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Acknowledgments

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1. Title, abstract and key words;

2. Main text (Introduction, Materials and Methods, Results, Discussion, Conclusions)

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Original article	4000*	400	10	40
Case report	2000*	200	5	20
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1 – TITLE PAGE

The title of the article should not exceed 100 characters (letters) in research articles and 80 characters in case reports. The title should be written in both English and Turkish. The names and surnames of the authors who contributed to the study should be written clearly, and the number of authors should not exceed 8 in research and review articles and reviews, 6 in case reports, 6 in letters to the editor, and 2 in image presentations, excluding multidisciplinary studies. The full address of the institution where the study was carried out should be written under the articles.

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Articles in journals;

Doğan MS, Callea M, Kusdhany LS, Aras A, Maharani DA, Mandasari M, et al. The evaluation of root fracture with cone beam computed tomography (CBCT): an epidemiological study. J Clin Exp Dent 2018; 10(1):41-8.

Online articles not yet published;

Das RR, Singh M, Naik SS. Vitamin D as an adjunct to antibiotics for the treatment of acute childhood pneumonia. Cochrane Database System Rev. 2018 Jul 19;7:CD011597. doi: 10.1002/14651858.CD011597.pub2. [Epub ahead of print] Review.

Books;

1) Krogman WM, Iscan MY. The Human Skeleton in Forensic Medicine. Second ed. Springfield Illinois: Charles Thomas Publisher, 1986:189-243.

2) Beard SD. Gaines PA, eds. Vascular and Endovascular Surgery. London: WB Sounders, 1998:319-29.

Chapters from the book;

1) Soysal Z, Albek E, Eke M. Fetus rights. Soysal Z, Çakalır C, ed. Forensic Medicine, Volume III, Istanbul University Cerrahpasa Medical Faculty Publications, Istanbul, 1999: 1635-1650.

2) Dogan, M.S. 2018. Relation of trace elements on dental health. In Saleh, H.E.M. and El-Adham, E. (eds.) Human Health and Environment. United Kingdom: IntechOpen. 2018:856-910.

Web Articles;

Abood S. Quality improvement initiative in nursing homes: The ANA acts in an advisory role. Am J Nurs [serial on the Internet] 2002 [cited 12 Aug 2002]. Available from: www.nursingworld.org/AJN/2002/june/wawatch.htm

Website;

Cancer-pain.org [homepage on the Internet]. New York: Association of Cancer Online Resources [last reach 16 May 2002]. Available from:www.cancer-pain.org

Thesis;

Gezer R: Morphological Characteristics and Individual Differences of Rugae Palatines. Master Thesis, Şanlıurfa: Harran University Institute of Health Sciences, 2016.

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Financial resources, contributing institutions, organizations and individuals, if any, should be specified in this section.

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straight lines at the top and bottom. Table numbering (Table 1., Table 2., ...) must be sequentially numbered and Roman numerals must not be used.

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The editorial board can make any changes it deems necessary without changing the essence of the article.

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· Use of humans and animals (including material/data) for experimental or other scientific purposes,

· On humans clinical studies,

· Animal studies,

· Retrospective studies in accordance with the law on the protection of personal data, (If requested, the permission document from the institution where the study was carried out should also be uploaded to the system.)

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1. The form of transfer of copyright and matters to be notified about the authors has been filled and signed in accordance with the form,

2. The abstract did not exceed 400 words in the orjinal research article and 200 words in the case report,

3. The title is written in Turkish and English,

4. References are written in accordance with the rules,

5. All abbreviations should be explained in tables, pictures and figures.

6. The pages should be numbered in the lower right corner, double-spaced, in Times New Roman 12 pt.

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HRÜ Uluslararası Diş Hekimliği ve Oral Araştırmalar Dergisi

HRU International Journal of Dentistry and Oral Research

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Evaluation of Root Canal Morphology Molar Teeth and Distance Between Additional Canals Using CBCT

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Abstract

Background: This study was conducted to analyze the morphological variations of maxillary and mandibular molars in the Turkish population, to evaluate the distances between the additional canals vertically and horizontally, to guide clinicians by determining the distance between the canals.
Materials and Methods: The maxillary and mandibular first and second molars (a total of 50 teeth per group) were using in the study. The teeth were embedded in an arch-shaped silicone impression material. Cone beam computed tomography *(*CBCT) images of the teeth were recorded. Two examiners scrutinized the root canal systems and sought out any additional canals.
Results: Upper first molars; 16% had three canals, 64% had four canals and 20% had five canals. The average distance between mesiobuccal 1(mb1)-mesiobuccal 2(mb2), mesiobuccal 1(mb1)-mesiobuccal 3(mb3), and distobuccal 1(db1)-distobuccal 2(db2) was 2.35, 2.52 and 1.91 millimeters, respectively. Upper second molars; 32% had three canals, 52% had four canals and 16% had five canals. The distance between mb1-mb2 and db1-db2 canals was 2.14 and 2.01 mm, respectively. In 16%, the mb2 canal was observed at an average depth of 0.72 mm from mb1. No significant difference was found between the number of canals and additional canals in the upper first molars and upper second molars teeth (p=0,275).Lower first molars; Two canals were detected in 8%, three canals in 20%, four canals in 28% and five canals in 44%. While 60% of the midmesial canals merged with the mesiolingual canal, 20% merged with the mesiobuccal, and 20% terminated in separate apices. Mesiobuccal(mb)-midmesial and mesiolingual(ml)-midmesial distances were 1.81 and 1.76 mm, respectively.Lower second molars; 4% had one canal, 8% had two canals, 60% had three canals, 28% had four canals. No midmesial canal was observed in the lower second molars. There was a significant difference between the number of teeth with three canals in the lower first molars and lower second molars teeth (p=0,00).
Conclusions: During root canal treatment, all canal access must be accurately identified. Using adequate light sources, checking the pulp floor with canal probes, strengthening the theoretical knowledge about the points where additional canals can be found can reduce the risk of missed canals.
Strengthening the theoretical knowledge of where additional canals can be found can reduce the risk of missing canals.

Research Article (HRU Int J Dent Oral Res 2024; 4(2): 30-37)

Keywords: Additional canal; root morphology; CBCT, second mesiobuccal canal, midmesial canal.

Introduction

In human dentition, it has been widely documented that root canal morphology exhibits significant anatomical variations across different tooth types. Specifically, root canal systems display a diverse array of configurations in terms of the number and arrangement of their components (1). Over the years, extensive research and clinical studies have been conducted on the diversity of root and canal morphologies. Variations in this aspect exist not only between different populations but also within populations, and can even be observed within the same individual (1). Clinicians should be aware of different root canal configurations and the presence of accessory canals, as these factors are essential for complete

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instrumentation and disinfection of the root canal system. Successful execution of root canal therapy depends on thorough disinfection of the root canal system. The complexity of root canal anatomy and presence of morphological variations present substantial challenges for practitioners in this field. Inadequate knowledge of the anatomical features of the root and canal systems of treated teeth can potentially lead to complications (2, 3). Specifically, the inclusion of additional canal systems is widely regarded as a substantial factor leading to treatment failure (4). The morphology of the maxillary and mandibular molar root canals is affected by various factors, including ethnicity, age, and sex (5, 6).

Several techniques have been employed throughout the years to evaluate root canal morphology and variations. Traditional radiographic imaging offers essential insights into the dental anatomical variations that are valuable for clinical applications (7). Periapical radiographic images are commonly used in clinical practice to provide a wealth of information. However, their interpretation can sometimes be difficult because of the presence of numerous regional anatomical landmarks and overlapping hard tissues of the adjacent teeth and other structures within the orofacial region. These factors can make it challenging to accurately interpret periapical radiographs. Numerous three-dimensional anatomical anomalies may remain concealed because of the possibility of two-dimensional representation and the accompanying distortion of the geometric image (8, 9).

In recent years, clinical research has evaluated the frequency of additional canals using loupes or microscopes that allow for magnification (7). Additionally, computerized systems have been using to analyze the morphology of root canals (10). CBCT offers the advantage of producing three-dimensional (3D) images while using relatively low levels of radiation exposure in contrast to other medical imaging techniques. Several studies have reported the usefulness of a diagnostic tool to assess root canal anatomy (11-15).

There has been much research on variation and configuration, but few studies have evaluated the distances between the additional canals. This research endeavors to provide clinicians with a direction to pinpoint the location of additional canals by assessing the spatial distances and to enhance treatment success by minimizing the number of overlooked canals. Moreover, this study aimed to examine the morphological differences in maxillary and mandibular molars among the Turkish population and to evaluate the vertical and horizontal distances between the additional canals. Ultimately, this study seeks to guide clinicians in identifying additional canals when they cannot be easily detected.

Materials and Methods

Ethical Dimension of the Research

This study was approved by the local ethics committee of Kahramanmaras Sutcu Imam University (2024/06). The research adhered to the recommendations outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for cross-sectional investigations.

Population and Sample of the Study

Sample size calculation was measured G-Power method: When the power of the test was 0.80, type I error was 0.05, and effect size was 0.25, the sample size was calculated as 180 using F test. Considering the data losses, it was set as 200.

Type of Research

This study included 200 maxillary and mandibular teeth that were removed as part of the examination, diagnosis, and treatment plan for individuals who had previously been admitted to the surgical clinic. Since extracted teeth are not images taken from patients, it was used when there are areas that are not clearly visible in the CBCT images, so that the patient does not need to receive an extra dose of radiation if the CBCT needs to be taken again. The following criteria were applied for tooth inclusion in our study:

1) completely closed apexes and complete root development;
2) absence of prior root canal treatment; and
3) absence of fractures or cracks.

The criteria that were applied to exclude teeth from our study were as follows:

1) any teeth that had metallic restorations,
2) teeth that exhibited canal calcification,
3) teeth that had undergone periapical surgery, and
4) teeth that had developmental anomalies.

The calculi and soft tissue debris on the tooth were removed using a curette. Prior to use, the teeth were stored in a solution containing 0.1% thymol. The samples were divided into four distinct categories, each comprising 50 teeth. The categories included 50 mandibular first molars, 50 mandibular second molars, 50 maxillary first molars, and 50 maxillary second molars.

Data Collection Tools

The silicone impression material was prepared in the form of an arch, and the teeth were embedded in each group. Formal tone rephrasing: The axial, coronal, and sagittal planes were used to acquire CBCT images of the

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teeth. All CBCT images were acquired high-resolution mode (voxel size=0.4 mm), FOV=16x5 cm) with exposure settings of 90 kVp, 12 mA, 12 s, and 0.2 mm resolution Planmeca (Planmeca, Helsinki, Finland). Images were analyzed in 0.2 mm sections along the entire root canal system (from canal access to the apices). CBCT images of the teeth were analyzed using Planmeca romexis software (Planmeca OY, Helsinki, Finland). The image-processing tool of the software was employed to optimize the visualization of the images by adjusting their contrast and brightness. The following text was rephrased to use a formal tone while preserving the original content and structure: analysis and recording of root canal system
changes, including the number of canals, their position, and the distances between the additional canals and canal configurations, were performed for each tooth. The analysis was performed by two observers (BE, ŞZ) who have been working as endodontists for seven years, and interrater agreement was assessed using the Kappa test.

The Vertucci classification system was employed as a foundation for categorizing the root canal morphology of teeth (16). Additional root canal types not included in this classification (Figure 1) were also considered, and images of the specimens were taken (17).

After additional canals were identified, the central points of each canal were marked. The distance between the main and additional canals was determined by drawing a straight line between these points. The distances between the points of the lines were measured in millimeters (mm), as illustrated in Figure 2.

Figure 1: Root canal classification types (10,11,12,13,14,15)- Vertucci classification - Additional types (17)

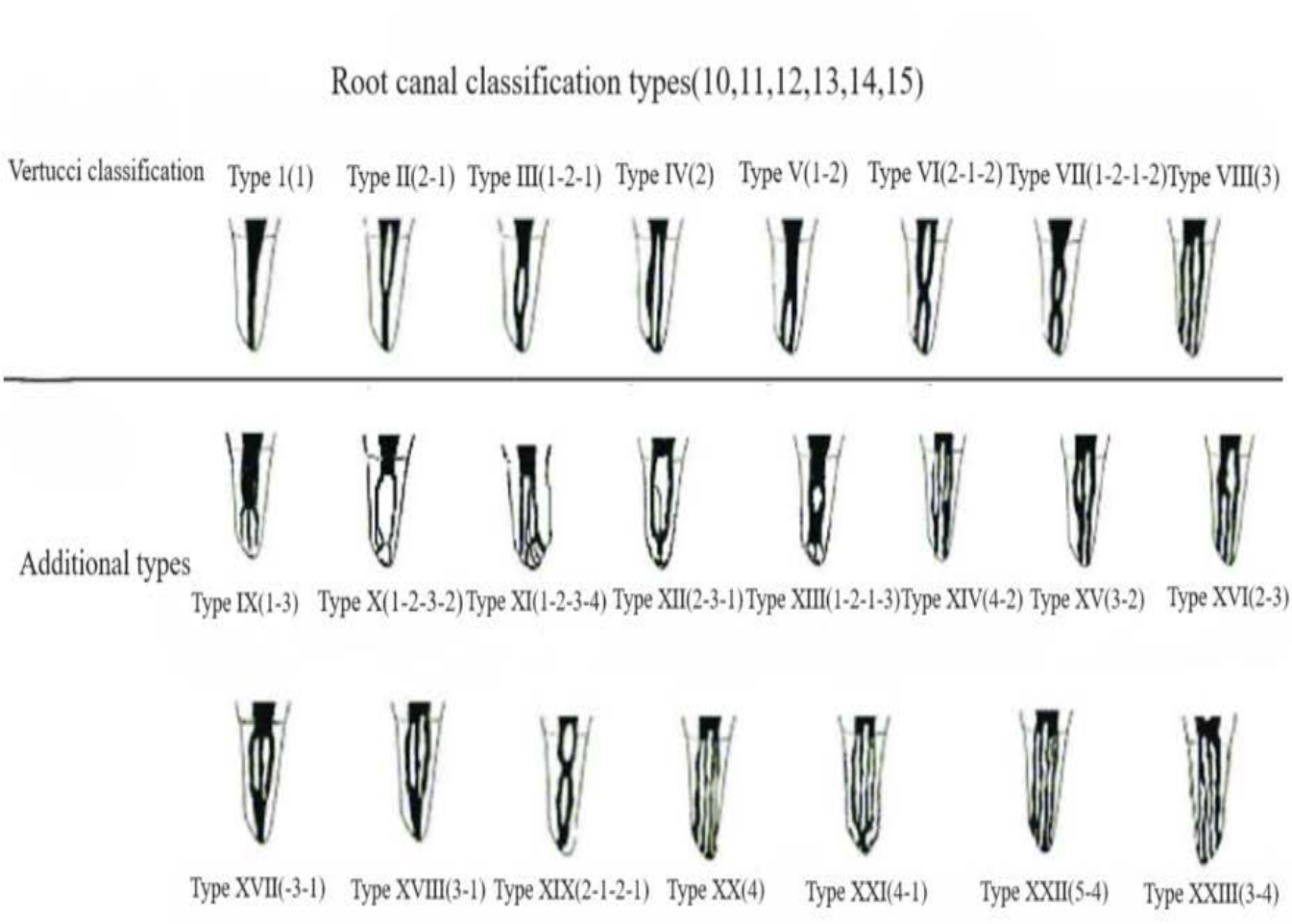

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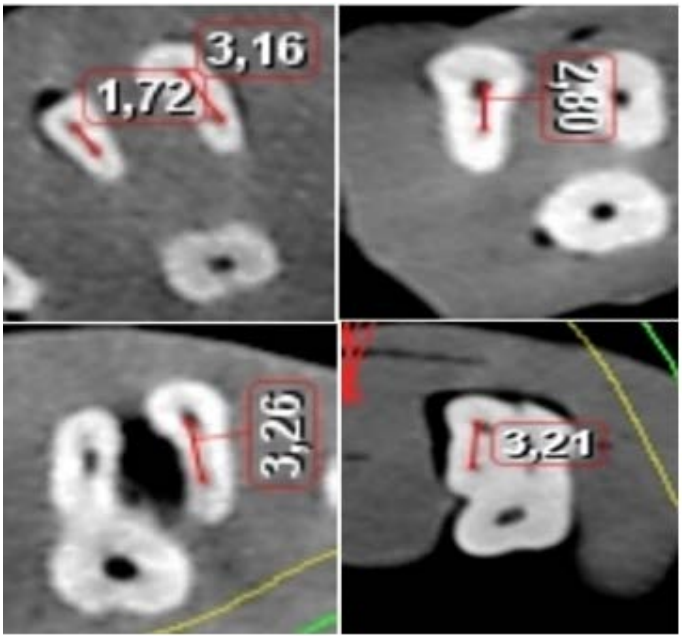
Figure 2: Distances between additional canals and main canals were measured in millimeters



Data Analysis

Test for Conformity to Normal Distribution and/or Homogeneity of Variance Test: Categorical variables will be written as number, percentage, mean standard deviation and non-categorical variables as median (min-max). Compliance with normal distribution will be determined by Kolmogrov Smirnov test.

Comparison Groups and Analytical Statistics Methods: Chi square test and fisher exact test will be applied in the evaluation of qualitative data. The comparison groups are Upper first molars, Lower first molars, Upper second molars and Lower second molars.

Results

Interrater agreement was evaluated by Kappa test and the agreement between two observers was found to be 0.890.

Upper First Molars

Analysis of the upper first molars revealed that 16% had three canals, 64% had four canals and 20% had five canals (Table 1). The second mesiobuccal canal (mb2) was found in 24% of the teeth. In 40% of the cases, mb2 and the first mesiobuccal canal (mb1) are merged (Figure 3). In 10% of the teeth with five canals, mb2 and the third mesiobuccal canal (mb3) were observed (Figure 4), whereas mb2 and db2 canals were observed in 10% of
cases (Figure 4). The mesial canal configurations were type II (8 %), type III (12 %), type IV (8 %), and type V (4 %) (Table 3). The mean distance between mb1-mb2, mb1-mb3 and db1-db2 was 2.35 mm, 2.52 mm and 1.91 mm, respectively (Figure 2).

