarılmasına ilişkin iki vakayı değerlendirmektir. Bu vakalar için kullanılan yöntem, periapikal dokulardan guta perka çıkarmak için güvenli ve konservatiftir.

Olgu Sunumu: 17 yaşında erkek hasta, sol alt azı bölgesinde çiğneme sırasında olan ağrı şikayeti ile yönlendirildi. Hasta, sol mandibular birinci molar dişinin dört ay önce kanal tedavisi gördüğünü bildirdi. Klinik olarak diş perküsyona duyarlıydı. Periapikal radyografi alındı ve mesial kökün ötesine taşan guta perka gözlendi. Klinik ve radyografik değerlendirmeye göre semptomatik apikal periodontitis tanısı konuldu. Tedaviye cerrahi olmayan kök kanalı tedavisi tekrarı olarak karar verildi. 31 yaşında erkek hasta sol maksiller ikinci küçük azı ve birinci azı dişinin tedavisi için yönlendirildi. Sevk eden diş hekimi tarafından üç ay önce endodontik tedavi gördüğünü bildirdi. Klinik muayenede hem sol maksiller ikinci premolarda hem de sol maksiller birinci molarda perküsyona duyarlılık görüldü. Periapikal radyografide sol maksiller birinci moların palatinal kökünde taşkın guta perka gözlendi. Klinik ve radyografik muayeneye göre semptomatik apikal periodontitis tanısı kondu. Guta perkanın cerrahi olmayan endodontik tedavi ile çıkarılmasına karar verildi.

Sonuç: Başarısız bir kök kanal tedavisinin yeniden tedavisi genellikle kanal dolgusunun tamamen çıkarılmasını gerektirir. Guta perkanın el eğeleriyle geleneksel olarak çıkarılması zahmetli ve zaman alıcı olabilse de, bu prosedür, vaka raporunda sunulduğu gibi periodontal dokulara taşmış guta perka dolgularını çıkarmak için güvenilir bir yöntemdir.

Anahtar Kelimeler: *Apeksi çevreleyen doku, Gutaperka, Kök kanal tedavisi, Yeniden tedavi*

ABSTRACT

Objectives: It is known that during endodontic treatment, root canal materials should be confined to the root canals. Overextended material may cause an inflammatory response. Filling materials should be cleaned from the root canals and adjacent tissues. The purpose of this study is to describe two cases of the nonsurgical removal of extended gutta-percha to periodontal tissues from symptomatic teeth. The described method used is safe and conservative.

Case Report: A 17-year-old male was referred to us with a complaint of pain while chewing at his left mandibular molar region. The left mandibular first molar was received root canal therapy four months previously. Clinically, the tooth was sensitive to percussion. At the periapical radiography, a gutta-percha extruded beyond the root was observed. Based on the evaluation, symptomatic apical periodontitis was diagnosed. A 31-year-old male was referred for treatment of his left maxillary second premolar and first molar. three months earlier, he had undergone endodontic treatments. Clinical examination showed sensitivity to percussion at both teeth. At the periapical radiography, an extruded gutta-percha beyond the root of the left maxillary first molar was observed. According to the examination, symptomatic apical periodontitis was diagnosed. Removing the gutta-percha by nonsurgical endodontic retreatment was decided in both cases.

Conclusion: Retreatment of a failed endodontic treatment often requires complete removal of the root canal filling. Although conventional removal of gutta-percha by hand files can be painstaking and time-consuming, this procedure is a reliable method to remove overextended gutta-percha from root canal failure cases as presented in this case report.

