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Professor İlknur ÖZCAN

Correspondence Address
Biruni University Facult of Dentistry
Protokol yolu Caddesi No:45 Topkapı
Zeytinburnu/İSTANBUL
edr@biruni.edu.tr

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FROM THE EDITOR

We are very pleased to announce to you that our journal, Eurasian Dental Research, which is a new scientific journal in the field of dentistry, has started its publication life.

Eurasian Dental Research aims to contribute to the literature by publishing manuscripts at the highest scientific level on all fields of dentistry. The journal publishes original articles, and rare case reports that are prepared in accordance with ethical guidelines.

The journal is the official publication of Biruni University and published triannually in April, August, and December. The publication language of the journal is English.

No fees or charges are required for manuscript processing and publishing with Eurasian Dental Research.

We aim to be accepted in the internationally respected indices and discovery services in the coming years.

We will be happy to see your scientific studies and articles in Eurasian Dental Research, the journal of our Faculty.

Best regards,

Prof. Dr. İlknur ÖZCAN
Editor in Chief

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ORIGINAL ARTICLES

CASE REPORTS

Evaluation of Dentists' in Turkey Coronal Restoration Preferences for Endodontically Treated Teeth

Serra KUTLU KATIRCIOĞLU[1], Fatma PERTEK HATİPOĞLU[2], Ömer HATİPOĞLU[1]

Abstract

Aim The aim of this study is to evaluate the upper restoration preferences of dentists in Turkey after performing root canal treatment with a questionnaire.

Material and method The survey questions consisted of demographic information, whether they performed root canal treatment regularly, whether they performed coronal restoration after root canal treatment, when they performed permanent coronal restorations, reasons for preference, in which cases they preferred extraction instead of root canal treatment, and the most frequently applied coronal restoration. The questionnaire was sent to the dentists electronically. Statistically, the data were analyzed with the Chi-square test. Significance was set to $p<0.05$.

Results 211 people participated in the survey. Most of the participants stated that they routinely performed root canal treatment, performed the coronal restoration immediately, and considered remaining amount of tissue in the selection of coronal restoration. For classes 1 to 3, resin-based composites were the most preferred, while post crown was the most preferred restoration in classes 4 and 5. Individuals without specialization were more likely to extract anterior and premolar teeth than those who specialized ($p<0.05$), those with over ten years of experience were more inclined to perform tooth extractions for all types of teeth than those with less than ten years of experience ($p<0.05$).

Conclusion The results of our study are useful in determining the missing aspects by evaluating the coronal restoration preferences of dentists after root canal treatment in Turkey. The use of indirect restorations is rare, but their use should be expanded.

Keywords Dentists, Endodontic treatment, Endodontically treated tooth, Postendodontic restoration, Survey

Introduction

The long-term viability of teeth that have undergone endodontic treatment depends on several factors. These include the number of adjacent teeth, occlusal contacts, position of the tooth in the arch, apical condition, collagen destruction, remaining dentin wall thickness, and permanent restoration type (1-3). Just because a root canal treatment is completed does not mark the end of patient care, and it is crucial to restore the tooth to its original form, function, and appearance. After the endodontic treatment, the coronal restoration should restore form, function, and aesthetics and prevent bacterial microleakage into the root canal system. Additionally, it should protect the tooth from potential fractures and caries in the future (4-6).

Choosing the right coronal restoration and ensuring its quality is crucial for the success of a tooth that has undergone endodontic treatment (7, 8). However, deciding on the best restoration option can be challenging for dentists, given the various treatment options available. Factors such as a dentist's clinical experience and postgraduate education may also influence their decision-making process (9). Although a dentist's skill may improve with time, using new materials requires proper training and up-to-date knowledge to ensure optimal application (9-11).

For years, amalgam/composite fillings, metal alloys, and dental ceramics were commonly used for restoring root canal-treated teeth. However, due to the toxic effects of amalgam and the high cost of precious metal alloys, alternative materials are now preferred (12). Additionally, with the importance of preserving the remaining tooth structure and aesthetic expectations, there has been an increase in the variety of materials and restorations available for coronal restorations after endodontic treatment (13). Composite resin is a popular choice due to its ease of application, acceptable aesthetics, and controllability. Furthermore, studies have shown that composite resins offer better support than amalgams when used for restoring root canal-treated teeth (14). Instead of amalgam cores and cast metal posts, composite and fiber posts are now used, along with CAD-CAM supported crowns, inlays, onlays, and endocrons, which provide superior aesthetic results (13). Advancements in technology have brought about new dental products and materials to the market, resulting in an increase in the options available for restoring teeth that have limited intact tissue (15). Consequently, there has been a shift in the coronal restoration preferences of dentists following endodontic treatment.

Dentists' preferred treatment concepts and materials for coronal restorations of endodontically treated teeth have been studied in various countries (16-19). These studies have looked at post-core preferences (20), types of prosthetic restoration (16), and overall restoration preferences (21). However, there is a gap in the literature regarding coronal restoration preferences of Turkish

Correspondence: Serra KUTLU KATIRCIOĞLU, kutluserra@gmail.com

[1] Niğde Ömer Halisdemir University, Faculty of Dentistry, Department of Restorative Dentistry, Niğde, Turkiye

[2] Niğde Ömer Halisdemir University, Faculty of Dentistry, Department of Endodontics Niğde, Turkiye

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dentists. This study aims to fill that gap by investigating the preferred coronal restoration types for endodontically treated teeth among dentists in Turkey, including both general and specialized practitioners.

The null hypothesis to be tested;

1. The coronal restoration preferred by Turkish dentists does not change depending on the amount of tissue remaining in endodontically treated teeth
2. The institution where the dentist works, the year of experience, age, gender, and expertise do not affect the preferred coronal restoration type.

Material and Methods

The study was approved by the Non-Interventional Clinical Research Ethics Committee of Niğde Ömer Halisdemir University (ethical no:119/2022), ensuring ethical considerations were met. Participants in the study included general dentists as well as specialists in restorative, endodontic, pedodontic, and prosthetic dentistry practicing in Turkey. However, specialists in orthodontics, oral and maxillofacial surgery, periodontology, and oral radiology were excluded from the study. The sample size was determined using the Raosoft web-based sample size calculation software, with an 85% confidence interval, 5% alpha error, and a required population size of 50000, resulting in a necessary participant count of approximately 206.

The survey is divided into three parts. The first part informs the participants about the study and obtains their consent. The second part of the survey asks for the participants' demographic information such as age, gender, years of experience as a physician, and their workplace. The third and final part of the survey asks if the participants regularly perform root canal treatments, if they usually perform coronal restorations after root canal treatments, when they perform permanent coronal restorations on teeth that had root canal treatments, and the reason behind their preference for permanent coronal restorations on teeth that had root canal treatments.

Table 1: A classification system with 5 categories based on the amount of healthy tooth tissue left after endodontic treatment and the number of remaining axial cavity walls, as defined by Naumann, Blankenstein

Class	Description
Class 1	It is the case where only the endodontic access cavity is opened and all four axial cavity walls are present.
Class 2	It only covers cavities with a loss of wall mesio-occlusally or disto-occlusally.
Class 3	It includes teeth with loss of 2 walls, mesial, occlusal, and distal.
Class 4	It covers single-walled situations where only the buccal or lingual cavity wall remains.
Class 5	The crown structure includes teeth that have lost a lot of substance and completely lost all their axial cavity walls.

In the following questions, we used a classification system with 5 categories based on the amount of healthy tooth tissue left after endodontic treatment and the number of remaining axial cavity walls (Table 1), as defined by Naumann, Blankenstein (22). We asked them which class of anterior, premolar, and molar teeth would they prefer to extract instead of performing a root canal treatment if coronal restoration is not possible. Additionally, we asked about the most commonly applied coronal restoration for each class of canal-treated teeth.

Statistical Analysis

Jamovi software (Version 2.3.21) was used for the statistical analysis. A descriptive analysis was performed. The relationship between demographic attributes and responses was examined with the Chi-square test, and significance was set to $p<0.05$.

Results

The study had 211 participants with an average age of 33.7±9.8 years. Of the participants, 63.5% were female and 53.6% had no specialization. Most participants (73%) had less than 10 years of experience. While 47.4% worked in private dentistry, 24.6% worked at a university (Table 2).