Table 1: Distribution of upper first and second molars according to the number of canals

NUMBER OF CANALS	FIRST MOLAR	SECOND MOLAR
1 canal	-	-
2 canals	-	-
3 canals	8	16
4 canals (mb2 ending separate apex)	12	14
4 canals (mb2 merging mb1)	20	12
5 canals (had mb2 and mb3)	5	4
5 canals (had mb2 and db2)	5	4

*mb1: first mesiobuccal canal,
mb2: second mesiobuccal canal,
mb3: third mesibuccal canal,
db2: second distobuccal canal.
Chi square test and fisher exact test will be applied.

Figure 3: First mesiobuccal and second mesiobuccal canal are merged

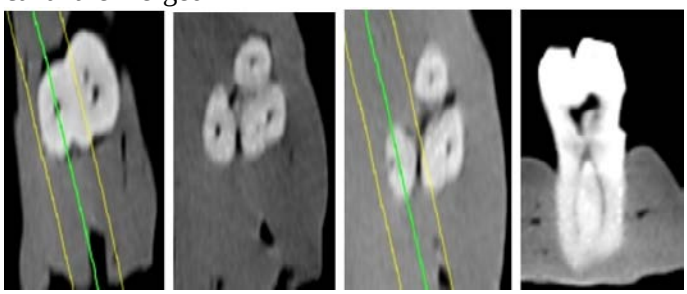


Figure 4: Second mesiobuccal canal, third mesiobuccal canal, second mesiobuccal canal and second distobuccal canal

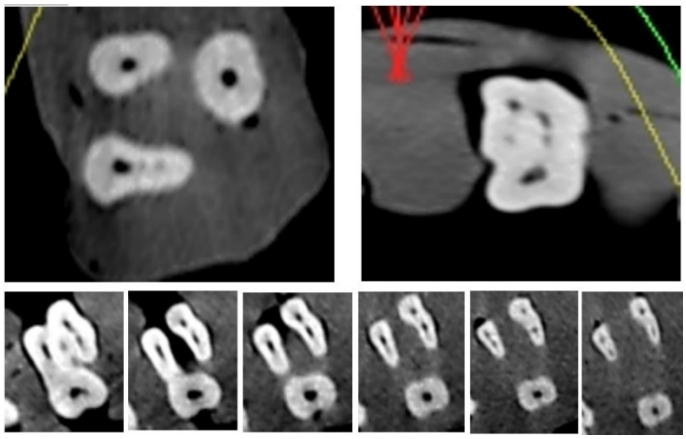


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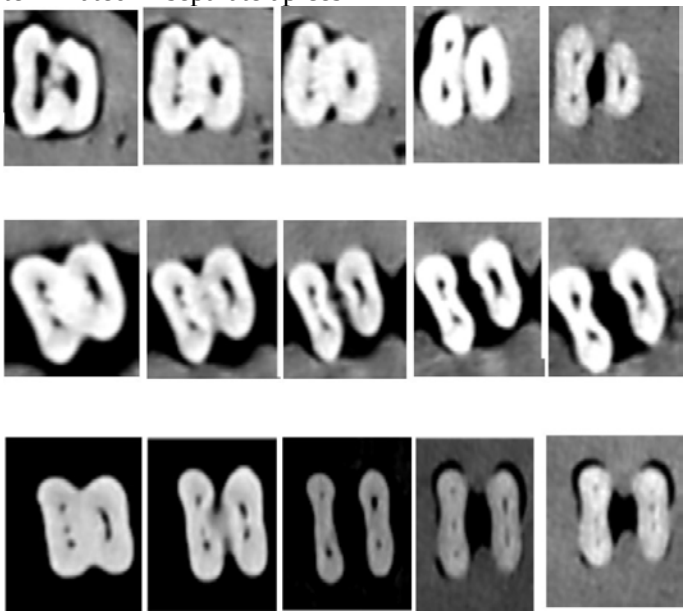
Figure 5: Midmesial canal merged with the mesiolingual canal, 20% merged with the mesiobuccal canal and 20% terminated in separate apices



Upper Second Molars

32% had three canals, 52% had four canals, and 16% had five canals (Table 1). In 28% of cases, mb2 terminated with a separate apex, while in 24%, it merged with mb1. In 8% of the teeth with five canals, mb2 and mb3 were observed, and mb2 and db2 were observed in 8% (Figure 4). 16% had type III and 8% had type VI mesial canal configuration (Table 3).

The distance between mb1-mb2 and db1-db2 was 2.14 and 2.01 mm, respectively. In 16% of cases, mb2 was observed at an average depth of 0.72 mm from mb1.

No significant difference was found between the number of canals and additional canals in the upper first molars and upper second molars teeth (p=0,275).

Lower First Molars

Two canals were detected in 8%, three canals in 20%, four canals in 28%, and five canals in 44% (Table 2). The midmesial canal was observed in 44% of cases. Sixty percent of the midmesial canal merged with the mesiolingual canal (ml), 20% merged with the mesiobuccal canal (mb), and 20% terminated in separate apices (Figure 5). In teeth with four canals, midmesial was not observed but db2 was present. Type III, type XVIII, type XVIII, and type XV mesial canal configurations were detected in 8% of the teeth, type III in 8 %, and type II distal canal configuration in 20% (Table 3).

Mb-midmesial and ml-midmesial distances were 1.81 and 1.76 mm, respectively.

Table 2: Distribution of lower first and second molars according to the number of canals

NUMBER OF CANALS	FIRST MOLAR	SECOND MOLAR
1 canal	-	2
2 canals	4	4
3 canals	10	30
4 canals (had midmesial)	-	6
4 canals (db2 ending separate apex)	14	8
5 canals (midmesial ending seperate apex)	6	-
5 canals (midmesial merging ml or mb)	16	-

*ml: mesiolingual,
mb: mesiobuccal,
db2: second distobuccal canal.
Chi square test and fisher exact test will be applied.

Lower Second Molars

4% had one canal, 8% had two canals, 60% had three canals and 28% had four canals (Table 2). In 16% of teeth with four canals, db2 terminated in a separate apex. In 24% of the cases, the mesial canals merged apically (type II), while in 16%, the canal that started as a single mesial canal ended in two (type V) (Table 3). Type III mesial canal configuration was observed in 12% of cases, and type XVX mesial canal configuration was observed in 16% of cases. No midmesial canal was observed in the lower second molars. There was a significant difference between the number of teeth with three canals in the lower first molars and lower second molars teeth (p=0,00).

Table 3: Classification of mesial canal variations of upper first second molars/lower first second molars according to the Vertuccis

MESIAL CANAL VARIATIONS	UPPER 1ST MOLAR	UPPER 2ND MOLAR	LOWER 1STMOLAR	LOWER 2ND MOLAR
1-2-1 (tip III)	6	8	8	6
2-1-2 (tip VI)	4	4	-	-
3-1 (tip XVIII)	-	-	4	-
3-2 (tip XV)	-	-	4	-
2-1 (tip II)	4	-	10	12
1-2 (tip V)	2	-	-	8
2-1-2-1 (tip XVX)	-	-	-	8

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Discussion

Root canal configurations vary considerably and we observe these variations even within the same nationality. The outcomes of morphological research may be influenced by intranational variation. The primary objective of this study was to provide information regarding the root and canal morphology of maxillary and mandibular molars in the Turkish population through the using of in vitro CBCT images and to identify any additional canals that may exist. Furthermore, this study aimed to elucidate the interconnections between these canals, thereby providing valuable insights for clinicians. Thus, in this study, we aimed to help clinicians perform root canal disinfection more effectively by considering the results obtained.

Betancourt et al. (18) stated that the results of in vitro studies are not as reliable as those of in vivo studies because the alignment of the evaluated teeth in in vitro studies does not simulate the natural arch shape, thus making CBCT images difficult to evaluate. In this study, we placed the teeth in the arch position and aimed to provide images similar to in vivo conditions. We also conducted an in vitro study to obtain more precise results by eliminating the radiation emitted from the surrounding tissues in the field of view.

According to certain investigations, endodontic magnification equipment has revealed the existence of mb2 in the maxillary second molar in 19.7% to 51.1% (19). Although magnification systems are very useful in locating additional canals, they have disadvantages, such as inadequate opening of the access cavity, the presence of fluids in the environment during canal entry, and the inability to follow the canal morphology until apical (19).

In addition, in the case of inclined or rotational molars, magnification efficiency is lost because angulation of the tooth prevents a good view of the cavity floor. Finally, the expenses associated with equipment and the necessities for operator training are significant constraints that impact the practical application of augmentation. To overcome these limitations, CBCT, a straightforward diagnostic method that requires only a computer, is currently being employed.

Based on our research findings, it was observed that a significant proportion of maxillary first molars exhibited additional canal variations. Specifically, the rate of occurrence was 84%, which is relatively high. The mesiobuccal root of maxillary molars is one of the main foci of morphologic studies, as the incidence of multiple canals is significantly higher, and a wide variety of variations have been reported. This ratio was also reported by Kim et al. (13) and Betancourt et al. (20) and similar studies(28) it is higher than the ratio reported by Zhang et al. (21). Xin et al. reported The detection rate of mb2 was 48% in maxillary first molars and 32% in maxillary second molars (22). The frequency of mb2 in maxillary second molars was 68%, which surpassed the rates reported in previous studies by Lee et al. (23), Betancourt et al. (24) and Silva et al. (25).

In many studies (4, 26), Vertucci's (1984) classification has been used as a reference. In this study, 12% of the first molars had an mb2 that started as a single canal similar to Vertucci type III, split into two canals, and then merged again, and 8% had an mb2 canal that merged with mb1 similar to Vertucci type II. Moreover, examination of the teeth revealed the presence of type IV and V canal configurations in 8% and 4% of the samples, respectively. In Vertucci's study (27), this frequency was 44% for Type II and 8% for Type IV in the second molars. Yang et al. reported the mesial root showed a Vertucci type II configuration in 28.9% cases followed by type IV (26). In our study, especially when the mesial canal structures of the upper first molar and lower first molar teeth were examined, it was determined that they had different types and many configurations. We believe that this may be related to innovations in CBCT imaging modalities, which have increased the number and configuration of the canals detected.

According to previous research, a considerable percentage of the lower first molars exhibited specific canal configurations. Specifically, 8% of the molars had a type III mesial canal configuration, 8% had type XVIII, and 8% had type XV. Additionally, 8% of the molars displayed a combination of type III and type XV mesial canal configurations and 20% showed a type II distal canal configuration (Table 3). Many studies have reported that palatal and distobuccal roots contain a single canal (1, 19). In our study, a similar result was reported for the palatal canal, but 16% of the first molars had two canals in the distal root.

By measuring the distance of the additional canals detected in our study to the main canal, we aimed to provide clinicians with knowledge and experience regarding this subject. The location of mb2 has been reported in in vitro and in vivo studies (28-31). In our study, we observed that the average distance between mb1-mb2, mb1-mb3 and db1-db2 in the upper first molars was 2.35 mm, 2.52 mm and 1.91 mm, respectively (Figure 5). However, the distance to the mb1 was found to be 2.2+0.54 mm by Betancourt et al. (24) and 1.65+0.72 mm by Gorduysus et al. (29).

The distance between the mb1-mb2 and db1-db2 in the upper second molars was 2.14 and 2.01 mm, respectively. In 16% of the cases, mb2 was detected at an

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average depth of 0.72 mm from mb1. This result is very important for finding the mb2 because it was found that the mb2, which could not be detected next to the other canals at the first access in the access cavity, can be detected when the cavity is deepened by an average of 0.72 mm from the base of the cavity and that the additional canal should be searched deeper than the other canal mouths for the upper second molars.

In the lower first molars, the mb-midmesial and ml-midmesial distances were 1.81 and 1.76 mm, respectively. It was observed that 60% of the mesiolingual canals merged with the mesiolingual canal, and 20% merged with the mesiobuccal canal. No midmesial canal was observed in the lower second molars.

In this study, 84% of the lower first molars had a single canal in the distal root, as in Vertucci type I, and 92% of the lower second molars had a single canal in the distal root. This result was higher than Vertucci et al. (27) and Calıskan et al. (32). In this study, the mesial roots of the mandibular first molars showed a wide variety of canal configurations. Caliskan et al. found the prevalence of a single distal canal to be 70% and two mesial canals to be 90%, with 41% of these mesial canals converging at the apex (32). However, this study shows that in 52% of lower first molars, the mesial root contains different canal configuration types (type III, XVIII, XV, and II). In 20% of cases, it starts as two canals, and the canals merge apically.

The number of teeth used in the study limits the data obtained from this study. We believe that increasing the number of teeth used in this study will increase the accuracy of the data obtained regarding the number, configuration, and location of the canals.

In light of the current and previous studies, it can be said that all canal accesses should be accurately identified during root canal treatment. Magnifiers such as loops and operating microscopes are useful to clinicians, but CBCT images are necessary when extra ducts are suspected. Using adequate light sources, checking the pulp floor with canal probes, and strengthening theoretical knowledge about the points where additional canals can be found can reduce the risk of missed canals.

Conclusion

Molars may exhibit morphological variations that lead to inadequate canal disinfection. Dentists' awareness of different anatomical structures gives them the advantage of performing better treatment.

Disclosure Statement

The author has no conflicts of interest to declare

Ethical Approval

This study was approved by the local ethics committee of Kahramanmaras Sutcu Imam University (2024/06).

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None.

Authors' contributions to the article

E.B. and Z.Ş. constructed the main idea and hypothesis of the study. E.B. developed the theory and arranged/edited the material and method section. E.B. and Z.Ş. have done the evaluation of the data in the Results section. Discussion section of the article written by E.B. and Z.Ş. reviewed, corrected and approved. In addition, E.B. and Z.Ş. discussed the entire study and approved the final version.

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Evaluation of Dental Anxiety Levels and Oral Health-Related Quality of Life of Patients Attending A Periodontology Clinic

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Abstract

Background: Dental anxiety is a problem that develops against dental treatments and practices, has negative effects on the patient's oral health, and affects a large population. This situation may affect individuals' oral health-related quality of life. The purpose of this study was to determine the dental anxiety levels and oral health-related quality of life of patients admitted to our clinic and investigate the relationship between them.
Materials and methods: Three hundred volunteer individuals were included in the study. Participants were asked questions to determine personal characteristics. The Oral Health Impact Profile-14 Scale (OHIP-14) was used to determine the level of quality of life related to oral health, and the Modified Dental Anxiety Scale (MDAS) was used to evaluate the level of dental anxiety. The periodontal status of the participants was evaluated using the gingival index, plaque index, clinical attachment levels, periodontal pocket depth, and the bleeding on probing index.
Results: According to the results of the evaluations, a statistically significant relationship was found between educational status, the frequency of visiting the dentist, and OHIP-14 (p<0.05). MDAS scores of primary school graduates were significantly higher than the other groups (p<0.05). A positive correlation was observed between periodontal parameters and MDAS and OHIP-14 scores (p<0.001). There was also a statistically significant and positive correlation between MDAS and OHIP-14 scores (p<0.001).
Conclusion: Within the limits of this study, high dental anxiety score may negatively affect periodontal parameters and quality of life.

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Keywords: Dental anxiety; quality of life; periodontium.

Introduction

Dental anxiety is a state of uneasiness that develops due to fear felt due to dental treatment. This situation can cause various problems for both the patient and the physician (1). Dental anxiety can negatively affect people's quality of life by causing negative effects on both the oral health and general health of patients (2). The etiology of dental anxiety is thought to depend on many factors such as sex, age, and socioeconomic status. These factors can be listed as the environment (the sight and sound of the instruments used, the examination room and its smell), past traumatic experiences, having a low pain threshold, the physician's approach, the negative effects of people around, TV programs watched, and the presence of bad experiences (3). Therefore, in studies aiming to evaluate dental anxiety, not only dental anxiety should be measured, but also the factors affecting dental anxiety should be evaluated (2).

Periodontal diseases are an inflammatory response to microbial dental plaque that affects the supporting tissues of the teeth and can lead to tooth loss when it progresses (4). Dental plaque and poor oral hygiene are important risk factors for periodontal diseases. Stress is one of the important factors in the etiology of numerous inflammatory diseases, including periodontal diseases (5). Periodontal diseases may be associated with dental anxiety and may affect quality of life in adults (6). Dental anxiety has been identified as a significant barrier to the receipt of dental services and may be exacerbated by situations such as sounds, smells, previous experiences, and friends (7).

Population-based epidemiologic studies have shown that 5-20% of adults experience dental anxiety,

which ranges from a feeling of mild-to-significant anxiety and dental phobia (5). According to the results of studies conducted in Turkey, this rate was reported as between 21.3% and 23.5% (8). Dental anxiety is an important public health problem due to its prevalence and because it has significant psychosocial effects (5). As noted by Berggren and Meynert (9), dental anxiety leads to avoidance of dental treatment, resulting in deterioration of dental health. This situation causes depression, social isolation, feelings of guilt and shame, and lower quality of life (5). Studies have shown that there is a positive correlation between dental anxiety and avoiding dental treatment (10, 11). For this reason, physicians' awareness can be increased by determining the anxiety levels of patients before dental treatment, and thus they can approach and treat the patient more easily.

There are various situations in the daily life of many patients that affect their oral health-related quality of life. For many years, oral health was identified only by the clinic, which did not allow the assessment of the real impact of oral diseases on the daily lives of patients (12). Identifying factors related to dental anxiety can both improve the oral health of patients and provide more successful dental treatments. In the light of this information, this study was planned with the hypothesis that dental anxiety has an effect on the frequency of dental visits, oral care habits and oral health-related quality of life. In the light of this information, this study was planned with the hypothesis that individuals with high dental anxiety avoid dental visits and have poor oral care habits. The aim of this study was to investigate the dental anxiety levels of individuals who applied to our clinic, to evaluate the factors affecting dental anxiety and the effect of dental anxiety on quality of life.