Keywords: *Gutta-percha, Periapical tissue, Retreatment, Root canal therapy*

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Giriş

Kök kanal tedavisi sırasında kök kanal dolum materyallerinin periapikal dokulara taşmadan kök kanalları ile sınırlandırılması gerekmektedir. Bununla birlikte, bu materyallerin kök kanallarının dışına istemeden uzaması, kök kanallarının aşırı enstrümantasyonu veya perforasyonu yoluyla gerçekleşebilir. Taşan dolgu materyali mekanik ve kimyasal iritasyona neden olarak inflamatuar yanıta sebep olabilir. Uzun süre asemptomatik olsa bile sonradan semptom vermemesi açısından böyle bir tedavi görüldüğünde kanal tedavisi yenilenmelidir ve dolgu materyali kök kanallarından ve komşu dokulardan temizlenmelidir. En çok kullanılan ve kabul edilen kök kanal dolum materyali guta perkadır. Bu olgu sunumunun amacı, önceden tedavi edilmiş semptomatik dişlerden periodontal dokulara taşmış guta perkanın cerrahi olmayan Resimde uzaklaştırılmasına ilişkin iki vakayı tanımlamak ve tartışmaktır. Bu vakalar için kullanılan yöntem, periapikal dokulardan guta perka uzaklaştırmak için güvenli ve konservatiftir. Hastaların tedavi sonrası post operatif rahatsızlıklarını azaltabileceği için cerrahiden daha iyi bir tedavi alternatifi olabilir. Ayrıca cerrahi alanda kendini yeterli hissetmeyen diş hekimlerine bir tedavi yöntemi alternatifi sağlayabilir.

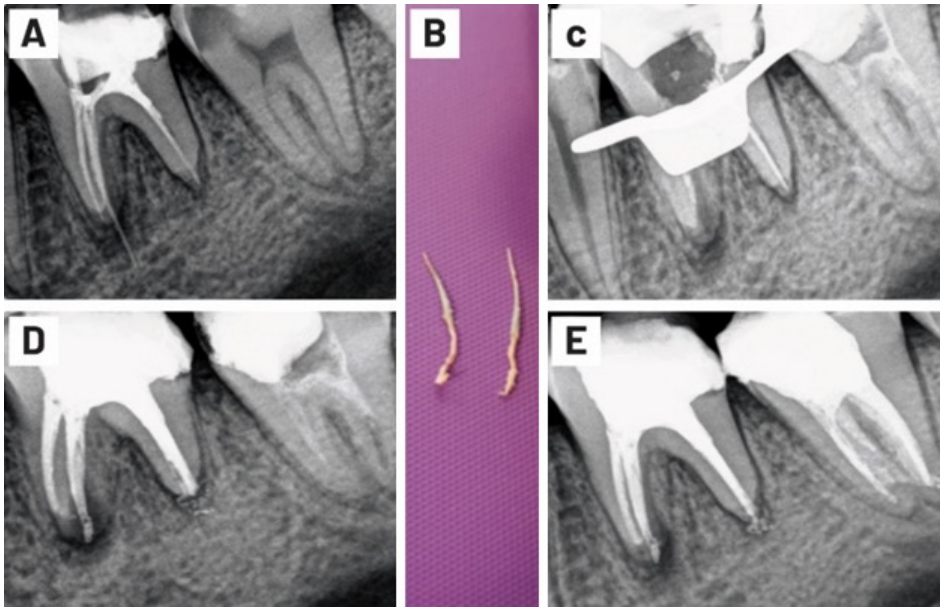
Guta perka en yaygın kullanılan ve kabul gören kök dolgu maddesidir.[3] Başlangıç endodontik tedavisinde kabul edilebilir başarı için guta perka kanal sisteminin sınırları içinde kalmalıdır.[6] Bununla birlikte, özellikle olgunlaşmamış, rezorbe olmuş veya aşırı genişletilmiş kök kanal apekslerinde, guta perkanın taşması obturasyon sırasında meydana gelebilir.[7] Mekanik iritasyon kök kanal materyallerinin periodontal dokulara taşmasından kaynaklanır ve taşan materyal, periapikal dokularda inflamatuar bir reaksiyona sebep olabilir.[14] Bununla birlikte, guta perka dolgu maddesinin, özellikle iyi dolum yapılmış kök kanallarından uzaklaştırılması zaman alıcı olabilir fakat kök kanal tedavisinin başarısı için şarttır.[10] Ayrıca taşkın dolum yapılmış dişlerde başarısızlık oranının daha yüksek olduğu kabul edilmektedir.[15] Bu nedenle bu klinik komplikasyonun tercihen konservatif bir yöntemle çözülmesi önemlidir. Aşağıdaki vaka raporları, bu klinik durumun bir örneğini ve çözümü için cerrahi olmayan bir yöntemi açıklamaktadır.