Table 2: Demographic attributes of participants

Gender	Overall (N=211)
Female	134 (63.5%)
Male	77 (36.5%)
Age	
Mean (SD)	33.7 (9.8)
Range	24.0 - 74.0
Age range	
≤30	107 (50.7%)
>30	104 (49.3%)
Speciality	
No	113 (53.6%)
Yes	98 (46.4%)
Experience	
≤10	154 (73.0%)
>10	57 (27.0%)
Workplace	
University	52 (24.6%)
Public Health	59 (28.0%)
Private Dentistry	100 (47.4%)

The majority of participants reported attending scientific meetings, such as congresses and symposiums, with a percentage of 87.68%. Additionally, 86.26% routinely performed root canal treatments, and 93.36% performed coronal restoration after the treatment (Fig 1). Moreover, 63.51% of participants stated that they perform a permanent coronal restoration of a root canal treated tooth immediately (Fig 2). The most important factor for selecting a permanent coronal restoration was the amount of remaining tissue, with a percentage of 88.00%, while the least important factor was whether there would be a supporting tooth for the fixed prosthesis, with only 1.5% (Fig 3). Class 2 restorations were the most frequent scenario with 54.04%, while class 1 was the least common with 0.00% (Fig 4). For classes 1 to 3, resin-based composites were

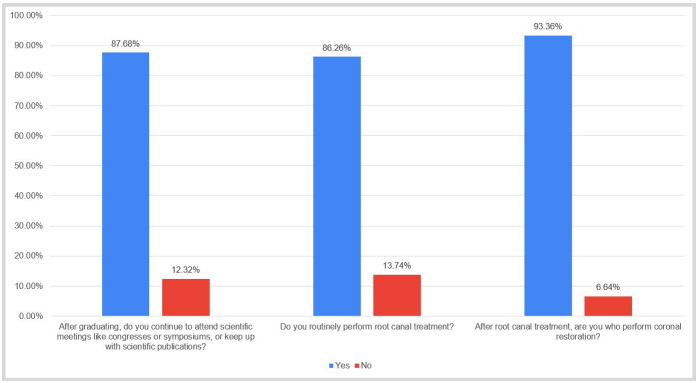

Figure 1: The responses to general questions about coronal restoration and root canal treatment choice.

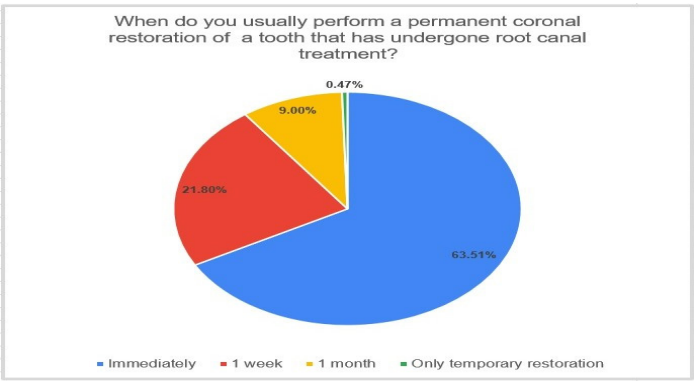

Figure 2: The time frame for practitioners between root canal treatment and coronal restoration.

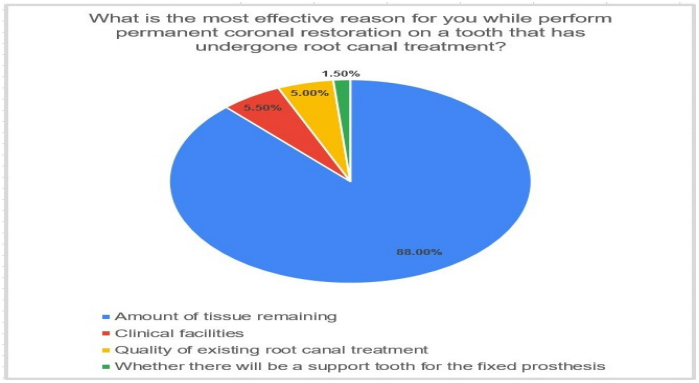

Figure 3: The responses to the question regarding what if the most effective reason for choosing permanent coronal restoration.

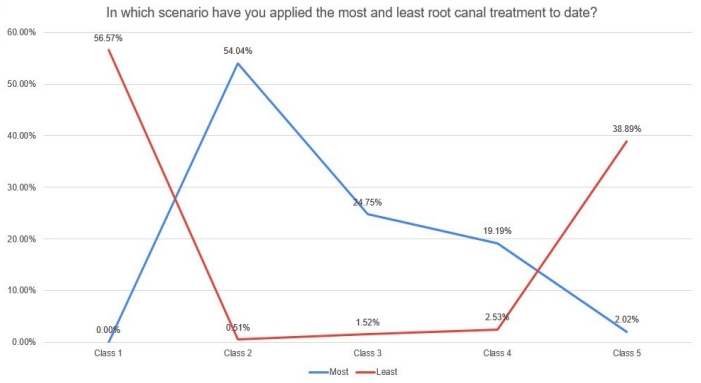

Figure 4: The responses to the question regarding the scenarios which they applied most and least root canal treatment.

the most preferred, while post crown was the most preferred restoration in classes 4 and 5 (Fig 5).

Individuals without specialization were more likely to extract anterior and premolar teeth than those who specialized ($p<0.05$). However, no significant difference was found for molar teeth ($p>0.05$). In addition, those with over ten years of experience were more inclined to perform tooth extractions for all types of teeth than those with less than ten years of experience ($p<0.05$), as shown in Table 3.

The choice of coronal restorations did not differ significantly based on specialization ($p>0.05$). However, practitioners from Public Health were more likely to use amalgam in scenarios involving Classes 2 to 4 ($p<0.05$) compared to other workplaces. There was no significant difference in the use of restorations for Classes 1 and 5 scenarios ($p>0.05$) (Table 4).

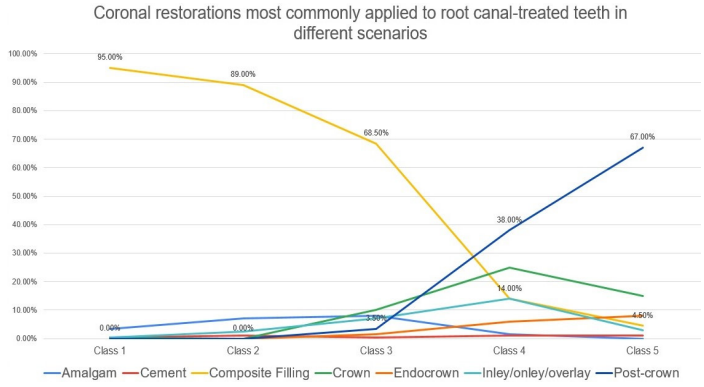

Figure 5: The responses to the question regarding the coronal restorations which they applied most and least in different scenarios.

Discussion

The success of a root canal treatment depends on several crucial factors, including a thorough understanding of the tooth's structure and anatomy, accurate diagnosis, effective treatment planning, complete disinfection, adequate filling of the root canal, and proper coronal restorations (23). After filling, small particulate molecules can still penetrate the root canal, so it is crucial to have a strong coronal restoration to protect against chemical, bacterial, thermal, and mechanical factors that may affect the root canal system (24). Our study aimed to investigate the various approaches of dentists in Turkey when faced with different coronal restoration scenarios. In the light of the findings, our hypotheses "The coronal restoration preferred by Turkish dentists does not change depending on the amount of tissue remaining in endodontically treated teeth." and "The institution where the dentist works, the year of experience, age, gender, and expertise do not affect the preferred coronal restoration type." were rejected.