Materials and Methods

The present study included 300 individuals who were admitted for treatment to the Department of Periodontology, Faculty of Dentistry, Recep Tayyip Erdoğan University, between March 2019 and June 2019. The content and aim of the study were clarified to the participants and they signed a voluntary consent form. Approval for the research was received from the XXX University Non-Interventional Clinical Research Ethics Committee (Ethics Committee Decision No: 2019/20). The study was conducted in accordance with the Declaration of Helsinki.

Individuals aged 18 to 65 years, who were literate, had no periodontal treatment in the last 6 months, and who agreed to sign the voluntary consent form were included in the study. Individuals receiving anxiety treatment, using medications that affected anxiety levels, and receiving psychiatric treatment were not included in the study. The Oral Health Impact Profile-14 (OHIP-14) (Figure 1) and Modified Dental Anxiety Scale (MDAS) (Figure 2) were administered to individuals who agreed to participate in the study, with questions to determine personal characteristics. To determine personal characteristics, questions were asked about the participants' education levels, sex, age, smoking status, systemic disease, medications used, and oral hygiene habits (Figure 3).

Figure 1: Oral Health Impact Profile-14 (OHIP-14) Scale

1. Have you had trouble pronouncing any words because of problems with your teeth, mouth or dentures?
2. Have you felt that your sense of taste has worsened because of problems with your teeth, mouth or dentures?
3. Have you had painful aching in your mouth?
4. Have you found it uncomfortable to eat any foods because of problems with your teeth, mouth or dentures?
5. Have you been self conscious because of your teeth, mouth or dentures?
6. Have you felt tense because of problems with your teeth, mouth or dentures?
7. Has your diet been unsatisfactory because of problems with your teeth, mouth or dentures?
8. Have you had to interrupt meals because of problems with your teeth, mouth or dentures?
9. Have you found it difficult to relax because of problems with your teeth, mouth or dentures?
10. Have you been a bit embarrassed because of problems with your teeth, mouth or dentures?
11. Have you been a bit irritable with other people because of problems with your teeth, mouth or dentures?
12. Have you had difficulty doing your usual jobs because of problems with your teeth, mouth or dentures?
13. Have you felt that life in general was less satisfying because of problems with your teeth, mouth or dentures?
14. Have you been totally unable to function because of problems with your teeth, mouth or dentures?

Figure 2: Modified Dental Anxiety Scale (MDAS)

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1. If you went to your dentist for treatment tomorrow, how would you feel?
   (1) Not anxious
   (2) Slightly anxious
   (3) Fairly anxious
   (4) Very anxious
   (5) Extremely anxious
2. If you were sitting in the waiting room (waiting for treatment), how would you feel?
   (Same alternatives as Q.1)
3. If you were about to have a tooth drilled, how would you feel?
   (Same alternatives as Q.1)
4. If you were about to have your teeth scaled and polished, how would you feel?
   (Same alternatives as Q.1)
5. If you were about to have a local anaesthetic injection in your gum, above an upper back tooth, how would you feel?
   (Same alternatives as Q.1)

Figure 3: Oral Examination Form

ORAL EXAMINATION FORM

Name-Surname: ..... Sex: .....

Age: ..... Job: .....

Education level: .....

Systemic anamnesis

Systemic diseases: .....

Medications: .....

Dental anamnesis

Main complaint: .....

Frequency of visits to the dentist: .....

Reason for last dentist visit: .....

Do you think there is a disease in your gums: .....

Smoking status: Smoker ( ) Non-smoker ( )

Oral hygiene habits

1- Do you think you need treatment for your oral health? Yes ( ) No ( )

2- When was the last time you went to the dentist?

3- What was the reason for your last visit to the dentist?

Control ( ) Pain ( ) Bleeding ( ) Caries ( ) Missing teeth ( ) Tooth Extraction ( ) Other ( )

4- What was the last treatment performed?

Filling/root canal treatment ( ) Tooth extraction ( ) Scaling ( ) Surgical procedures ( )

Prosthodontic treatment ( ) Orthodontic treatment ( ) Other ( )

5- Have any complications developed after the dental procedures? Yes ( ) No ( )

6- Tooth brushing frequency

Once a day ( ) 2 times a day or more ( ) 1-2 times a week ( ) Rarely ( )

7- Do you use other dental hygiene tools? Yes ( ) No ( )

To determine the dental anxiety level of the participants, the Turkish version of MDAS, the reliability and validity of which were tested by two different research groups, was used (13, 14). MDAS consists of five questions. Questions are evaluated between 1 and 5 points. Total scores range between 5 and 25.

OHIP is one of the most frequently used scales today to determine oral health-related quality of life in adults (15). In this study, to determine oral health-related quality of life, the short version of OHIP-14 was used. The reliability and validity of the Turkish version were evaluated by Mumcu et al. (16). In this survey, each question is given a score of 0-4 and the total score is between 0 and 56. A high total score means that the quality of life is low (15).

A Williams periodontal probe was used in clinical periodontal examination. The gingival index (GI) (17), plaque index (PI) (18), bleeding on probing (BOP), clinical attachment loss (CAL), periodontal pocket depth (PPD) were evaluated and recorded. Measurements of clinical periodontal parameters were performed by a single examiner (P.C.).

Statistical analysis

The sample size of the study was calculated with type 1 error margin of 5% and power of at least 80% for each variable. The SPSS (IBM SPSS for Windows, ver. 26) statistical package program was used to analyze the data. Kolmogorov-Smirnov (n>50) and Skewness-Kurtosis tests were used to check whether the data in the study were distributed normally. Since the measurements were normally distributed, parametric tests were performed. Descriptive statistics for the variables in the study are expressed as number (n) and percentage (%), mean, standard deviation. The one-way analysis of variance (ANOVA) or independent t-test was applied for comparison between groups. Following ANOVA, the Duncan test was used to identify different groups. Pearson correlation coefficients were calculated to identify the association between measurements. The statistical significance level was acknowledged as $p<0.05$.

Results

Three hundred individuals, 113 (37.7%) female and 187 (62.3%) male, with an average age of 41.74±12.76 years, were included in the study (Table 1). Table 2 shows the association between MDAS and OHIP-14 scores and demographic data. No statistically significant difference was observed between MDAS and OHIP-14 scores according to sex ($p>0.05$). When MDAS scores were compared according to education levels, the MDAS scores of primary school graduates (16.07±4.18) were statistically significantly higher than those of the others ($p<0.05$). The lowest MDAS score was observed in university graduates (14.16±4.90). A statistically significant difference was observed between educational status and OHIP-14 scores ($p<0.05$). The highest OHIP-14 score was found in primary school graduates (18.40±8.38), and the lowest score was observed in university graduates (11.33±7.53). A statistically significant difference was determined between the frequency of visiting the dentist and OHIP-14 scores

(p<0.05). Those who reported going to the dentist whenever they had a problem had the highest OHIP-14 score. A statistically significant difference was found between the answers to the questions "Do you need oral health treatment?" and "What was the reason for your last visit to the dentist?" and OHIP-14 scores (p<0.05). MDAS scores of those who did not perform additional care were found to be statistically significantly higher than those who did (p<0.05) (Table 2).

There was a statistically significant and positive correlation between MDAS and OHIP-14 scores and periodontal parameters and age (p<0.001). There was also a statistically significant and positive correlation between MDAS and OHIP-14 scores (p<0.001) (Table 3).

Table 1. Demographic characterictics and periodontal status of the study population.

Baseline characteristics	**n**	**(%)**
Sex		
Female	113	37.7
Male	187	62.3
Smoking status		
Smoker	88	29.3
Non-smoker	212	70.7
	Mean± SD	
Age	41.74±12.76	
PI (score)	1.52±0.61	
GI (score)	1.52±0.61	
BOP (%)	49.91±34.25	
PPD (mm)	3.44±1.27	
CAL (mm)	2.82±3.44	

PI: plaque index, GI: gingival index, BOP: bleeding on probing, PPD: periodontal pocket depth, CAL: clinical attachment loss, SD: standard deviation

Table 2. Evaluation of MDAS and OHIP-14 scores according to participants' demographic data

		n	**MDAS Mean±SD**	**OHIP-14 Mean±SD**
Sex	**Female**	113	14.85±5.05	14±8.05
	Male	187	14.94±4.24	14.65±7.86
	p		0.874	0.491
Education level	**Primary school**	89	16.07±4.18[a]	18.40±8.38[a]
	Middle school	35	14.66±4.55[b]	15.03±8.96[b]
	High school	97	14.53±4.45[b]	13.02±5.66[c]
	University	79	14.16±4.90[b]	11.33±7.53[d]
	p		**0.033**	**0.001**
Frequency of visiting the dentist	**Every 6 months**	46	13.67±5.30	11.96±8.17[c]
	1 time per year	32	15.50±4.44	13.28±7.57[b]
	Whenever there is a problem	222	15.07±4.38	15.08±7.84[a]

	p		0.122	**0.036**
Do you need oral health treatment?	**Yes**	199	14.96±4.60	15.37±8.38
	No	101	14.79±4.48	12.51±6.58
	p		0.764	**0.003**
When was the last time you went to the dentist?	**0-3 months**	54	14.07±4.35	14.50±8.63
	3-6 months	78	14.71±4.43	13.59±7.97
	6 months-1 year	84	14.61±5.04	13.39±7.68
	>1 year	84	15.92±4.16	16.12±7.48
	p		0.091	0.105
Tooth brushing frequency	**Once a day**	89	14.89±4.82	13.88±7.71
	2 times a day or more	163	14.61±4.50	14.06±7.88
	1-2 times a week	17	15.35±3.69	16.12±6.89
	Rarely	31	16.26±4.41	16.81±9.02
	p		0.309	0.227
What was the reason for your last visit to the dentist	**Control**	66	14.61±4.92	12.73±7.48[c]
	Pain	48	14.77±4.91	15.31±8.90[c]
	Bleeding	28	14.04±4.27	13.68±6.96[c]
	Caries	75	15.21±4.71	13.44±6.90[c]
	Missing teeth	34	15.74±3.18	17.94±7.61[b]
	Tooth extraction	45	14.47±4.04	14.53±8.34[c]
	Others	4	19.50±7.14	23.00±14.02[a]
	p		0.293	**0.011**
Have any complications developed after the dental procedures?	**Yes**	24	16.21±4.93	15.50±11.36
	No	276	14.79±4.51	14.31±7.57
	p		0.143	0.482
Additional care	**Yes**	39	13.44±5.12	12.72±8.89
	No	261	15.12±4.43	14.66±7.76
	p		**0.032**	0.154

MDAS: Modified Dental Anxiety Scale, OHIP-14: Oral Health Impact Profile-14,
SD (standard deviation), Statistically significant at $p<0.05$,
Independent T-test: for two group comparisons, One-way ANOVA: for more than two group comparisons, a, b, c: Indicates difference between groups (Duncan post-hoc test), there is no difference between groups with the same letter

Table 3. Correlation analysis

		Age	PI	GI	BOP	PPD	CAL	OHIP-14
MDAS	**p**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**
	r	0.217**	0.378**	0.378**	0.418**	0.317**	0.168**	0.453**
OHIP-14	**p**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	
	r	0.415**	0.624**	0.628**	0.625**	0.582**	0.409**	

PI: plaque index, GI: gingival index, BOP: bleeding on probing, PPD: periodontal pocket depth, CAL: clinical attachment loss
MDAS: Modified Dental Anxiety Scale, OHIP-14: Oral Health Impact Profile-14
** Statistically significant at p≤0.001, r: correlation coefficient

Discussion

Dental anxiety is a condition that reduces people's quality of life by causing negative effects on both oral health and general health.

The most important step in eliminating dental anxiety is to determine the cause of the anxiety. Verbal and written surveys are used to determine dental anxiety levels and oral health-related quality of life.

In present study, MDAS was used to determine dental anxiety and OHIP-14 was used to determine oral health-related quality of life.

In the present study, as a result of evaluations made according to sex, no statistically significant difference was found between men and women according to MDAS scores. In the literature, many studies reported that the level of dental anxiety was statistically significantly higher in women than in men (1, 2, 19, 20), but some studies found no significant differences according to sex and dental anxiety levels, similar to our study (21, 22). This difference between studies may be due to cultural differences and the sample size examined.

In our study, it was observed that the dental anxiety levels of primary school graduates were statistically significantly higher than the other groups, and the dental anxiety levels of the other groups was similar to each other. In the literature, although there are studies reporting that fear and anxiety towards dentists decrease as the level of education increases (13, 23, 24), there are also studies reporting that there is no association between the level of education and dental anxiety (1, 2, 25). These differences observed between the study results may be due to factors such as differences in the education level classification used in the studies and the numbers of participants, unequal distribution of individuals in the groups, and socio-cultural structures of the individuals.

Providing regular oral care plays an important role in maintaining periodontal health (2). In present study, although the level of dental anxiety increased as the frequency of visiting the dentist and brushing teeth decreased, no statistically significant difference was found. The level of dental anxiety was low in individuals who performed additional care, such as using an interdental brush and mouthwash. Kayaaltı Yuksek and Beşiroğlu (2) reported that individuals with lower levels of dental anxiety had more regular tooth brushing habits. Pohjola et al. (26) reported that individuals with high dental anxiety had lesser tooth brushing frequency. Additionally, there are studies that found no relationship between the need for additional care (2, 3, 27, 28), visiting the dentist (2, 27), and frequency of tooth brushing and dental anxiety (27, 28). Sohn et al. (29) reported that individuals with dental anxiety had irregular dentist visits and that these individuals tended to reduce the number of dentist visits. Armfield et al. (30) reported that individuals who did not fear of dentists visited the dentist at a higher rate. Hagglin et al. (11) found a strong relationship between irregularity in the frequency of visiting the dentist and high dental anxiety.

In this study, the dental anxiety rate of individuals who developed complications at their last dentist visit was higher than those who did not develop complications, although there was no statistically significant difference. In the literature, similar to our findings, it was reported that individuals with a negative dental treatment history had high dental anxiety (2, 27, 31, 32). Deogade et al. (31) found that the anxiety levels of patients who thought their oral health was poor were higher. In present study, although the dental anxiety levels of those who thought they needed oral health treatment were higher, there was no statistically significant difference.

Considering previous studies, there are studies reporting that OHIP-14 scores are higher in women (1, 33), but there are also studies reporting that sex has no effect on oral health-related quality of life (15, 34). In present study, no significant relationship was detected between sex and OHIP-14 score.

In this study, when the association between oral health-related quality of life and educational status was evaluated, it was observed that the oral health-related quality of life values of primary school graduates were significantly higher than those of middle school, high school, and university graduates. In the study conducted by Ng and Leung (34), similar to ours, the association between oral health-related quality of life and educational status was found to be statistically significant. Diken Türksayar and Bulut (1) found that the OHIP-14 scores of primary and secondary school graduates were statistically significantly higher than those of high school and university graduates.

Ng and Leung (34) reported that non-regular dentist visits were associated with low quality of life scores. In the present study, it was found that quality of life worsened as the frequency of visiting the dentist and brushing teeth decreased. Additionally, the oral health-related quality of life of those who did not perform additional oral care was worse than among those who did. The OHIP-14 score of those who thought they needed dental treatment was found to be higher. It can be thought that the oral health-related quality of life of individuals worsens because the decrease in the frequency of tooth brushing and the lack of additional care will cause periodontal health to worsen and the number of decayed and lost teeth to increase. In our study, oral health-related quality of life was found to be worse in those who developed complications as a result of previous dental treatment, although not statistically significant. This may be due to worsening oral health because of fear of complications and avoidance of treatment.

It is known that dental anxiety causes postponement of dentist appointments and dental treatments (30, 35). This causes periodontal diseases and caries to progress, causing conditions such as bad breath, bleeding gums, tooth displacement, difficulty in chewing, and nutritional problems, and thus deteriorating the quality of life of individuals. In present study, it was observed that individuals with high dental anxiety had worse oral health-related quality of life. Similar to our findings, there are studies reporting that high dental anxiety levels and fear negatively affect the quality of life (2, 6, 15, 26, 36). Gisler et al. (15) reported that the level of quality of life related to dental anxiety and oral health had a statistically significant relationship, and the quality of life of patients with high anxiety levels was 3.5 times lower than patients with lower anxiety levels. Diken Türksayar and Bulut (1) found a significant but weak correlation between MDAS and OHIP-14 scores.

In the present study, a statistically significant and positive association was found between dental anxiety scores and periodontal parameters. Levin et al. (5) also found a positive correlation between PI, BOP, radiographic bone loss, PPD, and dental anxiety, similar to our study. In another study, Levin et al. (6) reported that radiographic bone loss and high plaque scores were positively correlated with high dental anxiety, but they found no correlation between BOP and PPD and dental anxiety. According to the results of present study, a statistically significant and positive correlation was found between oral health-related quality of life and periodontal parameters. The increase in pocket depth makes plaque removal more difficult and causes increased plaque formation. Thus, periodontal infection progresses in cycles, which negatively affects the quality of life. In a study conducted in patients with chronic periodontitis, a significant relationship was found between probing pocket depth and radiographic bone loss and OHIP-14 scores (6). Levin et al. (5) reported that there was a significant relationship between bleeding index, PI, radiographic bone loss, pocket depth, and OHIP-14 scores. Şahin Aydınyurt and Altındal (37) found a strong positive correlation between total OHIP-14 scores and PI and GI scores. Similar to our study, Ng and Leung (34) also found a significant relationship between clinical periodontal parameters and quality of life.

Applying scales to determine patients' anxiety levels before treatment can create a different perspective in approaching patients with high anxiety levels. Thus, patients' anxiety can be controlled and dental treatments can be performed more easily. Dental anxiety of patients admitted for treatment should be eliminated and the patient should be relaxed before starting treatment. Communication should be established with patients, the tools to be used should be introduced, the procedures to be performed should be explained to the patients in a clear manner, the patients' questions should be answered, and patients should be prepared for procedures that will be performed.