Olgu 1

Genel sağlık sorunu olmayan 17 yaşında erkek hasta, sol alt azı bölgesinde sürekli ağrı şikayeti ile kliniğimize eski diş hekimi tarafından sevk edildi. Hasta, sol mandibular birinci molar dişinin dört ay önce kanal tedavisi gördüğünü bildirdi. Klinik olarak diş perküsyona duyarlıydı. Periapikal radyografi alındı ve mesial kökün ötesine taşan guta perka kanal dolgu maddesi gözlendi. Radyografik değerlendirme iki kökte de radyolüsent lezyonlar olduğunu ve kök kanal dolgusunun kuronalde ve orta üçte birlik kısmında boşluklar olduğunu doğruladı (Resim 1A). Klinik ve radyografik değerlendirmeye göre semptomatik apikal periodontitis tanısı konuldu. Tedavi planına cerrahi olmayan yeniden endodontik tedavi olarak karar verildi. Hastadan bilgilendirilmiş onam alındıktan sonra dişe anestezi uygulandı ve rubber dam ile izole edildi. Guta perkayı kök kanallarından çıkarmak için ProTaper Next (Dentsply Sirona, Ballaigues, İsviçre) döner eğe sistemleri ve K-eğeleri ve H-eğelerinin (Dentsply Maillefer, Ballaigues, İsviçre) kombinasyonu ile kök kanal tedavisine başlandı. Kök kanalının yetersiz doldurulması nedeniyle, 15 numara H-eğesinin (Dentsply Maillefer, Ballaigues, İsviçre) apikalinin kıvrılması ile guta perka ucu tutularak parçalanmadan kök kanal sisteminden uzaklaştırıldı (Resim 1B). Taşmış guta perkanın çıkarıldığını kanıtlamak için bir periapikal radyografi alındı (Resim 1C).

Kalan tüm dolum materyalleri temizlendikten sonra %5,[25] sodyum hipoklorit (NaOCl) ve ardından %17 sıvı etilendiamintetraasetik asit (EDTA) ile irrigasyon ile kanal tedavisine devam edildi, steril paper pointler (Dentsply Maillefer) ile kök kanalları kurutuldu, kanal içi medikament olarak kalsiyum hidroksit pat ($Ca(OH)_2$) kullanıldı ve giriş boşluğu geçici olarak Cavit (3M ESPE AG, Seefeld, Almanya) ile kapatıldı. iki hafta sonra hastanın ikinci seansında $Ca(OH)_2$ uzaklaştırıldı. İrrigasyon için 30-G irrigasyon iğnesiyle (Ultradent) %5,[25] NaOCl kullanıldı, 15 numara K-eğe (Dentsply Maillefer, Ballaigues, İsviçre) ile pasif ultrasonik irrigasyon yapıldı ve steril paper pointler ile bölge kurutuldu. AH Plus pat (Dentsply Maillefer, Ballaigues, Switzerland) uygulandı ve dişin kök kanalları lateral kompaksiyon yöntemi ile dolduruldu (Resim 1D).

Üç aylık takipte diş asemptomatik ve apikal bölgede preoperatif radyografilere göre daha az radyolüsensi gözlendi (Resim 1E). Hastaya dişin düzgün restorasyonu için mümkün olan en kısa sürede randevu alması önerildi.



Resim 1. Sol mandibular birinci molar dişin kök kanal tedavisi; A) Sol mandibular birinci molar dişin mesial kökünden taşan guta perka ve her iki kökte görülen radyolüsensi. B) Sol mandibular birinci molar dişin kök kanallarından guta perka çıkarılmıştır. C) Sol mandibular birinci moların kök kanallarından çıkarılan taşkın guta perkayı gösteren periapikal radyografi. D) İlk seanstan iki hafta sonra asemptomatik sol mandibular birinci moların soğuk lateral kompaksiyon tekniği ile doldurulması. E) Sol mandibular birinci molar dişin üç aylık takip radyografisinde apikal bölgede iyileşme.