Research shows that performing permanent restoration during the first session of root canal treatment can increase the lifespan of the treated tooth (25-28). Delaying the permanent coronal restoration, on the other hand, may increase the risk of endodontic failure (4, 29, 30). This is because temporary filling

Table 3: Comparison of the preference of tooth extraction in different classes instead of root canal treatment according to specialty and workplace since coronal restoration cannot be performed

	Speciality			Experience			
	Yes (N=88)	No (N=111)	p value	<11 (N=145)	>10 (N=54)	p value	Total (N=199)
Anterior			0.010*			0.006*	
RCT	69.0 (78.4%)	64.0 (57.7%)		101.0 (69.7%)	32.0 (59.3%)		133.0 (66.8%)
5	10.0 (11.4%)	27.0 (24.3%)		29.0 (20.0%)	8.0 (14.8%)		37.0 (18.6%)
4+5	7.0 (8.0%)	19.0 (17.1%)		15.0 (10.3%)	11.0 (20.4%)		26.0 (13.1%)
1+2+3+4+5	2.0 (2.3%)	1.0 (0.9%)		0.0 (0.0%)	3.0 (5.6%)		3.0 (1.5%)
Premolar			0.002*			0.005*	
RCT	61.0 (69.3%)	52.0 (46.8%)		84.0 (57.9%)	29.0 (53.7%)		113.0 (56.8%)
5	18.0 (20.5%)	40.0 (36.0%)		48.0 (33.1%)	10.0 (18.5%)		58.0 (29.1%)
4+5	5.0 (5.7%)	18.0 (16.2%)		12.0 (8.3%)	11.0 (20.4%)		23.0 (11.6%)
3+4+5	2.0 (2.3%)	0.0 (0.0%)		1.0 (0.7%)	1.0 (1.9%)		2.0 (1.0%)
2+3+4+5	0.0 (0.0%)	1.0 (0.9%)		0.0 (0.0%)	1.0 (1.9%)		1.0 (0.5%)
1+2+3+4+5	2.0 (2.3%)	0.0 (0.0%)		0.0 (0.0%)	2.0 (3.7%)		2.0 (1.0%)
Molar			0.076			0.004*	
RCT	45.0 (51.1%)	39.0 (35.1%)		63.0 (43.4%)	21.0 (38.9%)		84.0 (42.2%)
5	33.0 (37.5%)	43.0 (38.7%)		59.0 (40.7%)	17.0 (31.5%)		76.0 (38.2%)
4+5	8.0 (9.1%)	25.0 (22.5%)		23.0 (15.9%)	10.0 (18.5%)		33.0 (16.6%)
3+4+5	0.0 (0.0%)	1.0 (0.9%)		0.0 (0.0%)	1.0 (1.9%)		1.0 (0.5%)
2+3+4+5	0.0 (0.0%)	1.0 (0.9%)		0.0 (0.0%)	1.0 (1.9%)		1.0 (0.5%)
1+2+3+4+5	2.0 (2.3%)	2.0 (1.8%)		0.0 (0.0%)	4.0 (7.4%)		4.0

*indicates significance, RCT: Only Root Canal Treatment

materials may not fully seal off bacteria between sessions (4). In our study, 63.51% of participants reported performing coronal restoration during the first session. Similarly, Topalan (31) found that the majority of participants in their study also immediately performed coronal restoration after endodontic treatment.

When deciding on a permanent restoration for a tooth that has undergone endodontic treatment, there are several factors to consider. These include the amount of remaining tooth structure, the position of the tooth, and the cost (32). In this survey of dental professionals, 88% cited the amount of remaining tissue as the most important factor in their choice of coronal restoration. When asked about the restoration of endodontically treated teeth, the majority of participants (77.4%) reported that the remaining tooth structure was the main factor in their decision to use a fiber post or custom-made post and core system (33). This finding is consistent with other studies, such as Usta, Cömert-Pak (34)'s survey where 87% of respondents cited remaining tooth structure as the most important factor in post-endodontic restoration. Excessive material loss can weaken the tooth's resistance to incoming forces, making it crucial to consider the amount of remaining tooth structure when choosing a restoration method.

The survey results showed that Class 5 and Class 1 teeth are the least likely to receive canal treatment. Practitioners are more likely to notice caries on the occlusal surface, which may provide to the caries being treated early to prevent progression and reach of the pulp. Diagnosing occlusal caries lesions at an early stage can also prevent caries from appearing on the approximal surfaces (35). This may explain why Class 1 teeth receive less root canal treatment. Access cavity preparation can negatively affect fracture resistance if marginal ridges in the occlusal region are lost (36). It is possible that participants preferred extraction over root canal treatment for Class 5 teeth due to the greater loss of substance and more laborious and additional procedures required for restoration. When deciding on restoration for a tooth that has undergone endodontic treatment, the amount of healthy tooth tissue remaining is the most critical factor to consider. This is because the amount of remaining tooth tissue directly affects the tooth's ability to resist fractures. Posterior teeth, which experience high levels of force during chewing, are more susceptible to fractures. Meanwhile, esthetic considerations are more important for anterior teeth, which are less prone to fractures (37-39). If the remaining tooth tissue after root canal treatment is likely to be very weak, extraction may be preferred over root canal treatment. Additionally, the location of the tooth in the arch also plays a role in the choice of restoration, as the forces acting on restorations in the anterior and posterior regions are different (1).

Most participants indicated that they would opt for root canal treatment in all cases. According to Sambrook and Burrow (40), the position of the tooth in the arch and the type of restoration planned can influence the restorative decision. The study also found that root canal treatment was more likely to be applied in the anterior region due to the greater aesthetic need. General dentists tend to prefer tooth extraction, while specialists in anterior and premolar teeth prefer root canal treatment. Further, Demarco,

Table 4: Comparison of the most commonly applied coronal restoration types to root canal-treated teeth in different classes according to specialty and workplace.

	Speciality			Workplace				
	Yes (N=88)	No (N=106)	p value	University (N=50)	Public Health (N=50)	Private Dentistry (N=94)	p value	Total (N=194)
Class 1			0.446				0.414	
Amalgam	2.0 (2.3%)	5.0 (4.7%)		1.0 (2.0%)	3.0 (6.0%)	3.0 (3.2%)		7.0 (3.6%)
Cement	0.0 (0.0%)	1.0 (0.9%)		0.0 (0.0%)	1.0 (2.0%)	0.0 (0.0%)		1.0 (0.5%)
Composite Filling	85.0 (96.6%)	99.0 (93.4%)		49.0 (98.0%)	45.0 (90.0%)	90.0 (95.7%)		184.0 (94.8%)
Crown	0.0 (0.0%)	1.0 (0.9%)		0.0 (0.0%)	0.0 (0.0%)	1.0 (1.1%)		1.0 (0.5%)
Inley/onley/overlay	1.0 (1.1%)	0.0 (0.0%)		0.0 (0.0%)	1.0 (2.0%)	0.0 (0.0%)		1.0 (0.5%)
Class 2			0.308				< 0.001*	
Amalgam	4.0 (4.5%)	10.0 (9.4%)		1.0 (2.0%)	11.0 (22.0%)	2.0 (2.1%)		14.0 (7.2%)
Cement	0.0 (0.0%)	2.0 (1.9%)		0.0 (0.0%)	1.0 (2.0%)	1.0 (1.1%)		2.0 (1.0%)
Composite Filling	82.0 (93.2%)	91.0 (85.8%)		48.0 (96.0%)	38.0 (76.0%)	87.0 (92.6%)		173.0 (89.2%)
Inley/onley/overlay	2.0 (2.3%)	3.0 (2.8%)		1.0 (2.0%)	0.0 (0.0%)	4.0 (4.3%)		5.0 (2.6%)
Class 3			0.158				0.002*	
Amalgam	2.0 (2.3%)	14.0 (13.2%)		1.0 (2.0%)	10.0 (20.0%)	5.0 (5.3%)		16.0 (8.2%)
Cement	0.0 (0.0%)	1.0 (0.9%)		0.0 (0.0%)	1.0 (2.0%)	0.0 (0.0%)		1.0 (0.5%)
Composite Filling	65.0 (73.9%)	70.0 (66.0%)		39.0 (78.0%)	36.0 (72.0%)	60.0 (63.8%)		135.0 (69.6%)
Crown	8.0 (9.1%)	10.0 (9.4%)		4.0 (8.0%)	2.0 (4.0%)	12.0 (12.8%)		18.0 (9.3%)
Endocrown	2.0 (2.3%)	1.0 (0.9%)		2.0 (4.0%)	0.0 (0.0%)	1.0 (1.1%)		3.0 (1.5%)
Inley/onley/overlay	7.0 (8.0%)	7.0 (6.6%)		1.0 (2.0%)	1.0 (2.0%)	12.0 (12.8%)		14.0 (7.2%)
Post-crown	4.0 (4.5%)	3.0 (2.8%)		3.0 (6.0%)	0.0 (0.0%)	4.0 (4.3%)		7.0 (3.6%)
Class 4			0.473				0.003*	
Amalgam	0.0 (0.0%)	3.0 (2.8%)		0.0 (0.0%)	3.0 (6.0%)	0.0 (0.0%)		3.0 (1.5%)
Cement	1.0 (1.1%)	1.0 (0.9%)		1.0 (2.0%)	0.0 (0.0%)	1.0 (1.1%)		2.0 (1.0%)
Composite Filling	10.0 (11.4%)	18.0 (17.0%)		4.0 (8.0%)	16.0 (32.0%)	8.0 (8.5%)		28.0 (14.4%)
Crown	21.0 (23.9%)	27.0 (25.5%)		13.0 (26.0%)	11.0 (22.0%)	24.0 (25.5%)		48.0 (24.7%)
Endocrown	7.0 (8.0%)	5.0 (4.7%)		3.0 (6.0%)	1.0 (2.0%)	8.0 (8.5%)		12.0 (6.2%)
Inley/onley/overlay	15.0 (17.0%)	12.0 (11.3%)		9.0 (18.0%)	3.0 (6.0%)	15.0 (16.0%)		27.0 (13.9%)
Post-crown	34.0 (38.6%)	40.0 (37.7%)		20.0 (40.0%)	16.0 (32.0%)	38.0 (40.4%)		74.0 (38.1%)
Class 5			0.464				0.177	
Cement	1.0 (1.1%)	1.0 (0.9%)		1.0 (2.0%)	0.0 (0.0%)	1.0 (1.1%)		2.0 (1.0%)
Composite Filling	5.0 (5.7%)	4.0 (3.8%)		2.0 (4.0%)	6.0 (12.0%)	1.0 (1.1%)		9.0 (4.6%)
Crown	12.0 (13.6%)	16.0 (15.1%)		6.0 (12.0%)	7.0 (14.0%)	15.0 (16.0%)		28.0 (14.4%)
Endocrown	11.0 (12.5%)	5.0 (4.7%)		6.0 (12.0%)	2.0 (4.0%)	8.0 (8.5%)		16.0 (8.2%)
Inley/onley/overlay	3.0 (3.4%)	3.0 (2.8%)		2.0 (4.0%)	0.0 (0.0%)	4.0 (4.3%)		6.0 (3.1%)
Post-crown	56.0 (63.6%)	77.0 (72.6%)		33.0 (66.0%)	35.0 (70.0%)	65.0 (69.1%)		133.0 (68.6%)