Additionally, training should be provided on topics such as what approaches should be used to reduce patients' dental anxiety. The oral hygiene motivation of society, especially among individuals with high dental anxiety, should be increased, and they should be encouraged to have regular dental examinations and receive treatment at an early stage. Thus, quality of life related to oral health can be increased.

This study has some limitations. In present study, only patients who were admitted to the periodontology clinic were evaluated. For this reason, considering the possibility that individuals with high dental anxiety might not even come for an examination, or that those who were examined might only receive emergency treatments and left our clinic without visiting, it was possible that

we were not able to reach individuals with high anxiety or who had never been to the dentist. Other limitation is the small sample size in the study. It may be more useful to conduct more detailed evaluations in a larger population, including subgroups of the scales used.

Conclusion

According to the results of this study, there was a relationship between education level, frequency of going to the dentist, thinking that oral health treatment was needed, periodontal status, and MDAS and OHIP-14 scores. However, because not all factors that cause dental anxiety are known, more detailed scales should be developed to determine factors that cause anxiety. Learning the factors that cause dental anxiety and procedures to reduce dental anxiety during treatment may help dental treatment to be more successful and improve oral health.

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Ethics committee approval: Approval for the research was received from the Recep Tayyip Erdoğan University Non-Interventional Clinical Research Ethics Committee (Ethics Committee Decision No: 2019/20).

Authors' contributions to the article

H.Y. and O. K. constructed the main idea and hypothesis of the study. H.Y. and P.Ç. developed the theory and arranged/edited the material and method section. H.Y., O.K. and P.Ç. have done the evaluation of the data in the Results section. Discussion section of the article written by H.Y. O.K. and P.Ç. reviewed, corrected and approved. In addition, all authors discussed the entire study and approved the final version.

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Assessment of Caries Frequency and Severity in Immature Permanent First Molar Teeth Using Panoramic Radiograph in Elazig City, Turkey

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Abstract

Aims: Considering the importance of permanent first molars (PFMs), this study aimed to evaluate the prevalence and severity of caries in immature PFMs on panoramic radiographic images, which are frequently used for diagnosis and treatment, using the Classification and Management System (ICCMS™) as a reference.
Materials and Methods: Panoramic (Planmeca OY, 00880 Helsinki, Finland) X-rays taken for diagnosis and treatment of 799 individuals in the 6-9 age group were evaluated retrospectively. The prevalence and severity of caries in immature PFMs were determined using the (ICCMS™) system. Statistical comparisons were performed using SPSS 26 (SPPS Inc., Chicago, IL, USA). Chi-square analysis was used to compare the presence of dental caries according to age, sex, and tooth position. The study determined The statistical significance level was set at $p<0.05$.
Results: There was a statistically significant difference between individual evaluations of the presence of caries according to age ($p<0.05$). While the highest number of caries was seen in 8-year-old children, the lowest number of caries was seen in 7-year-old children. There was no statistically significant difference between individuals' evaluations of the presence of caries according to their sex ($p>0.05$), and there was a statistically significant difference between individuals' evaluations of the presence of caries according to the position of their teeth ($p<0.05$). Caries were observed at a higher rate in the lower left and right teeth.
Conclusion: In this study, the prevalence of caries in PFMs was 7.0% and the rate of extensive-stage caries was 3.9% in children aged 6-9 years. Thus, PFMs decay within 1-3 years following eruption. Studies that raise awareness of this alarming situation need to be conducted.

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Key words: Caries prevalence, immature, permanent first molars, panoramic radiograph.

Introduction

Dental caries are defined as the destruction of the hard tissue of the tooth caused by external factors. Dental caries is a disease that does not cause any symptoms at first and can usually be prevented by paying attention to proper oral hygiene and preventive treatments. In developing countries, the prevalence of caries is increasing due to socio-economic reasons and lack of attention to nutrition and oral hygiene habits (1). Dental caries cause time, personal, and financial losses for diagnosis and treatment, especially if the necessary protective measures are not taken, as well as school absences due to toothaches.
It is a problem that needs to be addressed seriously in terms of public health, as it can cause a decrease in learning ability, a reduction in an individual's quality of life, increased use of emergency services, malnutrition, and psychological and spiritual effects on the child (2).

Permanent first molars (PFMs) occur in the oral cavity at approximately 6-7 years of age, without loss of primary teeth, distal to the primary second molars, and

their root development is completed in approximately three years (3). As tooth eruption does not cause adverse effects in many children, most parents are unaware that the tooth has erupted. They also stated that these are primary teeth during dental examinations upon complaint or for control purposes (4).

PFMs are due to reasons such as diets high in carbohydrates, poor oral hygiene, parents' lack of knowledge about the eruption time of these teeth, as well as the fact that they erupt at a young age and have tooth morphologies such as profound and shallow fissures and large crowns, which pave the way for the accumulation of caries-causing bacteria. They rot early during and after eruptions. (5,6) Studies have reported that the risk of caries in PFMs is highest in the first 1–1.5 years, which is the period before the teeth reach occlusion. The risk of caries gradually decreases in the following years (7).

PFMs are the most prominent teeth in size and the most critical teeth in the dental arch. Therefore, the prevalence of caries in this tooth should be known, and necessary precautions should be taken to prevent its progression or the development of new carious lesions. The health of these teeth affects the opinions on oral health in society. This can be considered a reasonable basis for owning (8).

Panoramic radiographs are used for diagnosis and treatment in dentistry (9). Panoramic radiography is a simplified extraoral filming technique that shows the entire maxillo-mandibular region in a single frame. Panoramic radiographs play an essential role in the diagnosis and treatment planning of various dental and jaw problems. Dental panoramic radiographs are frequently used in pediatric dentistry clinics because they are noninvasive and can be tolerated more easily by pediatric patients. (10)

Considering the importance of PFMs, this study aimed to evaluate the prevalence and severity of caries in immature permanent first molars on panoramic radiographic images, which are frequently used for diagnosis and treatment, using the Classification and Management System (ICCMS^{TM}) as a reference.

Materıal and Methods

Before starting this study, **w**ith the approval of Firat University Non-Interventional Research Ethics Committee (Date: 14.09.2023, Decision No: 2023/12-27**),** all procedures were carried out according to the ethical rules and principles of the Declaration of Helsinki. Panoramic radiographs taken with the Planmeca ProMax (Planmeca OY, 00880 Helsinki, Finland) for the diagnosis and treatment of 799 individuals in the 6-9 age group were retrospectively evaluated by a single pedodontist for standardization purposes. The exposure parameters were 85 kVp and 10 mA with an exposure time of 14 s.

Individuals with erupted PFMs and open tooth apices were included in this study. Individuals who lost PFMs, did not erupt PFMs, or had and unclear radiography were excluded from the study.

Assessment of Caries Severity

Classification of caries severity in immature PFMs was determined according to the following radiographic features (ICCMS^{TM}) system (11):

0 = No radiolucency
RA: Initial stages
1 = Radiolucency in the outer half of the enamel
2 = Radiolucency in the inner half of the enamel
3 = Radiolucency limited to the outer third of dentin
RB: Moderate stages
4 = Radiolucency reaching middle third of dentin
RC: Extensive stage
5 = Radiolucency reaching the inner third of the dentin, clinically cavitated
6 = Radiolucency in the pulp, clinically with cavitation

Teeth were classified as no caries, initial, moderate, and advanced caries.

Analysis of Data

Within the scope of the study, teeth 16, 26, 36, and 46 of the 799 participants were examined. Statistical comparisons were performed using SPSS 26 (SPPS Inc., Chicago, IL, USA). Chi-square analysis was used to compare the presence of dental caries according to age, sex, and tooth position. The study determined The statistical significance level was set at $p<0.05$.

Results

Within the scope of this study, caries was examined according to the age of the individuals. According to the results, there was a statistically significant difference between the participants' evaluations of the presence of caries according to age ($p <0.05$). While the highest number of caries was seen in 8-year-old children (10,8%), the lowest number of caries

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was seen in 7-year-old children (3,7%). The presence of caries increases at the age of 8-9. (Table 1)

In this study, the rotten presence of individuals was examined according to sex. According to the results obtained, there was no statistically significant difference between individuals' evaluations of the presence of caries according to their sex (p>0.05). However, a relatively higher rate of tooth decay was observed in boys (7,3%) (Table 2).

The presence of caries was examined based on the position of the individual's teeth. According to the results, there was a statistically significant difference between individuals' evaluations of the presence of caries according to the position of their teeth (p<0.05). The presence of caries was observed at a higher rate in the lower left (n = 36) and lower right (n = 46) teeth. Extensive-level caries was more common in teeth 36 (5,0%) and 46 (6,6%). (table 3)

Table 1. Comparison of Caries Presence by Age.

		Caries Present		P
		Yes n (%)	No n (%)	
Age (years)	6	507 (95,3%)	25 (4,7%)	0,001*
	7	1121 (96,3%)	43 (3,7%)	
	8	1017 (89,2%)	123 (10,8%)	
	9	326 (90,6%)	34 (9,4%)	
Total		2971 (93,0%)	225 (7,0%)	

Chi-squared test, *: p<0.05

Table 2. Comparison of caries presence by gender.

		Caries Present		P
		Yes n (%)	No n (%)	
Gender	Male	1802 (92,7%)	142 (7,3%)	0,737
	Female	1169 (93,4%)	83 (6,6%)	
	Total	2971 (93,0%)	225 (7,0%)	

Table 3. Comparison of the presence of caries according to tooth position.

	Presence of caries				
	No caries	RA (Initial Stage)	RB (Moderate Stage)	RC (Extensive Stage)	P
Upper Right	764 (95,6%)	14 (1,8%)	6 (0,8%)	15 (1,9%)	0,001
Upper Left	763 (95,5%)	13 (1,6%)	6 (0,8%)	17 (2,1%)	
Lower Left	722 (90,4%)	17 (2,1%)	20 (2,5%)	40 (5,0%)	
Lower Right	722 (90,4%)	14 (1,8%)	10 (1,3%)	53 (6,6%)	
Total	2971 (93,0%)	58 (1,8%)	42 (1,3%)	125 (3,9%)	

Discussion

This study evaluated the prevalence and severity of dental caries in immature PFMs in children aged 6-9 years in the Turkish community living in Elazığ city. PFMs are the earliest permanent teeth to erupt in the mouth and play a key role in maintaining the vertical dimension of the face, along with occlusion and chewing function. We also focused on immature teeth because of the high risk of decay within 1–1.5 years after eruption. If early caries detection is not made in immature PFMs and the necessary interventions are not made, the severity of caries will increase very quickly, and its treatment will become increasingly difficult.

In a study covering the 14-17 age group in India, 62.6% had caries in the permanent first molar, whereas this rate was 67.6% in the 18-25 age group, 59.7% in the 26-35 age group, and 51% in individuals over 36 years of age. This has been observed previously (12). In a study conducted in Arabia of 432 children aged 9-12, the prevalence of permanent first molar caries was 75.5% (3). Another study found that children between the ages of 6 and 12 years had 85.4% caries in PFMs (13). Considering these studies, it has been observed that the frequency of caries in the permanent first molar is high in individuals of all age groups. The reasons for this may be that these teeth have a large surface area where bacteria can adhere because of their morphological structure, their eruption time is early, the child's oral hygiene habits are not fully established, and parents do not pay the necessary attention because they do not have sufficient information about this tooth.

Studies have also been conducted on this subject in our country. A survey conducted in Erzurum in the 7-15 age group observed that 25.2 rate of individuals had caries in their permanent first molars. In addition, the

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study found a significant increase in the rate of caries from the age of 8 years, and the frequency of caries in children aged 12 years increased to 34% (14). Bulucu et al. (15) conducted a study in a 6-12 age group. At age 6, the percentage of caries was 9%, and at age 12, it was 68%. Balkaya et al. Another study determined that the rate of caries in permanent first molars was 44.86% and 7.92% in the 11-14 age group (16).

In a study conducted by Carvalho et al. (6), they stated that the period until the tooth erupts and is completely occluded is the most critical period in terms of preserving the health of the permanent first molars, and that the risk of caries is highest between the ages of 6 and 9. Many studies have stated that the riskiest period for permanent first molars in caries is between 6-9 (7,14,15,17). Considering these studies, we chose ages between 6 and 9 years, where the risk of caries is high in this study.

Dimitrovska et al. (7) found that 36% of newly erupted permanent first molars of 127 children aged 6–7 years had caries. In another comprehensive study conducted in Mexico between 1999 and 2001, it was observed that 21.7% of the permanent first molars of 452 children between the ages of 6 and 9 had caries (18). Akıncı evaluated the permanent teeth of 600 children in the 4-12 age group and found that the prevalence of caries in permanent first molars was 7.69% in the 6-year-old group, increasing with age, reaching 73.89% in the 9-year-old group and 78.98% in the 12-year-old group (19). Our study broadly supports Akıncı's findings. In this study, the highest prevalence of caries was seen in 8-year-old children, while the lowest was seen in 7-year-old children. The presence of caries increases at the age of 8-9. Additionally, caries in immature PFMs were observed at 7%. Bulucu et al. (15) found this rate to be 9% in 6-year-old child groups. In a study conducted by Aras and Dogan in Sanlıurfa, the prevalence of caries in immature PFMs was 51.2% (20). We think that the reason why this rate is lower in our study may be because the children in these regions are at different socioeconomic levels.

In addition, in a study conducted by Aras and Dogan, the prevalence of caries in immature PFM teeth was found to be 41.2%, 51.6%, and 60.4% in 7-, 8-, and 9-year-old children, respectively (20).

This study found that The rates were 4.7%, 3.7%, and 10.8% at the ages of 6, 7, 8, and 9 years, respectively.

Güler et al. (21) Their study in Malatya determined that girls attach more importance to brushing frequency than boys. In addition, in a survey conducted by Akıncı, it was observed that those who brushed their teeth more often had better oral and dental health (22). Individuals who brushed their teeth once a day experienced more tooth loss than those who brushed their teeth two or more times a day. Several types of caries have been reported (23).

In this study, although there was no statistically significant difference between individuals' evaluations of the presence of caries according to their sex, it was observed that boys had a relatively higher rate of tooth decay. Therefore, in this study, Güler et al. This may be related to the fact that girls care more about oral and dental health, which supports her study.

In a study conducted by Aras and Dogan, it was observed that in immature PFM teeth, the lower molars had more advanced caries than the upper teeth (20). The results of our study were consistent with those of this study. Advanced caries (RC) occurs primarily in the teeth number 46. This finding was confirmed by Ahmed et al. This can be explained by the fact that the lower teeth are more prone to caries due to differences in the morphology of the teeth and eruption period (24).

The limitations of our study are the poor quality of panoramic radiography or the fact that initial caries were not observed on panoramic radiography. Despite these limitations, panoramic radiography with good image quality is preferred. Additionally, panoramic radiography facilitated a retrospective analysis because of the number of children in the study.

Conclusion

In our country, PFMs decay, are restored, or are lost at a very early age. In this study, the incidence of caries in PFMs was 7.0% and that of advanced caries was 3.9% in children aged 6-9. Thus, PFMs decay within 1-3 years following eruption. Therefore, if the necessary precautions are not taken, the dental treatment of teeth with open roots may be more complex. More extensive studies on this subject need to be conducted in our country, and societal awareness of this issue needs to be increased. In addition, it is recommended that parents need special care and attention, especially for oral hygiene education of the 6-7 age group, and that these children should be brought under regular dentist control and preventive treatments should be performed when necessary.

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Compliance with ethical standards

This study was approved by the Firat University Non-Invasive Research Ethics Committee (date: 14.09.2023; Decision No: 2023/12-27**).**

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Evaluation of Dental Anxiety Levels on Oral and Dental Health Quality of Life in Patients with Hashimoto Thyroiditis

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Abstract

Aim: This study aimed to evaluate the effect of anxiety level, dental fear, anxiety on oral health quality of life oral, and dental health in Hashimoto's thyroiditis patients.
Materials and Methods: Ninety adult individuals were included from Gaziantep University Faculty of Dentistry. All participants were asked about demographic parameters (age, gender), socio-economic status (education, marital status), and oral hygiene habits. The Oral Health Impact Profile-14 (OHIP-14) and oral health-related quality of life - United Kingdom (OHRQoL-UK) questionnaires were used to asses the effect of individuals' oral health on their quality of life. Dental anxiety levels were evaluation with the Modified Dental Anxiety Scale (MDAS). Statistical analysis was performed using IBM SPSS Statistics 22.0.
Result: There were no significant differences for Sociodemographic data, dental habits, age, marital status, educational status, smoking, frequency of brushing tooth, frequency of visiting the dental clinic in OHIP-14, OHRQoL, and MDAS survey scores ($p > 0.005$). However, there was a statistically moderate positive correlation between the total OHIP-14 scores and the MDAS scores ($r = 0.309$; $p < 0.003$). Additionally, a moderate negative correlation was showed between the total OHRQoL and the MDAS scale ($r = 0.307$; $p < 0.003$).
Conclusion: In conclusion, this study showed that patients' quality of life regarding oral and dental health was low, regardless of individual factors. It was found that dental anxiety was lower in patients with HT, and a significant correlation betwen the quality of life and anxiety level was observed.

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Keywords: OHIP-14, Hashimoto's thyroiditis, MDAS, OHRQoL-UK.