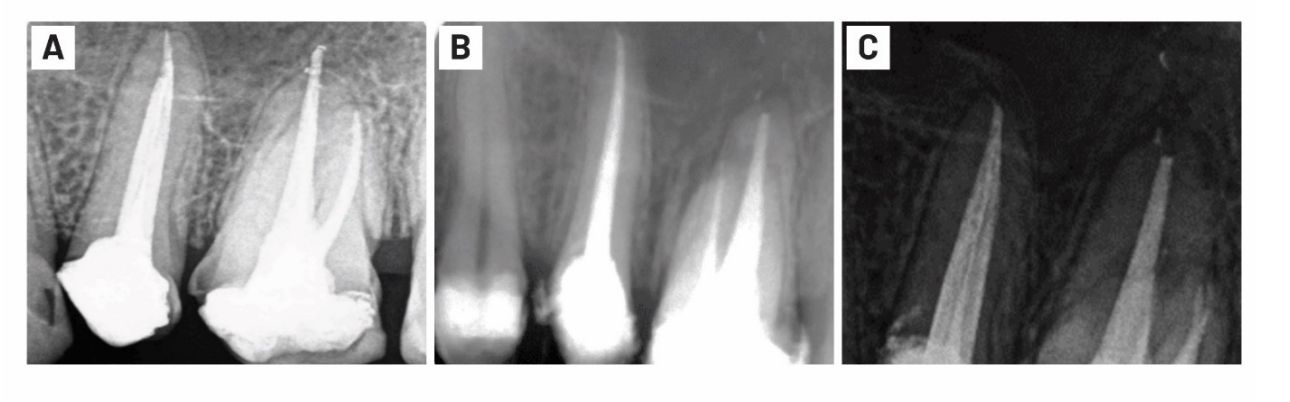
Olgu 2

31 yaşında erkek hasta sol maksiller ikinci küçük azı ve birinci azı dişinin kök kanal tedavisi için yönlendirildi. Aynı bölgedeki şiddetli bir ağrı nedeniyle sevk eden diş hekimi tarafından üç ay önce tek seanslık bir kök kanal tedavisi gördüğünü bildirdi. Klinik muayenede hem sol maksiller ikinci premolarda hem de sol maksiller birinci molarda perküsyona duyarlılık görüldü. Periapikal radyografi alındı ve sol maksiller birinci moların palatinal kökünde taşkın guta perka gözlendi (Resim 2A).

Klinik ve radyografik muayeneye göre semptomatik apikal periodontitis tanısı kondu. Guta perkanın cerrahi olmayan endodontik tedavi ile çıkarılmasına karar verildi. Hastaya tedavi planı anlatıldı. İlgili dişe anestezi uygulandı ve rubber dam ile izole edildi. Guta perkanın kuronal üçlüden çıkarılması 50 numara Gates Glidden frezleri (Dentsply Maillefer, Ballaigues, İsviçre) ile gerçekleştirildi. Daha sonra ProTaper Next (Dentsply Sirona, Ballaigues, İsviçre) döner eğe sistemleri ve el aletleri kombinasyonu ile işleme devam edildi. Taşkın guta perkayı çıkarmak için ucuna kavis verilmiş 10 ve 15 H-eğelerini kullanmak uygun bulundu.

Eski dolgu malzemeleri uzaklaştırıldıktan sonra kök kanalları temizlendi. Ni-Ti döner eğeler F1, F2, F3 (ProTaper; Dentsply, Maillefer) ile Resimlendirildi ve 30-G irrigasyon iğnesiyle (Ultradent), %5,[25] NaOCl irrigasyonu sonrası F3 guta-perka konu irrigasyon aktivasyonu için yaklaşık 1 dakika boyunca 100 kez aşağı-yukarı hareket ettirildi. Kök kanalları steril paper pointler (Dentsply Maillefer) ile kurutuldu, $Ca(OH)_2$ uygulandı ve giriş boşlukları geçici olarak Cavit (3M ESPE AG, Seefeld, Almanya) ile kapatıldı. Hasta iki hafta sonra geri döndü, $Ca(OH)_2$ uzaklaştırıldı ve kökler, AH Plus kanal patı (Dentsply Maillefer, Ballaigues, İsviçre) kullanılarak guta perkanın soğuk lateral kondensasyon tekniğiyle dolduruldu (Resim 2B).

Üç aylık takip radyografisinde periapikal lezyon bulgusu görülmedi ve yapılan klinik muayenede herhangi bir belirti saptanmadı (Resim 2C).