*indicates significance (p<0.05)

Baldissera (11) stated that postgraduate education can influence treatment choices, with specialists being more familiar with the literature and more willing to apply new technologies. Rabi and Rabi (41) also noted that treatment choices are influenced by experience duration.

Composite resin restoration is a popular choice for many reasons, including their natural appearance, strong bond, minimal preparation required, cost-effectiveness, and ability to strengthen remaining tooth tissue. Studies have shown that composite restorations have a high success rate in teeth with adequate remaining structure (33, 42, 43). In fact, a survey found that composite resin is the most preferred material across all regions (34). One reason for this preference may be due to the fact that composite resin bonding is often sufficient with multiple walls present in the tooth, eliminating the need for additional laboratory procedures. Overall, composite resin restorations are a reliable and effective option for Class 1, 2, and 3 teeth after root canal treatment. Consistent with this study, previous studies found that dentists working at public institutions tended to use more amalgam, maybe due to workload (44, 45).

Restoring damaged teeth after root canal treatment is often done using a method called post core application (46). This

helps prevent breakage in the buccal and lingual walls, which can occur due to loss of the mesial and distal walls that reduce the tooth's resistance to occlusal forces (47). Restoration with fiber posts has been proposed and successfully used to prevent this issue. In fact, a study showed an 8-year survival rate with post placement and crown restoration (48). A meta-analysis found that the presence of a post-core greatly improves the survival rate of root canal treated teeth (49). It is recommended to use post-cores in cases of excessive coronal loss (50, 51). Participants in the study preferred the post-core more frequently in Class 4 and 5 cases.

Our study had certain limitations, one of which was that we were unable to determine the response rate of participants due to the web-based survey method used. In addition, it is important to note that the classification based on Naumann, Blankenstein (22) included all teeth and may vary in approach between anterior and posterior teeth. On a positive note, the study's generalizability is increased as it was not conducted at a single center.

Conclusion

Dentists prefer to use composite resin for class 1, 2, and 3 scenarios where there is less tissue loss. For scenarios where there is more tissue loss, such as class 4 and 5 scenarios, post-crowns are the preferred option. The amount of tissue loss is the most important factor when choosing a restoration method. Dentists with more experience and general dentists tend to extract more teeth in cases where there is significant tissue loss. Physicians in public institutions generally prefer amalgam over those working in private or university institutions. The use of inlay, onlay, overlay, and endocrown restorations is infrequent, but indirect restorations may be a better option and their use should be expanded.

Declarations

Author Contributions: *Conception/Design of Study- S.K.K., F.P.H.; Data Acquisition- S.K.K., Ö.H.; Data Analysis/Interpretation- S.K.K., F.P.H., Ö.H.; Drafting Manuscript- S.K.K., F.P.H.; Critical Revision of Manuscript- S.K.K., F.P.H.; Final Approval and Accountability- S.K.K., F.P.H.; Material and Technical Support- S.K.K.; Supervision- S.K.K., Ö.H.*

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Mandibular Panoramic Radiograph Distortion Rate Determination

Elif AKBAŞ AKÇA[1] , Mehran MOGHBEL[2]

Abstract

Aim The aim of this study was to evaluate the distortion rates of the mandible on panoramic radiographs and to prepare bone grafts close to the actual values with a preliminary study. In patients with mandibular defects due to any cause, the dimensions of the bone graft used to repair the defect are compatible with the original dimensions of the defect, allowing a better contour. However, bone grafts used in clinical applications are prepared empirically. As a result, functional problems may occur during reconstruction. The aim of this study was to determine the appropriate bone graft to use in patients undergoing jaw reconstruction.
Material and method Two groups were prepared in the study. In the first group one cm radiopaque wires were wrapped over the mandibles. In the other group, points of random length were marked with wires and panoramic radiographs were taken.
Results As a result of the statistical study, these deviations in each region of the mandible were found to be highly significant according to the "Student T" test (p value 0.001 for each region). Distortion rate is different in each region..
Conclusion In cases where jaw reconstruction is being considered, it may be helpful to calculate the appropriate dimensions for the healthy state of the jaw by determining the excision margins on panoramic radiographs. Preoperative determination of the size of the defects is important for both the surgeon and the patient in planning the operation and achieving optimal results. In this way, prolonged surgery can be avoided and a near-optimal result can be achieved in the patient's jaw.

Keywords Dentists, Distortion, Mandible, Orthopantomography, Radiology

Introduction

For mandibular defects, the bone to be used for repairs should have dimensions compatible with the original dimensions of the defect to achieve a better contour. Currently, bone grafts used for clinical applications are planned empirically, which can negatively affect the functional and cosmetic outcome of the reconstruction. The consequences of bone grafting with jaw repair, facial asymmetry creation, and treatment that render patients' functions inadequate are too significant to be underestimated. This benign disease requires jaw reconstruction at the lesion site where mandibular tumors were originally excised due to incalculable deformity dimensions resulting in delayed treatment. The size of the defect area varies based on regional fibrosis and muscle contractures during repairs (1,3,4).

When considering jaw repair in the same session, a panoramic radiograph may be used to determine the margins of excision. The healthy side of the jaw fitting these boundaries can be quite helpful for calculating the dimensions (3).

Material and Methods

This study was conducted to replicate the same procedures on the remaining jaw segment for patients who require secondary jaw repair, and to prepare a bone graft that matches the corresponding dimensions. We also intended to prepare a bone graft that accurately matches the required values through a preliminary study using panoramic radiographs.

The study involved the preparation of two groups. For the first group, mandibles were wrapped with 1 cm radiopaque wires. In the other group, wires were used to mark randomly selected points and then panoramic radiographs were taken.

We measured the lengths of the wires and their panoramic projections on the graph. Each mandibular region was evaluated separately, and we took the averages of actual and panoramic radiograph measurements. These values were separately evaluated statistically using Student's T-test.

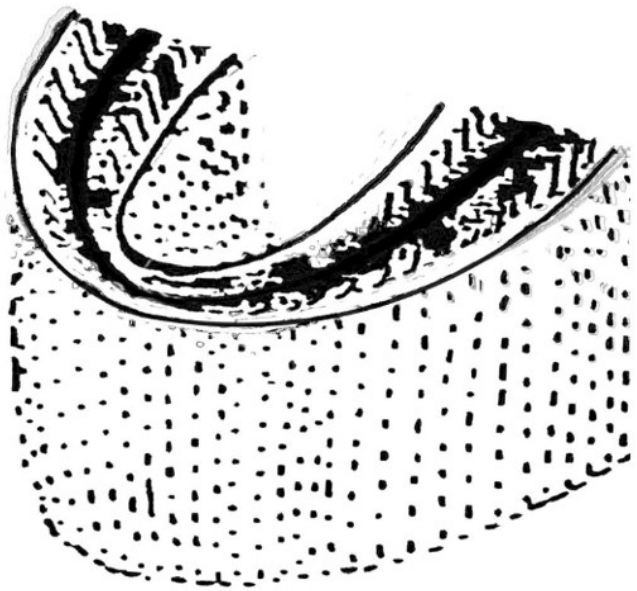

Figure 1: Showing the best and least distorted areas of the image with a black line on the panoramic radiograph.