Introduction

Hashimoto's thyroiditis (HT) is one of the chronic autoimmune diseases. It is characterized by a variable degree of decreased thyroid function and elevated levels of thyroid peroxidase antibodies (anti-TPO) and thyroglobulin antibodies (anti-TG), as well as other thyroid antibodies and lymphocytic infiltration. The prevalence of the disease depends on factors such as gender, age (especially between 45-55 years), and race (more common in whites than in other races) (1). Hashimoto's disease primarily affects women and has a prevalence rate of 2% in our society. It is characterized by the progressive destruction of thyroid tissue, although the exact mechanism is not fully understood. Possible factors involved in its etiology include dietary iodine intake, female gender, stress, smoking, alcohol, drug therapy (cytokine therapy and estrogens), bacterial (Yersinia enterocolitica) and viral infections, vitamin D deficiency, selenium deficiency, pregnancy, fertility, and age (2).

"Fear" and "anxiety" are terms that are often used interchangeably, though they refer to different experiences, but they have different meanings Fear is a subjective feeling towards a known situation, whereas anxiety is the uneasiness towards an unknown situation, implying worry (3). Dental anxiety is an intense state of uneasiness that cannot be easily explained and is related to fear and anxiety associated with dental treatments (4). Despite recent developments in dentistry, anxiety and fear about dental treatments continue to be widespread in society (5). Dental anxiety, which causes patients to

avoid treatment during or just before dental procedures due to extraordinary expectations, is a significant issue that can negatively impact the treatment process (6). This anxiety, which includes emotional, somatic, and cognitive elements, leads to the deterioration of patients' oral and dental health and adversely affects their quality of life (7). The oral/dental cares of patients avoided regular dental check-ups and treatments due to anxiety gradually deteriorates, eventually leading to urgent treatment needs. It has been determined that the dental fear levels of these patients, who seek urgent care, may increase. As a result of the pain efficient, they may avoid dental treatments even more, creating a vicious cycle (8).

HT can significantly affect the quality of life of individuals, potentially impacting all areas of life. Bocchetta et al. report that there is a pathogenic effect between HT and mood disorders, and it is also suggested that there may be a link between thyroid diseases and cognitive decline (9).

Scales such as the MDAS, DAS, and Dental Fear Questionnaire (DKA) are used to determine levels of dental anxiety. These scales, which observe psychological and behavioral changes, allow individuals to assess themselves (10). The MDAS, a 5-question self-assessment scale developed by Humpris et al., with Turkish validity and reliability studies conducted by Tunç et al., is frequently used because it is short and cost-effective in population-based studies (11).

OHIP-14 scale is a specific one developed by Slade et al. (12) to comprehensively assess the effects of individuals' current oral and dental health on patients' health and quality of life. Slade reduced the original 49-question scale to 14 questions to facilitate its use in clinical settings. When compared with the original form, a validity of 94% was observed (13). Başol et al. carried on a validity and reliability study of this scale in Turkish. (14), and the Cronbach's alpha value was obssrved as 0.74.

OHRQoL is based on the World Health Organization's (WHO) "structure-function-ability-participation" model, which was renewed in 1998 and focuses on health and disease states (both positive and negative). It is a questionnaire developed in England by McGrath et al.(15). The questionnaire includes two some questions on symptoms, on physical condition, on psychological condition, and on social status. Mumcu et al. (16) was conducted of validation in Turkish people scale with Cronbach's was observed as 0.96.

OHIP-14 and OHRQoL-UK were used to assess the impact of individuals' oral health on their quality of life. Dental anxiety levels were measured with the MDAS. The cut-off value of ≥13 was established to detect high dental anxiety.

The null hypothesis of the study was

i. The level of dental anxiety is high in patients with Hashimoto's thyroiditis

ii. There is no correlation between HT patients' dental health and quality of life and their dental anxiety

Materials and Methods

Ethics Committee Approval

The study was initiated after obtaining both written and informed consent from the patients, prepared with the Helsinki Declaration and, approved by the Gaziantep University Ethics Committee (Ethics Committee Approval Date - No: 2020/281).

This study aimed to asses the general oral health of 90 participant over the age of 18 who applied to the Gaziantep University, Faculty of Restorative Dentistry Department, and who had no other systemic diseases, in order to make comparisons regarding dental anxiety.

Participants were provided with a questionnaire form that included sociodemographic questions in the first part. Demographic information was gathered about gender, body mass index, education status, reason for application, tooth brushing frequency, and frequency of dental check-ups. The lowest level of education recorded was literacy, while the highest was university education. To assess tooth brushing habits, responses were classified as never, irregular, once daily, or two or more times daily. Smoking habits, including whether the participants smoked and the daily amount if they did, were also assessed. The purpose of the questionnaire was to profile the individuals regarding their general condition, hygiene habits, and interest in oral health.

In the second part of the form used in our study, the OHIP-14 questionnaire was utilized to assess the oral hygiene profile, and the OHRQoL scales were used to assess quality of life, while the MDAS was employed to evaluate fear and anxiety. The OHIP-14 scale is a measurement tool consisting of seven dimensions. Each question was evaluated using a 5-point Likert scale (0: never, 1: rarely, 2: sometimes, 3: often, 4: always). These categories are addressed under separate headings: functional limitation (questions 1-2), physical pain (questions 3-4), psychological discomfort (questions 5-6), physical disability (questions 7-8), psychological disability (questions 9-10), social disability (questions 11-12), and handicap (questions 13-14).

The total score of the questionnaire is obtained by summing the points given to all questions. Scores on the

OHIP-14 scale range from 0 to 56, with higher scores indicating a lower quality of life related to oral and dental health and an raise in severity of current symptoms

The MDAS was used to measure the level of dental anxiety. This scale consists of 5 questions, with scores ranging between 5 and 25. On this questionnaire, 1 point indicates "I feel comfortable," 2 points indicate "I feel slightly tense," 3 points indicate "I feel anxious," 4 points indicate "I feel anxious and distressed," and 5 points indicate "I am very scared; I feel changes in my body such as sweating.

The OHRQoL scale consists of 16 questions evaluated across 4 subscales: symptoms (2 questions), physical condition (5 questions), psychological condition (5 questions), and social condition (4 questions). A 5-point Likert scale is used to score this scale (Very bad effect = 1, Bad effect = 2, No effect = 3, Good effect = 4, Very good effect = 5). The lowest possible score on the scale is 16, while the highest possible score is 80.

Statistical Analysis

Statistical analysis of the data obtained from the study was performed using the IBM SPSS Statistics 22.0 (SPSS Inc., Chicago, IL, USA) program. The suitability of numerical variables for normal distribution was analyzed using the Shapiro-Wilk test. Since all variables were normally distributed, ANOVA tests were used for comparisons between groups. Comparisons of categorical data between groups were performed using the exact method of chi-square analysis. Relationships between parameters were evaluated using the Pearson correlation test, with the significance level set at $p < 0.05$. The correlation coefficient was interpreted as follows: $r > 0.60$ was considered a high correlation, $r = 0.3$-0.6 was considered a medium correlation, and $r < 0.3$ was considered a low correlation.

Results

The study was conducted with 90 female patients aged between 20 and 60 years who had Hashimoto's thyroiditis. The age distribution was as follows: 33.3% were aged 20-30, 23.3% were aged 31-40, 23.3% were aged 41-50, and 20% were aged 51-60. Of the participants, 63 (70%) had a body mass index (BMI) above 25, indicating that the study focused on overweight and obese individuals. Additionally, 70% of the patients were either university graduates or currently in the process of obtaining a university degree. It was noted that 69 (76.7%) of the participants were non-smokers.

Sociodemographic factors and habits such as age, marital status, education level, frequency of tooth brushing, smoking, and frequency of visiting the dentist did not show significant differences in OHIP-14, OHRQoL, and MDAS questionnaire scores ($p > 0.005$) (Table 1).

Table 1: Sociodemographic and clinical findings (n, %) and p values between oral health-related quality of life scales scores (OHİP-14, OHRQoL, MDAS)

AGE	Frequency (n)	Percentage (%)	OHIP-14 P	*OHRQoL* P	MDAS P
20-30	30	33,3	p>0,05	p>0,05	p>0,05
31-40	21	23,3			
41-50	21	23,3			
51-60	18	20,0			
BMI					
Weak	3	3,3	p>0,05	p>0,05	p>0,05
Healthy Overweight Obese	39	43,3			
Weak	27	30,0			
Healthy Overweight Obese	21	23,3			
MARITAL STATUS					
Married	66	73,3	p>0,05	p>0,05	p>0,05
Single	24	26,7			
LEVEL OF EDUCATION					
Elementary	6	6,7	p>0,05	p>0,05	p>0,05
Primary education	9	10,0			
Secondary education	12	13,3			
University	63	70,0			
FREQUENCY OF CIGARETTES	(n)	(%)			
Yes	12	13,3	p>0,05	p>0,05	p>0,05
No	69	76,7			
Sometimes	9	10			
FREQUENCY OF VISITED TO DENTİST					
In the presence of a complaint	30	33,3	p>0,05	p>0,05	p>0,05
Once every three to five years	39	43,3			
1-2 per year	21	23,3			
FREQUENCY OF TOOTH BRUSING					
None	12	13,3	p>0,05	p>0,05	p>0,05
1 time per day	42	46,7			
2 times a day	36	40,0			

*p<0.05

The mean scores for the scales used in the study are presented in Table 2. There was a statistically moderate positive correlation between the Total OHIP-14 score and MDAS (r = 0.309; p < 0.003). Conversely, a moderate negative correlation was found between the Total OHRQoL score and the MDAS scale (r = 0.307; p < 0.003) (Table 3).

Table 2: Mean Values of Oral health-related quality of life questionnaire and Modified dental anxiety scale scores (OHİP-14, OHRQoL, MDAS) (Mean± Sd)

OHIP-14	MEAN ± SD
Functional limitati	1,60 ± 2,1
Physical pain	3,46 ± 1,9
Psychological discomfort	2,00 ± 2,1
Physical disability	1,93 ± 2,2
Social disability	2,10 ± 2,03
Psychological disability	1,40 ± 1,9
Handicap	1,40 ± 1,7
TOTAL	12,50 ± 10,5
OHRQoL	
Symptom	5,20 ± 2,4
Physical status	14,96 ± 4,9
Psychological status	14,40 ± 4,2
Social status	11,56 ±3,2
TOTAL	34,56 ± 11,03
MODIFIED DENTAL ANXIETY SCALE	
MDAS 1	2,03 ± 1,1
MDAS 2	2,06 ±1,8
MDAS 3	2,60 ± 1,2
MDAS 4	2,13 ± 1,25
MDAS 5	2,63 ± 1,4
TOTAL	11,46 ±5,4

Table 3. OHIP-14 and OHRQoL correlation with MDAS

	MDAS1		MDAS2		MDAS3		MDAS4		MDAS5		TOTAL MDASMDAS	
	r	p	r	p	r	p	r	p	r	p	r	p
OHIP-14												
Functional limitati	,456	0,000	,495	0,000	,185	0,081	,409	0,000	,332	0,001	,372	0,000
Physical pain	,481	0,000	,296	0,005	,232	0,028	,369	0,000	,229	0,030	,333	0,001
Psychological discomfort	,310	0,003	,145	0,174	-0,075	0,484	,281	0,007	,011	0,921	,113	0,290
Physical disability	,574	0,000	,469	0,000	,166	0,118	,527	0,000	,202	0,056	,370	0,000
Social disability	,325	0,137	,158	0,137	,051	0,632	,347	0,001	,124	0,246	,217	0,040
Psychological disability	,435	0,000	,282	0,007	,085	0,425	,328	0,002	,024	0,821	,199	0,060
Handicap	,646	0,000	,543	0,000	,254	0,016	,520	0,000	,274	0,009	,432	0,000
TOTAL	,520	0,000	,354	0,001	,114	0,285	,442	0,000	,165	0,120	,309	0,003
OHRQoL												
Symptom	-,205	0,053	-,056	0,603	,283	0,007	-,238	0,024	-,362	0,000	-,282	0,007
Physical status	-,450	0,000	-,226	0,032	,366	0,000	-,488	0,000	-,342	0,001	-,430	0,000
Psychological status	-,294	0,005	-,081	0,449	,175	0,099	-,213	0,044	-,151	0,156	-,198	0,062
Social status	-,411	0,000	-,239	0,023	,294	0,005	-,402	0,000	-,268	0,011	-,374	0,000
TOTAL	**-,324**	**0,002**	**-,104**	**0,329**	**,272**	**0,010**	**-,350**	**0,001**	**-,268**	**0,011**	**-,307**	**0,003**

*p<0.05

Discussion

Autoimmune thyroiditis, commonly known as Hashimoto's Thyroiditis, is a prevalent condition that increases in frequency with age. Comprehending the connection between anxiety and quality of life in patients with Hashimoto's Thyroiditis is crucial for both patients and healthcare providers. This study aimed to evaluate the relationship between dental anxiety and oral-dental health-related quality of life in patients with Hashimoto's Thyroiditis. Oral-dental health is a A crucial aspect of maintaining overall well-being. and it has been clinically established that oral and general health mutually influence each other. (17), the evaluation of the effect of oral and dental health profile on general health quality of life is meaningful for this patient group, which has not been studied before. In our study, OHIP-14 was used to evaluate oral hygiene profile and OHRQoL scales were used to evaluate quality of life, while MDAS scale was used to evaluate fear and anxiety. Since both scales can detect relationships between different variables under the same domain, the use of OHIP-14 and OHRQoL questionnaire together contributed to the evaluation of different parameters.

In the study by Doğaner et al., a cut-off value of 15 was established for identifying high scores for dental anxiety. In contrast, Caltabiano et al. recommended a higher cut-off value of 19 for the same purpose (18). Considering that dental anxiety levels in this patient group are expected to be lower compared to healthy individuals, the study by Tunç et al., which includes reliability/validity analysis of MDAS questionnaire, was used as a reference for determining the appropriate cut-off value (11).

According to this study, individual parameters such as marital status, age, education level, tooth brushing habits, smoking, BMI and visiting frequency the dentist did not influence the patients' quality of life concerning oral/dental health. This aligns with the study by John et al. (19) ., which also found that education and age did not significantly impact oral and dental health-related quality of life. However McGrath et al. (20) conducted in England to identify key parameter related to OHQoL, it was observed that age, socioeconomic status, and individual factors.

It was found that the average MDAS scores of patient in our study were below the cut-off value for dental anxiety levels. Ilguy et at. (21), the MDAS scale was administered to a group of Turkish patients, revealing a dental anxiety frequences of 8.8%. In the study conducted using a different scale in individuals with thyroid disease, anxiety and depression levels were evaluated and no significant relationship was found between depression or
anxiety and dentist anxiety (22). However, on the other study et al. were found that patients with autoimmune

thyroiditis were more likely to exhibit symptoms of depression and anxiety compared to healthy controls (23). The dental anxiety in individuals with autoimmune diseases studies are limited in the literature. The low average dental anxiety observed in our study may be attributed to the fact that 86.7% of individuals with Hashimoto's thyroiditis brush their teeth at least once a day, suggesting that patients who maintain good oral hygiene are less likely to experience traumatic dental procedures.

In our study, we found a moderately significant correlation between the anxiety scale and both the OHIP-14 and OHRQoL questionnaire. This result aligns with the findings of McGrath and Bedi, who conducted a study with 1800 participants and examined the effects of dental visit frequency, oral hygiene practices, and dental anxiety on OHRQoL in detail (20).

Despite numerous studies on OHRQoL across various populations, research specifically focusing on individuals with Hashimoto's thyroiditis (HT) remains limited. Our study is valuable in providing insights into dental anxiety and OHRQoL in a frequently encountered yet under-researched patient group.

For comparison, Azuma et al. (24) used the OHRQoL and OHIP-14 scales to assess the quality of life in Sjögren syndrome' patients, finding an average OHIP-14 score of 15.9. This suggested low quality of life according to the OHRQoL scale. Similarly, another study on primary Sjögren syndrome patients reported an average OHIP-14 score of 16.2 and low quality of life according to the OHRQoL scale (25). Salehi et al. found that individuals with thyroid disease had lower oral health-related quality of life compared to healthy individuals, highlighting the need for better periodontal and dental care. (26). De Pinho et al. (27) examined the impact of gum problems in diabetic patients using the OHIP-14 scale and found that gum issues negatively affected quality of life. In this study observed that the average OHIP-14 score was 12.50 and the average OHRQoL score was 34.56. Despite a good oral hygiene profile in individuals with HT, their scores was lower, which is consistent with the literature mentioned.

The both null hypothesis were rejected.

There are several limitations to our study. These include, the exclusive participation of women, and the lack of classification of participants based on their HT treatment status. However, the power analysis indicated that the sample size was adequate for diagnostic efficiency.

To fully grasp the connection between oral health and dental anxiety in individuals with Hashimoto's thyroiditis, further longitudinal studies are necessary.

Conclusion

In conclusion, this study showed that patients' quality. of life regarding oral/dental health was lower, regardless of individual factor. It was also found that dental anxiety was generally low among patients with HT, and there was a significant relationship between dental anxiety and quality of life.

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Conflict of İnterest

There is no personal or financial conflict of interest between the authors.

Ethics Committee Approval

The study was initiated after obtaining written and verbal consent from the patients, prepared in accordance with the Helsinki Declaration and approved by the Gaziantep University Non-Interventional Clinical Research Ethics Committee (Ethics Committee Approval date - No: 2020/281).

Author Contributions

Conceptualization: GBA, GSD; Data Curation: GBA, GSD; Formal Analysis: GSD; Investigation: GSD, GBA, OS; Methodology: GSD, GBA; Supervision: GSD; Validation: GSD, GBA OS; Visualization: GSD, GBA, OS; Writing-Original Draft: GBA, GSD; Writing – Review & Editing: GSD, GBA, OS

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Removal of Two Canal Instruments from the Mesiobuccal Canal of a Mandibular Molar Tooth: A Case Report

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Abstract

One of the important factors that affect the success of root canal treatment is the complete removal of the pulp all the way to the root apex and disinfection of the canal. One factor that may impede this process is the existence of fractured canal instruments within the canal. In some cases, this problem can be eliminated by bypassing the broken instrument. However, this may not always be possible and the removal of the instrument is necessary. In this case report, we present the extraction of two fractured instruments inside the mesiobuccal canal of the lower left first molar of a 30-year-old female patient, performed under a microscope.