Resim 2. Sol maksiller birinci molar ve sol maksiller ikinci premolar dişin kök kanal tedavisi; A) Periapikal radyografide sol maksiller birinci moların palatinal kökünden taşan guta perka ve sol maksiller ikinci premoların apikal üçte birlik kısmında yetersiz dolumu. B) Hem sol maksiller ikinci küçük azı hem de birinci azı dişinin yeniden endodontik tedavisi. C) Periapikal lezyon belirtisi göstermeyen üç aylık takip radyografisi.

Sonuç

Başarısız bir kök kanal tedavisinin yeniden tedavisi genellikle kök kanal dolgusunun tamamen çıkarılmasını gerektirir. Yeterince yoğun olmayan guta perka dolguları, H-eğeleri ve kloroform veya ksilen gibi solventler ile kolayca çıkarılabilir.[5] Bununla birlikte, aşırı taşkın kök kanal dolgularında guta perka parçaları sıklıkla periapikal dokuda kalır.[1] Kök kanal dolgu materyalinin taşkın olması ciddi komplikasyonlara neden olabilir. Kök kanal sisteminin apikal üçte biri, kök kanal dolgu maddesinin uzaklaştırılması için en zor alandır. Ayrıca taşkın materyalin çıkarılması yeniden tedavi vakalarının en zorlu aşamalarından biridir.[4] Guta perkayı orijinal kıvamında tutmak, bu prosedürde başarının anahtarıdır çünkü bu, el eğesinin guta perka segmentini sıkıca kavramasına ve onu bir birim olarak çıkarmasına izin verir. Guta perka segmenti yumuşamış veya kısmen erimiş ise bu durum oluşmayabilir.[11]

Cerrahi ve cerrahi olmayan kök kanal tedavisi tekrarı tedavilerinin başarı oranları arasında istatistiksel olarak anlamlı bir fark olmamasına rağmen,[2] başarısız endodontik vakalarda tercih edilen yöntem cerrahi olmayan kök kanal tedavisi tekrarıdır. Bunun nedeni cerrahi olmayan kök kanal tedavisi tekrarının cerrahi yöntemlere göre avantajlarıdır. Bu avantajlar arasında; cerrahi olmayan tedavinin, cerrahi işlemlere göre daha az invaziv olması, cerrahi tedavinin daha fazla postoperatif rahatsızlığa neden olması, cerrahi olmayan endodontik tedavi tekrarının cerrahi müdahalelere göre daha az komplikasyon riski olması ve cerrahi olmayan tedavinin, genellikle cerrahi müdahalelere göre daha ekonomik olması yer alır.

Bunun yanı sıra, cerrahi olmayan kök kanal tedavisi tekrarı sırasında kök dolgularını kanal sisteminden uzaklaştırırken karşılaşılabilecek zorluklar bulunmaktadır. Bu zorluklar arasında; önceki tedavide kullanılan postlar ve korlar, kök kanal sistemindeki kalsifikasyonlar, kök kanal sistemindeki dentin debrisleri, kırılmış aletler, bazı pat materyalleri ve kanal sisteminin karmaşık yapısı yer alır. Bu zorluklar, deneyimli bir hekimin uygun ekipman kullanımıyla minimize edilebilir.

Cerrahi olmayan kök kanal tedavisi tekrarı işlemleri, özenli bir Resimde planlanmalı ve dikkatli bir Resimde uygulanmalıdır. Tedavinin başarısı için doğru teşhis, uygun ekipman seçimi ve dikkatli uygulama oldukça önemlidir. Isıtılmış tıkaçlar, ultrasonikler, döner eğeler ve çözücüler gibi guta perkayı çıkarmak için kullanılabilecek farklı cerrahi olmayan yöntemler vardır. Ancak guta perkanın taşkın kısımlarının çıkarılması için bunlar güvenli seçenekler değildir.[13]

Guta perkanın el eğeleriyle geleneksel olarak çıkarılması zahmetli ve zaman alıcı olabilse de, bu prosedür, bu vaka raporunda sunulduğu gibi kök kanal tekrar tedavisi vakalarından periodontal dokulara taşmış guta perka dolgularını çıkarmak için güvenilir bir yöntemdir.

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