Correspondence: Elif AKBAŞ AKÇA, akbaselif.35@gmail.com

[1] Private Practice Sakarya,Turkiye

[2] Private Practice Samsun,Turkiye

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Results

The statistical study revealed that the deviations in each region of the mandible were highly significant, with a p-value of 0.001 for each region according to the Student T-test. The distortion rate differs in each region. For instance, the measurements in the mentum area show significantly different values compared to the other regions provided. "1" unit of length in the mentum area loses approximately 27-35% of its actual value in radiographs. This is also probably because of the movement of the mandible, the amount of image distortion is directly proportional (5).

As these deviations near the corpus region, which is immediately adjacent to the foramen mentale, the ratio approaches 1:1. In the angulus and inter-corpus regions, we observe an increase of approximately 12-20% in the panoramic radiograph measurement value. Our studies suggest that mandible curvature is one of the factors affecting the difference in graphic values other than the mentum region (Figure 1).

As a result, the ratio in the angulus region increases with the increase of this angle. Consequently, the angulus appears more deformed in angled and young mandibular. The ramus region is one of the areas where the image shows a maximum increase of 20-30% compared to the actual values

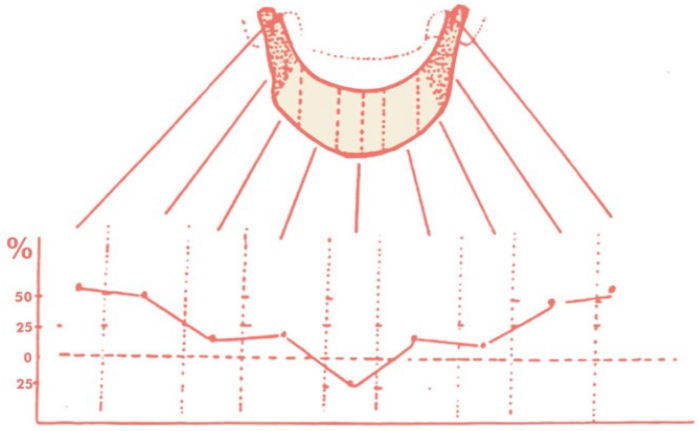

Figure 2: Showing the amount of distortion in radiographs according to regions (%).

Discussion

Panoramic radiographs present a comprehensive anatomical region but lack fine details (1,2). Magnification, geometric distortion gives the image of overlapping teeth, especially in the premolar region (3) (Figure 2). In addition to differences in visual size, there are also regional differences in the appearance of the radiopaque wires. For both foramen in the area between the mentale, it was observed that the image was much fainter depending on the amount of beam. However, both the angulus and ramus can be visualized more evidently. This brings attention to the fact that panoramic radiographs may overlook fracture lines or other minor lesions in the mentum region. In this current study, the distance between the X-ray device and the mandible bone was arranged as if soft tissue was present, same as in vivo. This approach made the study of cadaveric bone in vivo produce precise results, such as the 'real' value. However, the radiation absorption of the whole head in the living organism is neglected and not taken into account.

Conclusion

In cases where the primary operation was carried out in another clinic or the resected bone's size was not measured, the actual size of the bone defect during primary resection remains unknown. Furthermore, during the operative procedure, movements and muscle strength of the jaw's attached muscles cause changes to the bone defect's actual shape. For these types of defects, the optimal results during surgery are achieved by planning the operation based on the defect's size, which should be determined during the preoperative phase. This is important for both the surgeon and the patient. Hence, this can help in preventing prolonged operation time and achieving near-ideal outcomes for the patient's jaw.

Declarations

Author Contributions: *Conception/Design of Study- E.A.A., M.M.; Data Acquisition- E.A.A., M.M.; Data Analysis/Interpretation- E.A.A., M.M.; Drafting Manuscript- E.A.A., M.M.; Critical Revision of Manuscript- E.A.A., M.M.; Final Approval and Accountability- E.A.A., M.M.; Material and Technical Support- E.A.A., M.M.; Supervision- E.A.A.*

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Extrusion of Root Canal Filling Materials in Molars of a Turkish Subpopulation

Emre ÇULHA[1], Fatma TUNÇ[1]

Abstract

Aim This research aimed to investigate the root canal filling sealer or gutta-percha extrusion in molars in a population in Turkiye.
Material and method Cone-beam computed tomography images of 831 endodontically treated molars (284 maxillary first molars, 189 maxillary second molars, 178 mandibular first molars, and 180 mandibular second molars) were examined at three planes by two endodontists. The presence of extrusion, the number of teeth, and the type of molar were determined via the chi-square test at a p-value of 0.05 in SPSS V25 (IBM, Chicago, IL).
Results 13.71 % of the molars had extrusion of root canal filling materials. In maxillary and mandibular molars, extrusion was observed in 17.5% and 8.7% of cases, respectively. Extrusion was seen in 15.8% of maxillary first molars, 20.1% of maxillary second molars, 8.4% of mandibular first molars, and 8.9% of mandibular second molars.
Conclusion Root canal filling material extrusion was statistically detected more in maxillary molars than in mandibular molars. Extrusion was more observed in maxillary second molars than in other molar categories.

Keywords Endodontics, Molar, Root canal obturation, Root canal preparation, Root canal therapy

Introduction

One of the fundamentals of root canal therapy is obturating the root canal space to protect it from bacterial contamination. The root canal obturation material should, in principle, approach the apex without reaching the periapical tissues or other nearby structures (1). However, there is no agreement on the limit of root canal obturation in the apical region. While some authors predicate the apical limit on the apical foramen, apical constriction, or cement-dentin-canal junction, others assert that it is difficult to identify these structures clinically (2, 3, 4). Endodontic treatment shows the best success rate in obturations that ended 0-2 mm short of the length of the root while underfilling and overfilling have substantially lower success rates (5, 6). In the presence of an oval-shaped apical foramen, apical foramina, or lateral canal, extrusion of the root canal sealer is possible (2). The future of the extruded filler material is influenced by its volume and consistency, solubility, and sensitivity to phagocytosis, while biocompatibility determines the compound's influence on endodontic therapy (7).

On whether descending the canal beyond the apex prolongs the periapical healing process, the research is divided. The apical size of root canal fillings is not directly associated with treatment failure (8) unless there is an infection. In addition, the vast majority of overfilled teeth recover successfully with proper endodontic treatment (9). Extruded root canal sealer has no adverse effect on root canal treatment outcomes (7). Other studies, however, have linked root canal therapy failure to overfilling (2, 9, 10). The prognosis of teeth with apical periodontitis is negatively affected by root canals that are overfilled (11).

Gutta-percha, combined with an appropriate sealer, is the most common root canal filling material. Root canal sealers are harmful to cells and have the potential to irritate the tissues around the apex. Gutta-percha is more biocompatible than root canal sealers (12). However, these materials may cause tissue reactions when extruded by functioning as a foreign body in the periradicular tissue (13). This reaction is significantly influenced by the relationship between the material's characteristics, the location of the extrusion, and the immune response (8). Furthermore, the presence of an extraradicular filling substance may hinder the healing phase of apical periodontitis (14). Chemical factors resulting from the cytotoxic effects of root canal filling materials, mechanical factors resulting from canal filling material overflowing into anatomical structures, and thermal factors resulting from the overheating of adjacent tissues as a result of warm filling techniques can all cause tissue damage (15, 16). In addition, overfilled root canals are four times more prone to be unsuccessful than underfilled canals (17).
Cone-beam computed tomography (CBCT) is an imaging method that not only permits clinicians to diagnose and plan treatment but also to investigate extended root fillings in three dimensions (18). This research aimed to assess the presence of extruded root canal sealer or gutta-percha in molars with endodontic treatment in a Turkish subpopulation by using CBCT. The null hypothesis of this research was that there was no difference in the extrusion of root canal-filling materials between molar groups.

Material and Methods

The investigation was conducted with the authorization of the local research ethics commission. The study included a total of 831 molar teeth that had undergone root canal therapy. The

Correspondence: Emre ÇULHA, emreculha@hotmail.com

[1] Gaziantep University, Faculty of Dentistry, Department of Endodontics Gaziantep, Turkiye

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teeth of subjects younger than 18 years old were excluded from the investigation. Exclusion criteria include teeth with exposed apices, external root resorption, advanced periodontal disease, periapical pathology, and teeth that could not be evaluated reliably due to CBCT errors.