Case Report (HRU Int J Dent Oral Res 2024;4(2): 59-62)

Key words: Bypass, retreatment, broken file.

Introduction

The success of root canal treatment depends on the success of shaping and disinfection processes (1,2). To achieve effective disinfection, root canals must be shaped up to a certain width to accommodate the application of irrigation solutions and medication. However, there is a risk of fracture associated with the files used during the shaping process. The presence of broken instruments negatively affects the disinfection, forming and filling processes, hence the success of treatment (3). In a study, it was recorded that the fracture rate of hand files was 0.25%, and NiTi rotary instruments were 1.68%-2.4% (4).

Fracture of endodontic instruments in root canals is one of the most undesirable complications encountered during endodontic treatments (5). A study conducted by reviewing follow-up radiographs indicates that the prevalence of instrument fracture ranges from 0.4% to 5% (6). Broken instruments typically hinder reaching the apex and teeth with broken instruments in their canals have a worse prognosis compared to other teeth that have undergone root canal treatment. The prognosis of these cases depends mainly on the pre-treatment condition of the periapical tissues (7). However, an attempt should still be made to remove the broken instruments in all cases and leaving the instruments in the canal intentionally should only be considered in cases where the broken part cannot be removed and the periapical tissues are asymptomatic (8). In most cases, orthograde removal of broken instruments is very difficult and time-consuming (3). There are numerous reports regarding the methods for removing broken instruments from root canals. From the past to the present, methods involving chemical agents such as iodine trichloride, mechanical methods like hand instruments and ultrasonic devices, as well as surgical techniques, have been utilized (5). It is reported that the success rate in removing broken instruments varies between 55% and 79% (9).

The most common causes of file fractures are the complexity of the configuration of root canals, the use of files more than the recommended number of uses, the use of files without paying attention to their numbers and techniques, presence of excessively inclined channels, insufficient irrigation, fabrication errors in the production of files and insufficient experience of the practitioner (10).

The initial stage in the treatment of file fractures typically involves non-surgical approaches. Among these methods are the removal or bypassing of the fractured file, or cleaning and filling the root canal

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up to the level of the fragment (where the broken instrument is located) (11).

In a study, two significant issues related to retaining broken instruments in the apical region were highlighted, which could affect the long-term treatment outcomes (12). The first issue is the corrosion of the metal part located inside the root canals. A two-year follow-up study has shown that stainless steel (SS) files are inert and corrosion-resistant (12). The authors stated that this problem should be addressed in future studies on both stainless steel and Ni-Ti files (11).

The second issue is that the leftover fragments are most likely to endanger the effective irrigation of the apical part of the root canal, which can negatively affect the treatment outcome. This is particularly relevant for teeth with periapical pathology. Reports indicate lower success rates in cases where both broken files and periapical lesions are present (13).

Surgical approaches include apisectomy, root amputation, or intentional replantation, and these are treatment options used to save the tooth before extraction (14). But sometimes the surgical approach, especially apisectomy, may not be applied due to the difficulty of access to the area, lack of visibility of the surgical area, proximity to important anatomical regions such as the mandibular canal and neurovascular bundle. Additionally, surgical methods are both more invasive and prone to more complications compared to non-surgical methods (11). For addressing these issues, positive developments include the use of dental operating microscopes with better magnification and illumination, improved designs of ultrasonic tips, and the utilization of innovative instrument access systems.

Case Report

In the dental history obtained from a 30-year-old female patient without any systemic diseases who presented to our clinic, it was learned that she experiences pain on the lower left first molar tooth while biting. Informed consent was taken before any dental procedure conducted. Periapical radiography of the patient (Figure 1) showed that there were 2 broken instruments in the apical third of the mesiobuccal canal. During the first session, under the dental operating microscope, the old root canal filling was removed, and access to the broken instruments was achieved. Since the attempt to bypass the files was unsuccessful, a modified size 4 Gates Glidden drill (Figure 5) was used to create a platform up to the first broken instrument, and the broken piece was visually identified. The dentin was removed circularly from the periphery of the file using ultrasonic tips. Using ultrasonic tips without cutting features, movement were made counterclockwise around the file to free the broken piece within the canal.

With the help of irrigation, the first broken part was removed from the canal, and then periapical radiography was taken (Figure 2). Then the second broken piece was bypassed. During the preparation, the broken instrument found in the canal was removed. Subsequently, purulent exudate drainage was observed in the mesiobuccal canal. The root canals were irrigated with physiological serum, dried with microsuction and then checked with paper points. Since purulent exudate findings were encountered on the paper points used, the cavity was sealed using a loose cotton and temporary filling material (Figure 3). The patient was given an appointment for the second session two days later.

When the patient came to the second session, it was learned that the pain during chewing had decreased. After the cavity was reopened and the root canals were irrigated using physiological serum, they were checked with paper points and no signs of exudation were found. Subsequently, the root canals were irrigated with 20cc NaOCl per canal and irrigation solution was activated for 15 seconds with the help of ultrasonics(Endoart ultrasonic polymer tips, İnci Dental). After drying the canals, they were temporarily filled with $Ca(OH)_2$, and the cavity was sealed with sterile Teflon and temporary filling material. The patient was scheduled for a third appointment in two weeks.

During the third session, it was found that the symptoms had completely resolved. After opening the cavity, $Ca(OH)_2$ was removed with the help of NaOCl and ultrasonic polymer tips. The canals were dried, and then filled with bioceramic root canal sealer(Dia-Root Biosealer, DiaDent Group International) and gutta-percha cones. At the most apical point of the created platform, it was cut and condensed. The remaining part of the canal was filled using thermoplastic gutta techniques (Figure 4).

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Figure 1: Initial periapical radiograph.

Figure 2: Periapical radiograph taken after the removal of the first broken instrument

Figure 3: Radiograph taken after placement of $Ca(OH)_2$

Figure 4: Periapical radiograph taken after root canal filling and coronal restoration

Discussion

The use of ultrasonic devices with the help of a microscope is a more conservative method of removing broken instruments compared to other alternatives (15,16). Ultrasonic devices can conservatively remove dentin structure, and they have a lower likelihood of causing damage to root structure and periodontal tissue (17).

Another procedure for removing broken instruments is performed by Ward et al. (17). This technique is a small variation of the technique described by Ruddle (18). In brief summary, it relies on creating a flat platform in the canal using modified Gates-Glidden drills. The purpose of this technique is to create a funnel-shaped enlargement in the canal towards the broken instrument to facilitate its visualization under the operating microscope. The Gates-Glidden drills were modified by cutting them with a diamond bur at their maximum cross-sectional diameters (19).

Figure 5: Modified Gates Glidden Drill

Conclusion

The attempt to remove broken files is becoming increasingly popular among clinicians. In the past, attempts to remove broken canal instruments often resulted in significant failures. However, with the help of magnification and illumination devices such as a dental operating microscope and with the increasing prevalence and variety of ultrasonic instruments, many clinicians are now able to achieve higher success in removing broken endodontic instruments from the canal.

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Complicated Crown Fracture and Reattachment: Case Report

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Abstract

Aim: The purpose of this case report is; It offers partial amputation with calcium silicate-based biomaterial (Biodentin) to the patient who has a complicated crown fracture in the maxillary left lateral tooth as a result of trauma, and protective and aesthetic restoration of the broken tooth piece using the internal dentin groove method.
Case Report: Thirty-one-year-old female patient; Three hours after the trauma, she applied to our clinic with complaints of pain and tooth fracture. According to the anamnesis, it was learned that the patient had no systemic disease. As a result of clinical, radiographic and intraoral examination, a slight luxation of the maxillary left central tooth and a complicated crown fracture of the maxillary left lateral tooth were detected. Partial amputation treatment was performed on the patient's maxillary left lateral tooth with calcium silicate based biomaterial. In order to provide better retention of the broken tooth fragment, the dentin tissue was removed and a groove was opened, binding agents were applied to the fracture surfaces, composite resin material was placed into the groove, the fragment was placed with the help of finger pressure and the resin was polymerized. Then, groove bevelling was performed on the fracture line and the aesthetic restoration was completed with composite resin material.
Conclusion: In the treatment of crown fractures involving the pulp, partial amputation treatment with calcium silicate-based pulp capping biomaterial and reattachment treatment by removing dentin tissue from the broken part of the tooth (internal dentin groove) in order to increase retention were found to be successful.

Case Report (HRU Int J Dent Oral Res 2024;4(2):63-68)

Key words: Calcium silicate, reattachment, internal dentin groove.

Introduction

Dental traumas can appear as problems that can range from a simple injury to serious injuries in the mouth and surrounding soft and hard tissues, depending on the type of accident and the severity of the impact. In cases of dental trauma, a small enamel fracture may occur, as well as dental hard tissue injuries, in which one or more fractures occur in the root or crown. (1) Tooth fractures as a result of dental trauma are a common problem in adults and children. These injuries mostly involve the incisors, especially the maxillary incisors due to their location in the dental arch. (2,3) Maxillary incisors require rapid, aesthetic and functional repair. (4)Crown fractures involving pulp, dentin and enamel tissue are called complicated crown fractures.(5) Crown fractures seen in permanent incisors are observed at a rate of 18-22% in traumas to dental hard tissues.

These are complicated (pulp, dentin and enamel) crown fractures at a rate of 11-15% and simple (dentin and enamel) crown fractures at a rate of 28-44%. (6) Tooth damage, especially in the incisor area, in young patients; Due to its social, psychological and functional effects, a rapid and appropriate treatment option becomes important. An ideal restorative treatment should restore function and aesthetics and protect the remaining tooth and the tissues surrounding the tooth. (7,8)In the treatment of these teeth; Many factors play a role, such as the restoreability of the fracture (presence/absence of a root fracture), the shape of the fracture, the extension of the fracture line (involving pulp or bone), and the presence of a broken tooth piece. (2) In complicated crown fractures; Root canal treatment, amputation (cervical or partial) and direct capping are the treatment options that can be applied. Findings such as the size of the exposed pulp, the

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developmental stage of the tooth and its restorability are important when deciding on the treatment to be performed as a result of radiographic and clinical examination. (9)Biodentin is similar to dentin in mechanical properties and is a material that can be preferred in treatments that require regeneration of the pulp-dentin complex. It induces tertiary dentin formation in treatments where it does not cause pulp inflammation and the pulp is vital, and provides reparative dentin production when it comes into direct contact with the vital pulp. (10-12) It has been reported that more than one material and technique is preferred for the restoration of broken teeth caused by trauma, indirect or direct composite restorations, ceramic crowns, and reattachment treatment with the patient's own broken tooth piece. (1) It has been reported that if the patient has his own broken tooth piece, it can be glued to the tooth after the exposed pulp is treated. (5) It has been determined that the fracture strength increases as a result of the removal of the dentin tissue in the broken piece and provides a strength similar to healthy teeth. (13,14) Gluing the broken piece (reattachment technique) technique generally involves fewer complications, is more economical and faster, and also provides a long-lasting and more natural aesthetic appearance because the original surface shape, anatomical form, color, structure and shape of the tooth are preserved. (6,15)

This case report aims to present the partial amputation of the maxillary left lateral incisor tooth with calcium silicate-based biomaterial, which has a complicated crown fracture due to trauma, and reattachment therapy performed by removing dentin tissue from the broken part of the tooth.

Case Report

A thirty-one-year-old female patient was admitted to the clinic of the Department of Dental Diseases and Treatment of the Faculty of Dentistry of Harran University after a domestic accident due to a tooth fracture. When the patient was admitted to the clinic, about three hours had passed since the trauma. As a result of the history taken, it was learned that the patient did not have any systemic diseases. During the extraoral examination, it was found that there were no signs related to trauma. As a result of clinical intraoral examination and radiographic examination, a complicated crown fracture occurred in the maxillary left lateral tooth, while slight luxation was observed in the maxillary left central tooth. It was found that there were no fractures in the alveolar bone and the roots of the teeth. When the patient applied to the clinic, the broken part of the maxillary left lateral tooth was not with him, but he was told to keep the broken part in a container containing physiological serum because he reported that he could find it (Figure 1-3).

Fig 1: Intraoral view of the patient.

Fig 2: Radiographic image of the patient.

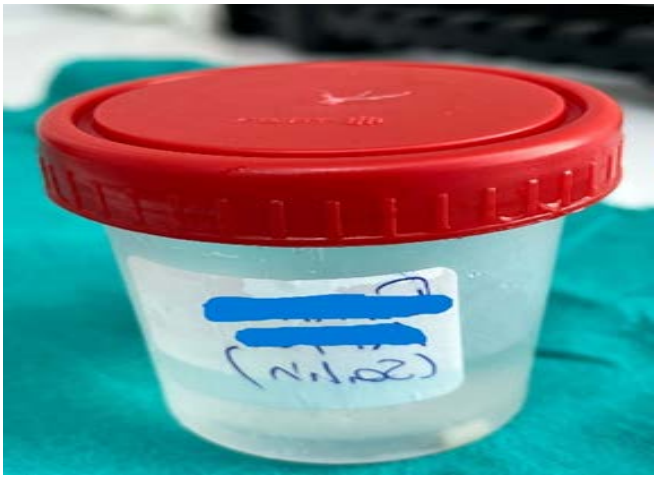

Fig 3: Image of the container containing physiological saline.

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A partial amputation cavity was opened for the patient under local anesthesia (Lidofast, Turkey). (Figure 4)

Fig 4: Partial amputation preparation applied to the patient.

After cotton impregnated with 5% sodium hypochlorite was placed in the opened amputation area and bleeding control and cavity disinfection were achieved, partial amputation treatment was performed with calcium silicate based biomaterial (Biodentin, Septodont, France). (Figure 5)

Fig 5: Partial amputation treatment image with calcium silicate based biomaterial.

The permanent restoration of the tooth was postponed for a day because the patient reported that he could find the broken piece. To prevent microleakage and plaque formation at the forty line, the tooth surface was wrapped with two layers of Teflon tape (Swedent). (Figure 6)

Fig 6: Image of the tooth with Teflon tape.

2. Seans

The decay on the mesial side of the broken piece was cleaned, and in order to increase the retention of the broken piece, the dentin tissue was removed with a small round bur (Meisinger, Germany) and a retention groove was opened. (Figure 7,8)

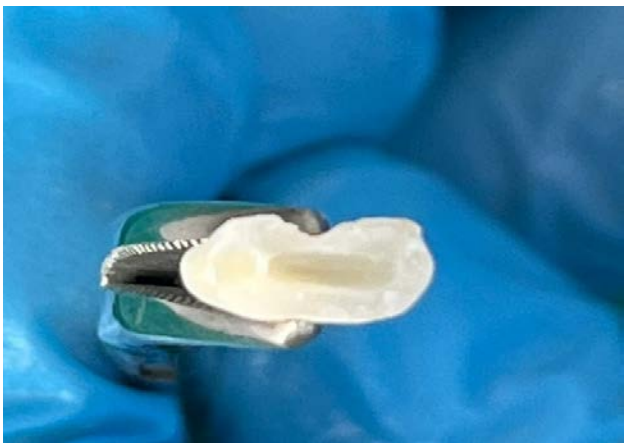

Fig 7: Image of the broken piece after caries removal and dentin tissue removal.

Fig 8: Checking the compatibility of the broken piece with the tooth.

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Fig 9: Image of 35% orthophosphoric acid applied to the broken piece and the tooth.

After 35% orthophosphoric acid was washed with pressurized water and air dried, Single Bond Universal adhesive (3M ESPE, St. Paul, MN, USA) was applied to both fracture surfaces as a bonding agent. Then, composite resin (3M ESPE Z250, USA) was placed into the dentin groove and the fragment was combined with the tooth with the help of finger pressure and polymerized with a light device (Woodpecker BUILT-INC, China). Aesthetic restoration was completed with composite resin (3M ESPE Z250, USA) by groove beveling on the fracture line. (Figure 10-14)

Fig 10: Image of the adhesive applied to the broken piece.

Fig 11: View of the broken piece after placement.

Fig 12: View of the bevelling applied to the fracture line.

Fig 13: A view of the aesthetic adjustments made to the tooth and the polishing process of the restoration with finishing burs.

Fig 14: The final view of the tooth restoration.

In the radiographic and clinical examinations performed at the patient's 1st and 6th month follow-up sessions after the restoration, it was observed that the tooth responded positively to vitality tests, the periapical region was healthy, there were no symptoms in the tooth, and the broken piece maintained its current shape and position. It was observed that the patient was satisfied with the result (Figure 15-17).

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Fig 15: The patient's 1st month radiographic image.

Fig 16: Intraoral view of the patient at the first month.

Fig 17: Intraoral image of the patient at the 6th month.

Discussion

While dental traumas cause damage to the mouth, teeth and surrounding soft tissues, depending on the severity of the impact and the type of accident, they generally cause function, phonation, aesthetics, pain and psychological problems. (6) The treatment to be preferred in complicated crown fractures is; It varies depending on the contamination level of the pulp tissue, root development and the size of the perforation. (9)

In this case, partial amputation treatment was preferred because 3 hours had passed since the trauma and there was a large pulp exposure area.

Biodentin is a promising and convenient material in amputation treatment. It is similar to dentin in mechanical properties and can be preferred in treatments that require regeneration of the pulp-dentin complex. It induces tertiary dentin formation in treatments where it does not cause pulp inflammation and the pulp is vital, and provides reparative dentin production when it comes into direct contact with the vital pulp. It has been reported that there are differences in the success of calcium hydroxide and biodentin. It has been determined that biodentin has better radiographic and clinical success and more regenerative potential than the calcium hydroxide group. MTA and biodentin materials are tolerable by the pulp and have been found to form a dentin bridge under the coating agent. (10-12) However, it has been determined that MTA takes more time to place into the cavity, is more difficult to manipulate, and has a longer hardening time than biodentin. (16) In this case, biodentin was preferred in amputation treatment because it has a higher regenerative potential, easier manipulation, shorter hardening time and better results in terms of bond strength compared to other materials.