A private dental clinic's database was searched for all full-size scans (Orthophos XG 3D, Sirona Dental Systems, USA) with a field volume of 8 x 8 cm and a voxel size of 0.4 mm. This study had no relevance to the radiographic examination. DICOM images were captured and displayed in a dark environment on a 20-inch LED screen with a high resolution. Using the CBCT software (Sirona Galaxis Galileos Viewer Version 1.9.2, Sirona Dental Systems, Germany) images were evaluated concurrently by two endodontists with more than 10 years of CBCT experience. After comparing the results, a definitive consensus was reached. To analyze the periapical sections, the axial, coronal, and sagittal planes of the CBCTs were aligned to the long axis of every root. For this investigation, a root canal was considered to be overfilled and root canal filling material extruded when the root canal sealer or gutta-percha extended beyond the radiographic apex.

Maxillary first molars (n = 284), maxillary second molars (n = 189), mandibular first molars (n = 178), and mandibular second molars (n = 180) were studied. All personal information has been made anonymous. The data included the patient's age, gender, number of teeth, and types of molars. The presence of gutta-percha or canal sealer extrusion in at least one of the roots of molar teeth was also documented.

Statistical analysis

All parameters were evaluated with Windows-based statistical software (SPSS V25; IBM, USA) and presented as frequencies and percentages. Using the chi-square test and a significance level of 0.05, proportional differences were evaluated using the chi-square test.

Results

52.2% (n = 434) of the owners of the molars included in the investigation were female, and 47.8% (n = 397) were male. The average age of the owners of the teeth was 51.5 (standard deviation 12.8, minimum 21, maximum 90). There was no statistical link identified between age, gender, and the presence of root canal-filling material extrusion in molar teeth.

13.71 % of the root canal-treated molar teeth included in the study had extrusion of the canal obturation material. Regarding extrusion, there was a statistical association with the maxillary and mandibular molars. Extrusion occurred substantially more frequently in maxillary molars than in mandibular molar teeth ($p<0.05$) (Table 1).

Table 1: Distribution of molars with extrusion.

	Extrusion		χ^2	p
	Absent n(%)	Present n(%)		
Maxillary molars	390 (82.5)	83 (17.5)	13.601	0.001*
Mandibular molars	327 (91.3)	31 (8.7)		

*p<0.05; chi-square test

Table 2: Distribution of maxillary molars with extrusion.

	Extrusion		χ^2	p
	Absent n(%)	Present n(%)		
Maxillary 1st molars	239 (84.2)	45 (15.8)	1.424	0.233
Maxillary 2nd molars	151 (79.9)	38 (20.1)		

chi-square test

Although more extrusion was observed in maxillary second molars compared to first molars, no statistical difference was detected. Extrusion was most common in maxillary second molars among all molar groups in the current study (Table 2). In the aspect of extrusion, there was no statistically significant variance between mandibular molar teeth. (Table 3).

Table 3: Distribution of mandibular molars with extrusion..

	Extrusion		χ^2	p
	Absent n(%)	Present n(%)		
Mandibular 1st molars	163 (91.6)	15 (8.4)	0.024	0.877
Mandibular 2nd molars	164 (91.1)	16 (8.9)		

chi-square test

Discussion

Regarding the extent of apical root canal obturation, there is no consensus. Some authors suggest that the apical border of the obturation is terminated within the apical narrowing of the root canal (2). However, obturation up to the radiographic apex is typically extruded because the actual apical foramen of the tooth rarely overlaps the radiographic apex (19). Other researchers advocate filling canals that are shorter than the radiographic length of the root (20). There is no agreement on the degree of shortness of the root canal filling (9, 21). There is consensus, however, that root canal filling should not extend beyond the apex. The effectiveness of endodontic treatment with a root canal filling extending 1 mm beyond the apex is inadequate (22). Extruded root canal filling is defined as a material composed of gutta-percha and canal sealer that extends through the periodontal ligament (PDL). Typically, this extrusion only extends to the PDL region at the apical foramen.

Overinstrumentation is the most common cause of extruded fillings. Due to the incorrect determination of the working length, the apical foramen enlarges and the apical structure gets harmed (23). Complex root canal anatomy, apical resorption, and immature roots, which influence the formation of the apical barrier, are frequently observed in teeth with overextended root canal fillings (24, 25). Clinically, primary endodontically treated

non-vital teeth and teeth undergoing retreatment are more likely to be overextended (7, 24, 26). During root canal filling procedures, excessive condensation force, hydrostatic pressure, injectable hot gutta-percha, and the usage of a lentulo spiral contribute to overextended root canal fillings (24, 25, 27, 28). In addition, conditions associated with the filling materials, such as the excessive viscosity of some sealers, the use of excessive sealing material, and gutta-percha that do not meet the standards, lead to overextended fillings (25, 27, 28). No materials and techniques prevent extrusion beyond the apex with certainty (29).

The prognosis of the extruded material depends on its physicochemical properties, particularly its water solubility (30). Although root canal sealers are resorbed to the point where they cannot be detected radiographically, microscopic particles may persist in the periradicular tissues (31). There is no correlation between the nature of the extruded material or its resorption, periapical healing, and treatment outcome (26, 32). Furthermore, there is no consensus regarding the impact of overfilling on the efficacy of endodontic treatment in teeth with periradicular lesions. In teeth with apical periodontitis, excess filling that does not extend beyond 2 mm of the radiographic apex does not affect the result of treatment (9). On the other hand, unsuccessful treatments are intimately related to infection and are not initiated by the material's cytotoxicity (33). In addition, extrusion of obturation material can activate the host's immune system and diminish the healing outcome (7). Although gutta-percha is well tolerated by tissue (12), extruded gutta-percha can delay periapex healing (34). Gutta-percha points may exacerbate this process because zinc may dissolve from its structure (35). Also, extruded gutta-percha cones have a biofilm that allows bacteria to proliferate and makes them immune to the body's defenses (36). This structure could trigger an inflammatory response, resulting in the accumulation of macrophages (37).

The canal-filling technique is the determining factor in gutta-percha and canal sealer extrusion (38). Consequently, the combined use of lateral and vertical condensation techniques statistically considerably increases the potential for overfilling when compared to the single cone or vertical condensation techniques alone. In addition, as a result of the fluidity produced by the heat-applied compaction techniques, more canal sealer may be applied than with the lateral condensation technique, causing it to overflow (39).

Previous investigations assessed the quality of root canal fillings as adequate or inadequate based solely on their length (40, 41) or on their length and lateral adaptation (42, 43). A study focusing on endodontic procedural errors revealed that overfilling was the most prevalent error among all teeth undergoing endodontic treatment (44). Another research using CBCT to assess the condition of root canal fillings discovered that 8.1% of root canal-filled teeth included any kind of extruded material (45). Literature shows that approximately 1.09 to 31.8% of the time, root-filling material overextends (45, 46, 47, 48, 49). Although it is radiographically difficult to distinguish between gutta-percha and root canal sealers, studies investigating only paste extrusion found a prevalence of 6.9% to 8.12% in all teeth (45, 50).

The first limitation of the investigation was the possibility of root canal-filling materials that were too resorbed to be identified by CBCT but detectable histologically (51). The second limitation is that the present study did not evaluate CBCT images of teeth in terms of primary or secondary endodontic interventions. In addition, it was not documented whether the teeth were vital or non-vital before the endodontic procedure, nor was the technique used to fill the root canal recorded. In detecting the presence of extrusion, the current study considered the radiographic apex rather than the apical constriction (52), which was another limitation. Furthermore, while analyzing the extrusion of root canal filling material, it was challenging to distinguish from gutta-percha to root canal sealers using CBCT images.

When all molar groups were evaluated for extrusion, a higher result (13.71%) was determined from previous studies. Besides, our findings revealed a higher incidence of maxillary molar extrusion (17.5%) than studies in the literature (2.13-11.6%) (47, 49, 53, 54). When the numbers relating to the long canal obturations and sealer puffs in a German study, which was the only study in the literature to generate separate data for every molar type, were evaluated collectively, our findings showed higher extrusion in each molar group (45). The current study probably included CBCT images of all patients who applied for varied reasons, not simply endodontic purposes, which may have contributed to these differences in findings.

In the current investigation, the incidence of root canal filling material extrusion in maxillary molars was statistically higher than in mandibular molars, similar to many studies (45, 47, 49). However, while a Turkish study detected overfilling incidences close to each other in maxillary and mandibular molars (53), a Serbian study reported more overfilling in mandibular molars, contrary to the current study (54). These differences may be because these two studies were performed on two-dimensional periapical radiographs may have resulted in results. Although no statistical difference was observed, there was more extrusion in maxillary second molars compared to first molars. Compared to percentage, extrusion was most common in maxillary second molars among all molar groups. This situation may be because of the position of the tooth that did not allow dental operators for appropriate endodontic treatment.

Conclusion

In conclusion, maxillary molars had more root canal-filling material extrusion than mandibular molars. Extrusion was most common in maxillary second molars among all molar groups, with no statistical difference between mandibular molar teeth. Dentists should be especially careful about the extrusion of the obturation material during root canal filling of maxillary molars.

Declarations

Author Contributions: *Conception/Design of Study- E.Ç.; Data Acquisition- F.T., E.Ç.; Data Analysis/Interpretation- F.T.; Drafting Manuscript- F.T., E.Ç.; Critical Revision of Manuscript- F.T., E.Ç.; Final Approval and Accountability- F.T., E.Ç.; Material and Technical Support- F.T., E.Ç.; Supervision- F.T.*

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Examination of The Mandibular Cortex of Renal Osteodystrophy Patients on Panoramic Radiographies

Murat Mert ATAPAEK[1], Mehran MOGHBEL[2]

Abstract

Aim Renal osteodystrophy, also known as uremic osteopathy, is a constellation of musculoskeletal abnormalities that occur in patients with chronic renal failure. Osteomalacia, Rickets, abnormal calcium and phosphate metabolism due to secondary hyperparathroidism are also related to this phenomenon. Bone changes are expected in renal osteodystrophy cases such as lamina dura loss, resorption of alveolar bone, multiple tiny radiolucencies on calvaria, subperiosteal resorption of bones and osteopenia.

Material and method In the first part of the study, cases who applied to the oral diagnosis and radiology department of our faculty with no known metabolic bone disease were evaluated. These cases were first divided into two separate groups according to gender, and each group was divided into seven different age groups. Age groups were determined as 0-14, 25-19, 20,-29, 30-39, 40-49, 50-59, and over 60 years of age.

Results In the statistical study, it was first investigated whether there was a significant difference between the age groups of both sexes. As a result of the research conducted with one-way analysis of variance, no statistically significant relationship was found between age groups in both genders. Furthermore, the values obtained from both sexes were checked with the t-test and no significant relationship was found.

Conclusion In the light of these findings, it was concluded that our method is a useful method in determining metabolic bone loss.

Keywords Bone, Cortex, Mandible, Osteodystrophy, Renal osteodystrophy

Introduction

A healthy bone structure is under the influence of calcium and phosphorus metabolism, both of which are normally under the influence of many hormones and controlled by vitamin D metabolism (1). With the effect of these hormones, serum calcium level in normal individuals is 8.5 - 10.5 mg/dl. while the serum phosphorus level is 4.7 mg/dl (2). Changes in mineral metabolism may cause hard tissue loss by changing the bone structure. The most common conditions resulting in metabolic bone loss are hyperparathyroidism, osteoporosis after menopause (3-5).

Hyperparathyroidism can be seen primarily and it can also occur secondary to renal failure (6). It is called osteodystrophy (4). In severe kidney failure, vitamin D metabolism is disrupted, which results from reduced calcium absorption in the intestines. It causes phosphorus accumulation and serum phosphorus level increases (1,4). As a result, this condition stimulates parathyroid hormone production. Increased levels of the parathyroid hormone lead to increased osteoclastic activity. The resultant bone resorption produces cortical thinning (subperiosteal resorption) and osteopenia (1). The most well-known radiographic symptoms of metabolic diseases in the mouth are loss of lamina dura (7). However, the lamina dura examination may not always be performed successfully. Reasons for this are poor application of radiography technique, presence of periodontal or periapical lesions and total edentulous jaws. Therefore, in metabolic bone diseases, other criteria should be determined (8). Studies have shown that such cases revealed cortical bone loss especially in the angulus region of the mandible, but this finding has not been sufficiently investigated (9-11).

The aim of this study was to determine the thickness of the cortex on panoramic radiographs in the angulus region of the mandible in healthy individuals without any known metabolic bone disease in order to investigate whether the values obtained vary according to age and gender, and to compare these results with the values obtained from renal osteodystrophy cases as well as to determine whether there is a statistically significant difference between them.

Material and Methods

In the first part of the study, cases who applied to the oral diagnosis and radiology department of our faculty with no known metabolic bone disease were evaluated. These cases were first divided into two separate groups according to gender, and each group was divided into seven different age groups. Age groups were determined as 0-14, 25-19, 20,-29, 30-39, 40-49, 50-59, and over 60 years of age. Since the development of the mandible completes in the first fifteen years of life, the first age range was determined as 0-14 years. In the panoramic radiographs of the cases, the cortex thickness was measured in both the right and left gonion regions with the help of measuring tool on imaging media.

In our research, MicroDicom is used for it is a free viewer software. Mandibular gonial points is assessed because it is more relevant to mandibular cortical thickness. An oblique line were placed between the gonial angle point and end of the cortex. Then, the same procedures were performed on 11 patients, four men

Correspondence: Murat Mert ATAPEK, matapek@gmail.com

[1] Yeditepe University Faculty of Dentistry, Department of Oral and Maxillofacial Radiology, Isanbul, Turkiye

[2] Private Practice Samsun,Turkiye

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and seven women, aged between 22 and 38 (average 30 years and 4 months), diagnosed with renal osteodystrophy. In cases where the cortex could not be detected radiographically, the thickness was evaluated as 0. Finally, the obtained values were compared statistically.

Results

The findings obtained from healthy male individuals are shown in Table 1, and the findings obtained from female individuals are shown in Table 2.

Table 1: Healthy Male Cortex Thickness (In mm)

Age Group	Lowest	Highest	Average
0-14	0.75	1.45	1.226
15-19	1.00	1.80	1.226
20-29	1.20	2.55	1.820
30-39	1.15	2.30	1.723
40-49	0.95	2.15	1.546
50-59	1.10	2.55	1.556
Above 60	1.10	2.15	1.450

Table 2: Healthy Female Cortex Thickness (In mm)

Age Group	Lowest	Highest	Average
0-14	0.85	1.85	1.236
15-19	0.95	1.50	1.130
20-29	0.95	2.75	1.606
30-39	1.35	2.50	1.766
40-49	1.10	1.65	1.356
50-59	0.95	1.95	1.310
Above 60	0.90	1.85	1.316

In the statistical study, it was first investigated whether there was a significant difference between the age groups of both sexes. As a result of the research conducted with one-way analysis of variance, no statistically significant relationship was found between age groups in both genders. Furthermore, the values obtained from both sexes were checked with the t-test and no significant relationship was found. Then, individuals with renal osteodystrophy were compared with healthy individuals. Findings related to the renal osteodystrophy patient group are described in Table 3. These values were compared with healthy individuals. In the analysis made with the t-test, the difference was found to be statistically highly significant.

Discussion

Postnatal development of the mandible completes at 10 years old in 65% of individuals, and 10-15 years in the remaining 35%. Therefore, our first age group was determined as 0-14 years old.

Since the risk of postmenopausal osteoporosis is taken into account, especially in female patients over 55 years of age, female patients at this age were selected among those using postmenopausal calcium preparations (3).

Table 3: Findings of patients with renal osteodystrophy

Age	Gender	Dialysis Time	Cortex Thichness (mm)
22	F	20 months	0.05
24	F	8 months	0.00
32	F	11 months	0.00
38	F	6 months	0.75
36	M	4 months	0.00
37	F	6 months	0.05
35	M	12 months	0.10
28	F	11 months	0.15
26	M	9 months	0.00
32	F	6 months	0.00

There are studies in the literature about the oral manifestations of renal osteodystrophy. In the radiographs of such cases, radiolucency increased due to mineral loss in the bone. Cortical bone image disappeared in most of them, and a marked thinning occurred in cortices with a noticeable thickness compared to healthy individuals (12). In our study, we also experienced loss of cortical bone appearance on our radiographs or lack of presence of any cortex, just as other researchers have found (7).

To have a distinct idea regarding how dialysis time and cortical thickness relate to each other, an increased number of individuals with renal osteodystrophy is required. Data size of our patients are limited in this manner. Therefore, no correlation or suggestions were made on this issue. There is no significant loss in the lamina dura of the patients. Silverman et al. also reported that loss of lamina dura was a later symptom and was seen in 11% of patients (13).