For the restoration of teeth broken as a result of trauma; Many techniques have been developed from past to present, such as indirect or direct composite restorations, resin crowns, strip crowns, indirect ceramic veneer crowns and re-gluing of the broken piece. (13) When performing permanent restoration of traumatized teeth, if there is a broken piece and it can be used in the restoration of the tooth, it is bonded to the tooth. It is preferred over other treatment options. (9) There are different methods for using the broken tooth piece in restoration and re-attaching it to the tooth after dental trauma. (13) Pusman et al. In their study where they investigated the effect of the abrasion technique and the material used in bonding the broken tooth piece to the tooth on the fracture strength, they used internal dentinal groove, simple re-bonding and overcontour techniques as the abrasion technique. They determined that the highest fracture strength was obtained by reattaching the broken piece with the internal dentin groove technique, and the lowest fracture strength was obtained by the simple re-gluing technique of the broken piece. (13,17) Therefore, in our case, in order to increase retention, dentin tissue was removed from the broken piece of the tooth (internal dentin tissue). reattachment treatment was applied. It has been determined that by re-gluing the broken piece, the transparency and color tone of the

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tooth will have a more original appearance, the incisal edge will show wear similar to that of the adjacent tooth, less time will be spent than required to complete the restoration, and the natural tooth structure will be preserved. (2)

Conclusion

In the treatment of crown fractures involving the pulp, partial amputation with calcium silicate-based pulp capping biomaterial and reattachment treatment by removing dentin tissue from the broken part of the tooth (internal dentin groove) in order to increase retention were found to be successful. Thus, it was seen that aesthetic expectations could be met with short-term clinical treatment procedures while preserving the vitality and continuing function of traumatized teeth.

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Odontoma: Report of Four Cases, İncluding One Giant Case

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Abstract

Central giant cell granuloma is a rare, benign but locally aggressive bone tumor. Lesions may show slow growth or rapid progression. They are usually characterized by painless swelling, but cases of rapid and destructive growth and destruction of alveolar bone have also been reported. The etiology is unknown. The involvement of the mandible is more common than the maxilla and is more common in women. It is usually seen in childhood and young adults. Differential diagnosis is made with radicular cysts, odontogenic cysts, Brown's tumor and fibrous dysplasia. Conservative treatment options include intralesional steroids, interferon, calcitonin. Satisfactory results can be obtained with surgical treatment. In this case report, three cases of mandibular central giant cell granuloma treated surgically are presented.

Case Report (HRU Int J Dent Oral Res 2024;4(2): 69-73)

Key words: Granulom, tumor, benign.

Introduction

Giant cell granulomas occur in the jaws in two forms: central giant cell granuloma and peripheral giant cell granuloma (1). CGCG develops from bone.Peripheral giant cell granulomas are seen in the alveolar process and gingiva. Both types of lesions are often seen in children or young adults. About %65 patients are female patients (2).

Central giant cell reparative granulomas (CGCRG) are rare lesions that account for less than 7% of all benign tumors of the jaws (3). Although the etiology is unknown, it has been reported that it may be related to local trauma, a developmental disorder, an inflammatory lesion or a tumor (9,19). It is located almost exclusively in the mandibles and in areas of the jaws that usually contain teeth (4). In some cases, edentoulus has also been reported in patients (8). CGCG is 2 times more common in the mandible than in the maxilla. (5). In individuals in the first 2 decades, it tends to be seen anterior to the first molar tooth in the mandible and anterior to the canine tooth in the maxilla, whereas in older individuals it is frequently located posterior to the jaws (6).

Clinically, it may show slow and asymptomatic growth, or it may be seen as a recurrent, aggressive, painful lesion (7). CGCRG tends to widen the cortical borders of the maxilla and mandible. This widening usually occurs in an irregular or wavy pattern and may give the appearance of a double border when examined on occlusal x-ray. The bone forming the enlarged mandibular margin shows a granular structure compared to the cortical bone (6).

While lesions may be asymptomatic, in some cases, especially in lesions occurring in the maxilla, the outer cortex of the bone is destroyed instead of expanding, a domed, purplish submucosal swelling is formed in that area, and this gives the lesion a malignant appearance (3, 6).

Enucleation, curettage and in some cases (in aggressive lesions) resection can be performed (4, 6). There is a 15-20% risk of recurrence after curettage (4). Especially when conservative treatment is applied, the patient should be followed carefully against the risk of recurrence (6). The traditional method of treating CGCG is surgical removal. However, conservative treatment is also an option. CGCG has also been treated with non-surgical methods such as radiotherapy, daily systemic doses of calcitonin (24) and intralesional injection with corticosteroids.

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In this case report, three cases of mandibular central giant cell granuloma treated surgically are presented (25).

Case 1

An 8-year-old female patient was admitted to Harran University Faculty of Dentistry in March 2024 due to swelling in the anterior mandible. Physical examination revealed painless swelling on palpation. The patient had no significant medical history. An orthopantomographic film was taken for radiologic examination and showed a lesion with smooth borders, displacement and resorption of the teeth. (Fig 1) Computed tomography (CT) was obtained to further evaluate the lesion. Three-dimensional examination showed that the lesion caused expansion and constriction of the mandibular cortical bone. (Fig 2,3) After clinical and radiological examinations, the patient underwent incisional biopsy. Histopathologic examination revealed edematous connective tissue with areas of tissue and hemorrhage, fibrohistiocytic stromal cells and osteoclastic giant cells. Morphologic findings were reported to be consistent with central giant cell granuloma. Serum PTH and calcium values were requested from the patient in order to make a differential diagnosis of jaw tumors with the same histologic features as central giant cell granuloma seen in hyperparathyroidism. Normal values confirmed the biopsy result. It was decided to remove the lesion under general anesthesia.

Fig 1: A large radiolucent lesion with smooth borders is observed on the pretreatment orthopantomographic film.

Fig 2-3: 3-dimensional computed tomography image.

It was performed through nasal intubation. In addition to the mandibular sulcular incision, a relaxing vertical incision was preferred. The flap was carefully lifted.It was reached to the anterior border of the mandible and observed that it caused expansion and destruction of the bone. After reaching the lesion center, the entire lesion was successfully removed surgically.(Fig 4) The bone walls were examined for any remaining lesions.(Fig 5) The expanded bone cortices were approximated with resorbable suture material.(Fig 6) The soft tissue was closed with 3-0 vicrly suture without tension.(Fig 7) The patient was told what to pay attention to after the operation, a soft diet was recommended and painkillers, antibiotics and mouthwash were prescribed. After 1 week, she was called for follow-up and sutures were removed.

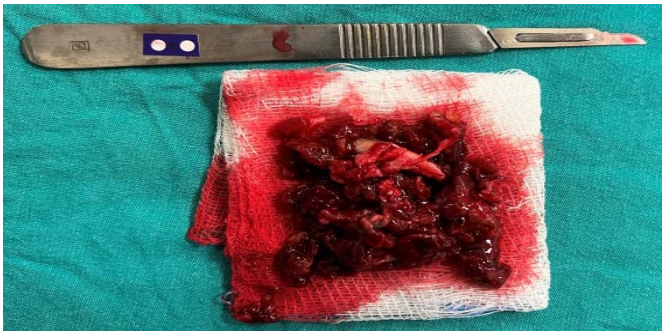

Fig 4: Surgically removed central giant cell granuloma.

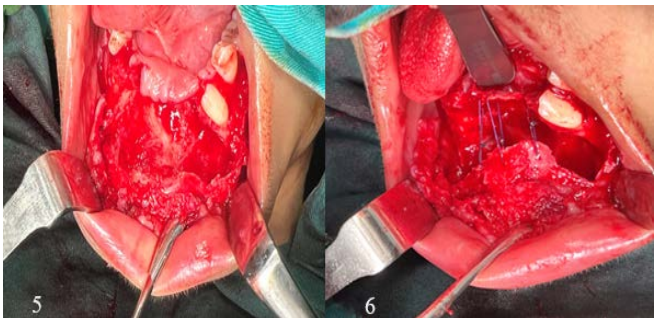

Fig 5-6: After complete removal of the lesion, the expanded bone cortices were approximated with absorbable suture material.

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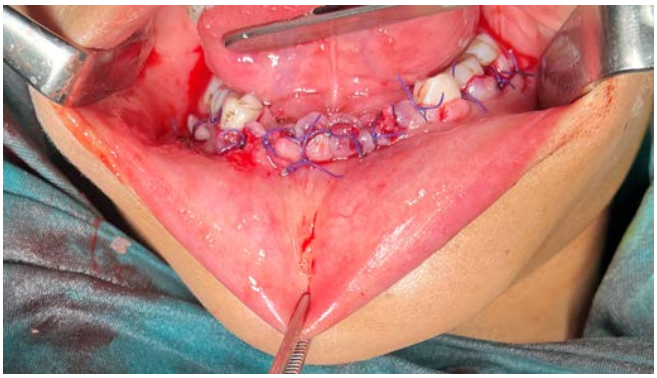

Fig 7: The soft tissue was closed with 3-0 vicrly suture without tension.

Case 2

A 12-year-old female patient was admitted to Harran University Faculty of Dentistry, Department of Oral and Maxillofacial Surgery in April 2024. On physical examination, painless swelling was detected by palpation. The patient had no significant medical history. An orthopantomographic film was taken for radiologic examination. A large radiolucent lesion with smooth borders was seen. It did not cause resorption or displacement of the teeth (Fig 8).

After clinical and radiologic examinations, excisional biopsy was performed with a preliminary diagnosis of central giant cell granuloma. Histopathologic examination revealed areas of tissue and hemorrhage in edematous connective tissue, fibrohistiocytic stromal cells and osteoclastic giant cells. These morphologic findings were consistent with central giant cell granuloma as predicted.Serum PTH and calcium values were requested from the patient in order to make a differential diagnosis of jaw tumors with the same histologic features as central giant cell granuloma seen in hyperparathyroidism. Normal values confirmed the biopsy result.The decision was made to excise the lesion using local anesthesia.In addition to the mandibular sulcular incision, a vertical relaxing incision was made.The flap was carefully lifted.The lesion's center was accessed, and it was successfully excised during the surgical procedure(Fig 9). The bone walls were examined for any remaining lesions (Fig 10). Bleeding was controlled and soft tissue was closed with 3-0 vicrly suture without tension.

The patient was told what to pay attention to after the operation, a soft diet was recommended and painkillers, antibiotics and mouthwash were prescribed. After 1 week, she was called for follow-up and sutures were removed.

Fig 8: Pretreatment panoramic radiograph.

Fig 9: Cleaned bone from the lesion.

Fig 10: Surgically removed central giant cell granuloma

Case 3

A 23-year-old female patient was admitted to Harran University Faculty of Dentistry, Department of Oral and Maxillofacial Surgery in May 2024. Routine examination of the patient revealed a large radiolucent lesion with smooth borders in the anterior region of the mandible (Fig 11). On physical examination, painless swelling was detected by palpation. The patient had no significant medical history. After clinical and radiologic examinations, excisional biopsy was performed with a preliminary diagnosis of central giant cell granuloma. Histopathologic examination revealed areas of tissue and hemorrhage in edematous connective tissue, fibrohistiocytic stromal cells and osteoclastic giant cells.

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These morphologic findings were consistent with central giant cell granuloma as predicted. The decision was made to excise the lesion using local anesthetizing addition to the mandibular sulcular incision, a vertical relaxing incision was made. The flap was carefully lifted. The lesion's center was accessed, and it was successfully excised during the surgical procedure (Fig 12). The bone walls were examined for any remaining lesions (Fig 13). Bleeding was controlled and soft tissue was closed with 3-0 silk suture without tension. The patient was told what to pay attention to after the operation, a soft diet was recommended and painkillers, antibiotics and mouthwash were prescribed. After 1 week, she was called for follow-up and sutures were removed.

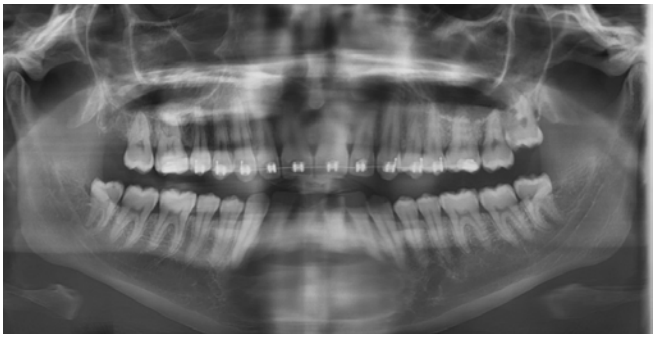

Fig 11: Pretreatment panoramic radiograph.

Fig 12: Surgically removed central giant cell granuloma.

Fig 13: Cleaned bone from the lesion.

Discussion

Central giant cell granuloma (CGCG) was originally characterized by Jaffe in 1953 as a giant cell "reparative" granuloma found in the jaw bones (10).
The lesions are most often observed in children or young adults, with about 75% of all cases occurring before the age of 30, but it can occur at any age and is 2 times more common in women than in men (11).

Consistent with this information, our three cases occurred at an early age and in women.
Other than the facial bones, the small bones of the hands and feet are the most common sites where central giant cell granuloma (CGCG) can occur (12,20,21).

Central giant cell granuloma (CGCG) can present with a range of radiologic findings, including small (unilocular) lesions to large multilocular lesions, ill-defined margins, displacement of teeth and tooth germs, root resorption, and cortical enlargement or perforation (13). In our case, consistent with the rates we found in the literature review, an 8-year-old female with central giant cell granuloma was seen in the mandibular region. Cortical enlargement, tooth displacement and root resorption were found.Whitaker and Waldron published a study including 142 cases of CGCG root resorption was observed in 43% of these cases and tooth germ displacement in 36%. Multilocular lesions were detected in 60% of cases (14).

In a study by Triantafillidou K. et al. involving 17 cases of CGCG, 12 patients with lesions were reported as asymptomatic and non-aggressive, while 5 cases were characterized as aggressive due to painful, rapid growth causing tooth displacement (15).

Central giant cell granuloma has been associated with syndromes known to be of genetic origin such as Noonan syndrome, NF1 and cherubism (16). Some studies have identified chromosome translocations in giant cell tumors (GCT) associated with aneurysmal bone cysts and in long bones, which are lesions resembling giant cell granulomas. However, there remains controversy over whether chromosome abnormalities are universally observed in all giant cell lesions (17,23).

The histologic appearance of CGCG may be confused with hyporparathyroidism, Brown tumor, fibrous dysplasias, cheribusim, aneurysmal bone cyst and Paget's disease of bone. Considerations in differential diagnosis: Hyperparathyroidism is characterized by a moderate increase in serum Ca, AP and a moderate decrease in phosphorus, Paget's disease is easily differentiated because the patient with CGCG is young,

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Aneurysmal bone cyst differs in its histologic appearance with fibrous septae, blood filling the cavities and non-endothelial (18).

Conclusion

Central giant cell granulomas are more common in women and young people. They are non-neoplastic benign but rare lesions that are mostly seen in the anterior region of the mandible. There are two types of treatment, surgical or conservative.

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Effects of Propolis on Oral Health and Oral Cavity Cancers

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Abstract

For centuries, people have used apitherapy, the therapeutic use of bee products like propolis, honey, bee venom, wax, pollen, and royal jelly, to prevent and treat various diseases. Propolis is well-known for its antimicrobial, anti-inflammatory, anticancer, and antioxidant properties. It contains over 300 bioactive compounds, including flavonoids, phenolics, and aromatic substances. Recent studies have highlighted its growing application in dentistry, especially in products like toothpaste, mouthwashes, and sprays, which have demonstrated efficacy in preventing dental caries, reducing gum inflammation, and accelerating the healing of oral ulcers. Moreover, due to its antioxidant capacity, propolis may help mitigate oxidative stress, potentially contributing to the prevention of oral cancer. Given its therapeutic potential in both oral health and oncology, propolis emerges as a promising natural treatment option. However, further in-depth studies are required to fully elucidate its clinical potential and verify its efficacy and safety.

Review (HRU Int J Dent Oral Res 2024; 4(2): 74-81)

Keywords: Propolis, oral health, oral cancer, antimicrobial, antioxidant.

1.Introduction

A systematic analysis of the chemical composition and biological properties of propolis is important due to its wide range of applications. Propolis is a complex bee product that contains over 300 constituents, which are beneficial for humans in different ways. The name propolis is derived from the Greek and has two parts “pro”, which means defense, and “polis”, which corresponds to city resulting in the translation of ‘Hive defense’ (1). These insects use propolis as an element that helps to disinfect hives and repel bacteria, viruses, fungi and parasites. It shall do this by sealing the gaps and making the external environment aseptic and characterized by moderate temperatures and humidity. The nature of propolis is a complex one and it has been observed that propolis exhibits differences in chemical composition based on the phytogeographic location, the month of collection, or even the species of bee. As for its chemical content, propolis, in most cases, contains resins, volatiles,

polyphenols, polysaccharides, and wax. They possess various biological activities comprising of activities against protozoan parasites, fungi, inflammation, viruses, bacteria, and cancer cells. Further, propolis possesses mineral matter, carbohydrates, flavonoids, amino acids, and vitamins B, C and E, and many aromatic matters (2,3). The non-specific biological activity contributes to the use of propolis as a natural remedy and especially for oral health concerns and diseases. As found, there is a strong correlation between oral health and general health. Dysbiosis which refers to the impaired balance of microbe’s paves way for the pathogenic microbes in the mouth due to poor hygiene practices (4). The toxins and inflammatory mediators which are released by these pathogens can enter the bloodstream thus resulting in a compromised systemic health. Therefore, personal oral

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hygiene implies practical techniques required to prevent the development of caries, periodontal diseases, and pulpitis. In this regard, propolis has been identified as a natural substance that can be used effectively (5,6).

The effects of this compound have been hiked in the recent years because of its incorporation in the production of a number of dental products such as toothpaste, mouthwash, and chewable tablets. Propolis has been used effectively in the treatment of oral diseases including periodontal disease, oral ulcers, candidiasis, acute necrotizing ulcerative gingivitis and pulpitis (7). Some research have provided proofs in support of the antibacterial and anti-inflammatory properties of propolis with particularly good results in the field of odontology and, more recently, in the context of oral cancer (8). Propolis contains a number of bioactive components that are effective against cariogenic bacteria. Flavonoids and phenolic compounds are the most important antimicrobial components of propolis. These components damage the cell wall of bacteria, causing pores to open in the cell membrane, which leads to disruption of the intracellular metabolic processes of bacteria. Flavonoids such as galangin and apigenin inhibit the DNA replication of bacteria, limiting their ability to reproduce. Furthermore, propolis stops the demineralization of tooth enamel by disrupting the acidic metabolic processes of bacteria(1). Propolis also directly affects the formation of cariogenic biofilms. Propolis components inhibit the synthesis of extracellular polysaccharides that allow bacteria to adhere to the tooth surface. This results in reduced plaque accumulation on the tooth surface and decreased acid production by bacteria. Flavonoid components reduce the ability of Streptococcus mutans to form biofilms, maintaining balance in the oral microbiome(2). In addition, caffeic acid phenethyl ester (CAPE) inhibits the glucose metabolism of bacteria such as Streptococcus mutans, reducing acid production and thereby protecting tooth enamel. CAPE also has antioxidant properties that suppress bacterial growth and biofilm development, which plays an important role in preventing dental caries. Research have confirmed that flavonoids; phenolic acids and CAPE reduces the proliferation rate of oral cancer cells and induces apoptosis (9). Also, it has been suggested that propolis could alleviate some of the side effects of chemotherapeutic agents, and to overcome tumor chemosensitivity leading to improved cancer treatments (10). If the above discussion is to be believed, then propolis may be very effective in regulating the balance of the bacterial flora. This effect is believed to be suitable for both oral health and other general conditions such as neurodevelopmental disorders. For instance, more study into the connection of the microbiota and autism reveals that microbial homeostasis is an essential aspect of the

disease development of autism (11). Lastly, it is clearly seen that there rising importance of propolis in oral health and cancer research. However, more clinical trial is needed to assess the full therapeutic role of this drug and its relevance impacts on health to enshrine it.

2. Biological Properties of Propolis

It is through studying the biological properties that make up propolis that we can comprehend this substance and its uses in different areas. One of the most important uses is in the dental field, where propolis has been investigated for its effectiveness in the prevention and treatment of dental caries and other oral diseases. Because of the chemical structure of polyphenols among its many compounds, it excelled in combating free radicals. The flavonoids Content, which is one of the main compounds of propolis, demonstrate proven antioxidant properties: they shield cell membranes from the damaging action of lipid peroxidation by means of neutralizing free radicals (12). Of all the biological activities of propolis, the antimicrobial activity has been the most investigated. This can be explained either by the direct impact of propolis on microorganisms or by the ability to trigger the body’s immune response and enhance the activity of the natural defense system. The ability of propolis to inhibit microbial growth is usually higher towards gram-positive bacteria as compared to gram-negative bacteria because of outer membrane structure of the later and hydrolytic enzymes which can degrade the active compounds of propolis. Further, propolis has been depicted to possess antibacterial, antifungal, antinematodal, antiviral, and antiprotozoal properties. These effects could be attributed to combined interaction of some of the constituents found in propolis. The compounds responsible for its antimicrobial activity are galangin, terpenoids, p-coumaric acid and caffeic acid, apigenin, phenols and esters (13,14). Furthermore, propolis has variety of pharmacological properties such as cytostatic, wound healing, antitumor, antidiabetic, antiallergic, anti-inflammatory and immunomodulatory effects (15,16-18).

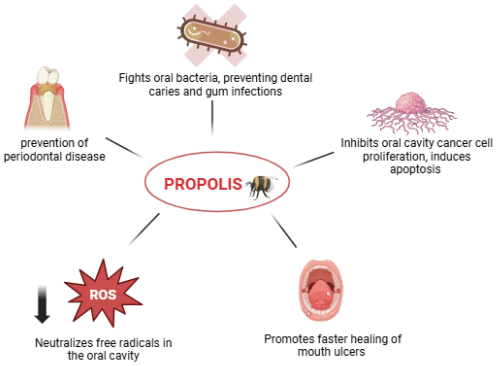

Figure 1*:* This figure illustrates the key effects of propolis on oral health, emphasizing its role in inhibiting cancer cell proliferation through the induction of apoptosis in malignant cells. Propolis also exhibits significant anti-inflammatory properties, reducing gum inflammation and preventing periodontal diseases. Additionally, it promotes the healing of oral ulcers and alleviates associated pain, while its antioxidant activity neutralizes free radicals, thereby reducing oxidative stress. Moreover, propolis contributes to improved oral hygiene through its antimicrobial effects, which help prevent dental caries and gum infections.

3. Use of Propolis in Dentistry

3.1. Propolis in the Prevention and Treatment of Caries

Dental caries or tooth decay is officially one of the world's most prevalent chronic diseases affecting a large population, and it poses a major problem to health systems across the globe (19). This disease can be described as the gradual loss of minerals in the hard tissues of the teeth, especially the enamel and dentin, through the action of acid-secreting cariogenic bacteria. Demineralization process takes place through enzymatic reactions of the by-products of bacteria metabolism and fermentable carbohydrates from the diet with extra attention to the sugars like sucrose, glucose, and fructose (20-22). These reactive conditions, over time, dissolve the mineralized structure of the tooth to form cavities and, finally, dental caries where the cavitation is left untreated. Some of the key microorganisms that play a role in the growth of carious lesions are Streptococcus mutans, Lactobacillus and Actinomyces spp. Of these, S. mutans is known to be the major cause of initiation of dental caries or the initial process in the development of carious lesion. It is well adapted to colonize on the tooth surfaces and create biofilms or microbial accretions that enhance cariogenic processes. Thus, attachment and biofilm development allow S.mutans to utilize fermentable carbohydrates under acidic environments and in the localized production of lactic acid that enhances demineralization (22,23). *Lactobacillus* species are also implicated in caries progression, particularly in advancing the lesion once it has formed. *Actinomyces* species, while less studied, have been associated with root caries and are thought to contribute to the overall microbial diversity of cariogenic biofilms (24). The increasing resistance of cariogenic bacteria to conventional antimicrobial agents has sparked interest in natural products such as propolis, which offers a broad spectrum of biological activities. Propolis, a resinous substance collected by honeybees from plant exudates, has been extensively studied for its antimicrobial properties, particularly its ability to target oral pathogens involved in caries development. Studies have demonstrated that propolis exerts potent inhibitory effects against *S. mutans*, *Lactobacillus*, *Actinomyces*, and other oral microorganisms implicated in caries formation. This antimicrobial activity is attributed to the diverse chemical composition of propolis, including flavonoids, phenolic acids, terpenoids, and other bioactive compounds with strong bacteriostatic and bactericidal properties (25,26). Therefore, the ability to prevent the formation of biofilms is one of the keyways on how propolis has a potential to protect. Biofilms can therefore be described as massive, and highly ordered microbial systems that fix themselves to surfaces such as enamel and are encased in a thick layer of extracellular polymers formed by the microorganisms themselves. This matrix protects the bacteria from various environmental factors, for instance, antimicrobial agents and host's immune system responses thus making biofilms quite difficult in their elimination (27,28). There has also been information suggesting that propolis inhibits biofilm formation and S. mutans' capacity to bond to the surface of the teeth along with the capacity to alter the cohesiveness of the matrix of the biofilm. This disruption results in the reducing bacterial load as well as the acicular production which aids in preventing the further demineralization of the tooth surface and or extension of the carious lesions as it Is stated in the literature (29). Also, it has proved that propolis has the potential to advance the mineralization of white spot, that

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is early caries lesions. Besides the fact that it contains high flavonoids and phenolic compounds which
slow the growth of cariogenic bacteria it also increases the adsorption of calcium and phosphate ions on the surface of teeth. These properties that include the ability to prevent demineralization and to allow remineralization also points that propolis can be used as the additional preventive measure in the process of dental caries (7,30). In addition to the antimicrobial effect of propolis it has anti-inflammatory and antioxidant property that assist propolis when used in mouth maintenance. Infection is one of the enemies that a person has to fight, especially when bacteria live in the oral cavity and the inflammation experienced, especially in chronic form, increases the wear of the tissue, including in the development of caries. The anti-inflammatory effects of propolis, mediated through the downregulation of pro-inflammatory cytokines, help to mitigate the inflammatory response, thereby protecting the surrounding tissues from further damage. Given these multifaceted effects, propolis has gained increasing recognition in the development of novel oral hygiene products. Regarding the toothpastes, mouth washes and other dental preparations containing propolis these has relatively appreciable results in preventing and in the curing and controlling of caries (31). Literature also revealed that propolis could be ingested or other products containing propolis help in reduction of dental caries, enhanced on the plaque control in the oral cavity, and improvement of the health of the mouth. On the other hand, all of this research suggested that propolis possess various pharmacological actions and should for formulators to set standardized protocols of propolis in clinical medicine. This means that there are some issues to define the preparations with constant effectiveness of the main chemical compositions of propolis as they vary depending on the geographic location, kind of bees, and plant resources. Therefore, efforts should be made to determine the optimal concentration, preparation and ways of propolis use in the light of its frequent use in dental practice.

3.2. Gingivitis

Gingivitis is a not unusual inflammatory circumstance that impacts the gum tissues and is particularly universal among people aged 11 to 13 years (32). It is the second one-maximum not unusual oral ailment global, following dental caries, and impacts over 75% of the global population (33). Poor oral hygiene ends in the accumulation of dental plaque, which finally outcomes in gingivitis (34). Microbial biofilm performs a crucial function within the pathogenesis of both periodontal illnesses and dental caries (35). Clinical research has validated that toothpastes and mouthwashes containing propolis drastically enhance gingival fitness, reduce plaque and biofilm formation, and enhance standard oral hygiene because of their anti-inflammatory and antibacterial houses (nine,10,36).

3.3. Propolis in the Healing of Oral Mucosal Wounds

Studies have established that preparations containing propolis are appreciably extra effective at getting rid of pathogenic and opportunistic microorganisms compared to conventional oral hygiene merchandise. In addition to their strong antimicrobial houses, those arrangements play an important position in keeping the physiological stability of the oral microflora, that's crucial for long-time period oral fitness (37).Propolis promotes collagen synthesis by increasing fibroblast activity during wound healing in the oral mucosa. Fibroblasts are connective tissue cells that play an important role in wound healing and components in propolis such as caffeic acid phenethyl ester (CAPE) stimulate fibroblast proliferation. This process accelerates the reconstruction of damaged tissues. At the same time, the anti-inflammatory properties of propolis suppress the inflammatory response, which accelerates wound(3, 4).The phenolic compounds contained in propolis show an effect that limits tissue damage by suppressing the production of inflammatory mediators (e.g. prostaglandin E2 and TNF-α). The reduction of prostaglandin E2 is particularly critical in reducing acute and chronic inflammation. At the same time, propolis prevents free radical damage to cell membranes, inhibiting lipid peroxidation and protecting cellular membranes. Thanks to these effects, propolis accelerates wound healing in the oral mucosa and contributes to tissue reconstruction (4). Propolis acts selectively, concentrated on dangerous bacteria even as keeping beneficial microorganisms, thereby contributing to the maintenance of a wholesome oral atmosphere (38). Maintaining right oral hygiene, specifically the powerful removal of dental plaque, is vital throughout the put up-surgical recuperation process. Dental plaque, a biofilm composed of microorganism and their through-products, can substantially obstruct healing by means of promoting contamination and inflammation at the surgical web page

(39). Ensuring the powerful elimination of dental plaque is therefore essential in
minimizing postoperative headaches. Propolis, with its effective antibacterial and anti-inflammatory houses, has been proven to decorate wound restoration via decreasing bacterial load and controlling inflammation. Research similarly indicates that the software of propolis following dental approaches, together with extractions or periodontal surgical procedures, positively impacts the oral microflora and speeds up the healing system. This accelerated recovery is likely attributed to propolis' capacity to sell tissue regeneration even as simultaneously inhibiting the boom of harmful microorganisms. Consequently, sufferers revel in faster recuperation times, decreased infection, and a decrease prevalence of postoperative infections, all of which make a contribution to improved remedy outcomes (40-42).

3.4. Dentin Sensitivity

Sudden onset of severe nerve pain caused by external factors such as temperature changes, tactile forces, or chemical stimulation of exposed nerves can affect various mechanisms a directly below, causing discomfort or pain (43). Traditionally, vasoconstrictive agents have been advocated to manage dental hypersensitivity by blocking vasoconstriction or reducing vasomotor excitability (44) but recent studies in vitro and in vivo have shown propolis to be a promising alternative therapy (45,46). Propolis has been shown to be effective in reducing tooth sensitivity by creating a barrier that creates exposed teeth, thereby preventing drainage and reducing irritation to the periodontal tissue (47) Furthermore, propolis is recognized as safe, affordable, and biocompatible The use of propolis, which is a viable low-cost alternative, not only reduces early symptoms not only but also provides long-term protection of the tooth surface, thereby reducing the risk of re-sensitivity (48,49).

4. Oral Cancers and Anticarcinogenic Properties of Propolis

Propolis shows increasing promise in treating oral malignancies, and its potential extends to mitigating the side effects of cancer therapies, such as aphthous formation (50). Chemotherapy and radiation treatments often result in painful oral mucositis, and the healing properties of propolis offer a natural solution for alleviating these symptoms. The anticarcinogenic effects of propolis are attributed to its bioactive constituents, such as flavonoids, phenolic acids, terpenoids, and caffeic acid
phenethyl ester (CAPE). These compounds inhibit cancer cell growth and proliferation, activate programmed cell death pathways, and reduce tumor formation (51-53). Oral cancers are prevalent globally and have a significant fatality rate. Oral cavity cancers are frequently linked to risk factors such as smoking, excessive alcohol intake, and human papillomavirus (HPV) (54,55). Given the influence of genetic and environmental factors on cancer development, researchers are increasingly investigating the potential impact of natural compounds, such as propolis, on these processes (56). Research on the anticancer properties of propolis has demonstrated its strong inhibitory effects on the growth of cancer cells. Propolis has been shown to effectively suppress cell proliferation and induce programmed cell death pathways in human oral squamous cell carcinoma cell lines (HSC-2, HSC-3) (57). This research demonstrated that propolis could disturb the mitochondrial membrane potential, resulting in an elevation of intracellular reactive oxygen species and ultimately causing the demise of cancer cells (50). Furthermore, the antioxidant properties of propolis may help mitigate oxidative stress, a significant factor in cancer progression. Oxidative stress, caused by an overproduction of free radicals, can damage cellular components such as DNA, proteins, and lipids, promoting carcinogenesis. Propolis, through its rich polyphenol and flavonoid content, can neutralize these free radicals, reducing the risk of DNA mutations and inhibiting tumorigenesis (58). Additionally, propolis has been shown to modulate immune responses, which is critical in the context of cancer progression and therapy. Studies indicate that propolis can enhance the activity of natural killer (NK) cells, which are involved in detecting and destroying abnormal cancer cells. By boosting immune surveillance, propolis contributes to the body's ability to fight off early-stage cancer cells before they proliferate into larger tumors (59).

Moreover, propolis plays a role in the inhibition of angiogenesis, the process by which new blood vessels form to supply nutrients to growing tumors. By inhibiting angiogenesis, propolis can starve cancer cells of the nutrients they require for growth, effectively slowing tumor progression (10). This anti-angiogenic effect, combined with its pro-apoptotic and immune-modulatory properties, makes propolis a multifaceted natural agent with potential in both cancer prevention and therapy. Further studies have highlighted the potential of propolis

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in overcoming chemotherapy resistance, a significant challenge in cancer treatment. Cancer cells can develop resistance to chemotherapeutic agents through various mechanisms, such as efflux pumps that remove drugs from cells, mutations in drug targets, and enhanced DNA repair. Propolis, when used in conjunction with chemotherapeutic agents, may sensitize resistant cancer cells to treatment by interfering with these resistance mechanisms. For instance, flavonoids and phenolic compounds in propolis have been shown to inhibit efflux pump activity, allowing chemotherapeutic drugs to accumulate within cancer cells and exert their cytotoxic effects more effectively (10). In summary, the potential of propolis to prevent and treat oral cancers should be considered a promising strategy due to its anticarcinogenic properties. However, more comprehensive research, including clinical trials involving human subjects, is necessary to substantiate this potential. The clinical application of propolis will remain limited until its safety, efficacy, and appropriate dosages are thoroughly established.

5. Conclusion and Future Perspectives

Propolis has received a lot of attention as a natural treatment for oral health and oral cancer treatment. Due to its antibacterial, antibacterial, antiviral, and carcinogenic properties, propolis has shown effectiveness in treating tooth decay, gum disease, gum disease, and oral cavities Used propolis plays a major role in pharmaceuticals such as toothpastes, mouthwashes, and chewable medicines, and is apparently sufficiently capable of maintaining oral health (65). Oxidant activity: Cellular oxidative May help prevent oral cancer by providing protection against stress, and studies showing promise as an ingredient in cancer treatment have also shown effectiveness in cancer in targeting drug-resistant cells. However, further clinical studies are needed to fully understand the potential of propolis, especially its role in the treatment of oropharyngeal abscesses and the prevention of periodontitis in cancer patients. These promising data suggest that propolis may improve treatment compliance during cancer therapy (66,67). Future studies should prioritize the efficacy, safety, and appropriate dosing of propolis to ensure safe and effective clinical use. In addition, ongoing research into the biological effects, molecular mechanisms, and clinical applications of propolis will further expand its therapeutic potential, enhancing its role in oral health and cancer treatment.

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