In these patients, the degree of renal osteodystrophy can be determined by performing iliac bone biopsy. However, such an attempt was not made in our cases. In the light of these findings, it was concluded that our method is a useful method in determining metabolic bone loss. A further investigation can be made by using more advanced imaging techniques such as CBCT or MRI (14).

Conclusion

A panoramic radiography is cheap, easy to use and can give an idea about the patients' situation with a simple measuring tool. Bone loss due to metabolic bone disease - renal osteodystrophy - can be detected by dental radiographs. In particular, the information that can be obtained from the measurements made from the mandible gonion point was found to be important.

Declarations

Author Contributions: *Conception/Design of Study- M.M.A., M.M.; Data Acquisition- M.M.; Data Analysis/Interpretation- M.M.A.; Drafting Manuscript- M.M.; Critical Revision of Manuscript- M.M.A.; Final Approval and Accountability- M.M.; Material and Technical Support- M.M.; Supervision- M.M.A.*

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Unusual Impaction of a Mandibular Second Premolar: Case Report

Şükriye Neslihan ŞENEL[1], Sabri Cemil İŞLER[2], Tamer Lütfi ERDEM[3]

ABSTRACT

Aim The aim of this study is to present clinical and radiographic features along the treatment of an unusual impacted mandibular second left premolar of a patient applied to our faculty.

Case Report A 23-year-old female patient was referred to our clinic with pain and mild swelling that is localized at mandibular left area. We examined her panoramic radiography and we noticed that her mandibular second left premolar was impacted vertically and the point of root crossed the cortical bone at the inferior border of mandible. Then, we took a dental volumetric tomography from the patient for a more sensitive assessment of the localization of the impacted tooth and its relationship with the mandibular canal. The tooth was extracted at the Department of Oral Surgery to relieve the pain and the patient was followed up periodically.

Discussion In the case of having an impacted tooth, periapical, orthopantomographs or occlusal radiographs are used to detect it. The images obtained with these conventional techniques are 2-dimensional and not sufficient for determining of the exact localization and the relation of the tooth with adjacent structures. Latest research shows that instead of conventional radiographies, Cone beam computed tomography is more successful in defining the localization of impacted teeth.

Conclusion In the treatment of impacted teeth, orthodontic treatment or tooth extraction can be applied according to the age of the patient and the condition of the dental arch.

Keywords Cone-beam computed tomography, Dentistry, Impacted teeth, Mandible, Tooth

Introduction

Impacted teeth, are those teeth whose eruption is delayed or ceased for various reasons. Tooth eruption failures are quite frequent developmental anomalies and third molars are the most common impacted teeth followed by maxillary canines, maxillary and mandibular premolars (1-4). The impaction of teeth may be the consequence of local or systemic factors. Local factors include supernumerary teeth, cysts and tumors that prevent tooth eruption, and insufficient space in the dental arch due to micrognathia or premature loss of deciduous teeth. Systemic factors are genetic diseases, endocrine disorders, and irradiation of the jaws due to head and neck radiotherapy (5-7).

When a clinically impacted tooth is suspected, the presence of an impacted tooth is investigated with periapical, panoramic or occlusal radiographs. However, 2D imaging techniques are insufficient in detecting impacted teeth due to imaging errors such as magnification, distortion, and superposition. For this reason, cone-beam computed tomography has been used in recent years to accurately determine the positions of impacted teeth and their relationships with neighboring structures (3, 8, 9).

Correspondence: Şükriye Neslihan ŞENEL, neslihan.senel@istanbul.edu.tr

[1] İstanbul University Faculty of Dentistry, Department of Oral and Maxillofacial Radiology, Isanbul, Turkiye

[2] İstanbul University Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Istanbul, Turkiye

[3] Atlas University Faculty of Dentistry, Department of Oral and Maxillofacial Radiology, Isanbul, Turkiye

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Case Report

Our patient is a 23-year-old female without any systemic disease. She referred to Istanbul University Faculty of Dentistry with swelling and pain with palpation, at her left mandibular area. Extraorally there was no evident asymmetry, but a small swelling was perceived with palpation, at the lower edge of left mandibular area. The patient had pain when the swelling was palpated. The intraoral examination revealed that the mandibular left second premolar was absent. The patient pointed out that her deciduous mandibular left second molar was extracted because of caries. She did not remember if her permanent mandibular left second premolar had erupted and then been extracted. The mandibular left first molar was observed to have moved towards mesially. (Figure 1)

Figure 1: An intraoral view of the patient.

The examination of orthopantomograph (OPG) revealed that the mandibular left first premolar erupted normally, the mandibular left second premolar impacted vertically and the point of its root crossed the cortical bone at the inferior border of mandible. The crown of the tooth was covered totally by a layer of bone with sclerotic appearance. (Figure 2)

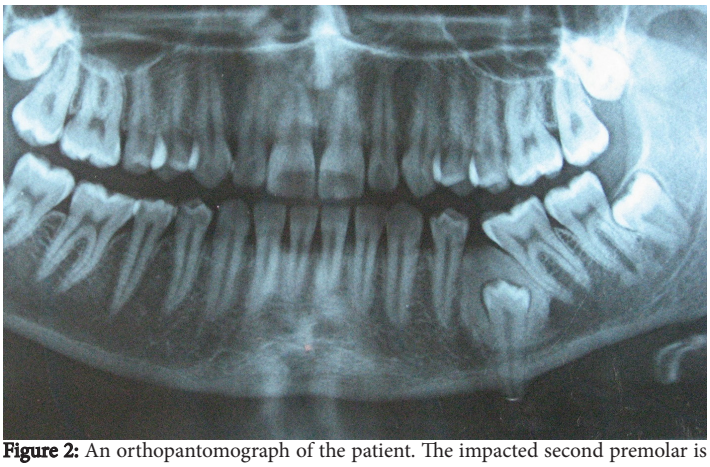

Figure 2: An orthopantomograph of the patient. The impacted second premolar is seen at the left mandibular area.

Cone beam computed tomography (CBCT) was taken from the patient to determine the exact localization of the impacted tooth and its relationship with the mandibular canal. (Figure 3, 4)

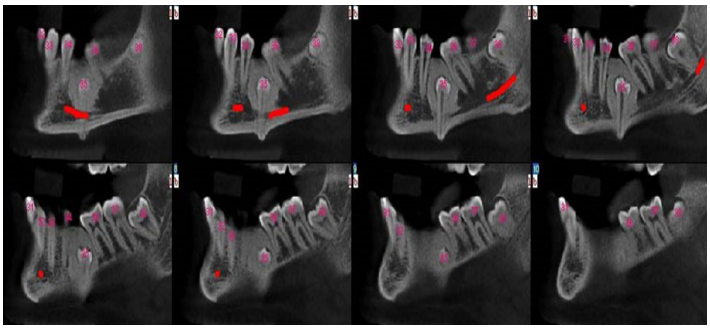

Figure 3: The sagittal section of the Cone beam computed tomography (CBCT) image of the patient. The root of the impacted premolar is seen in close proximity to the mandibular canal marked in red.

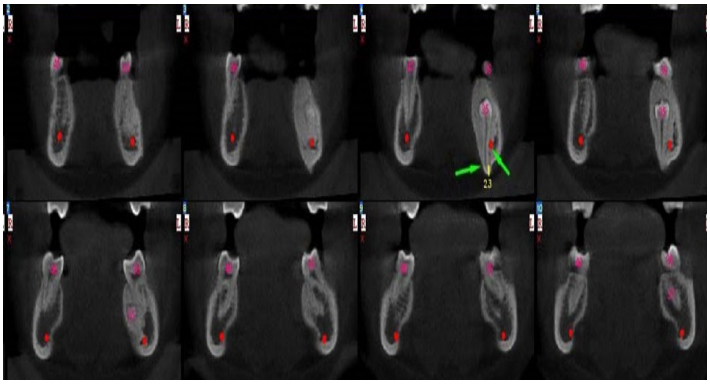

Figure 4: The coronal section of the CBCT image of the patient. The position of the mandibular canal is indicated by the red dot in the image marked with green arrows. In addition, the root tip of the impacted tooth which crossed 2.3 mm from the base of the mandible can be observed.

Surgical treatment

The patient was referred to Department of Oral and Maxillofacial Surgery after the clinical and radiological examinations for surgical extraction of the impacted second premolar. The patient's impacted tooth was extracted by a maxillofacial surgeon under local anesthesia. After the soft tissue flap was removed in the lower left premolar region during the operation, a biopsy was taken from the sclerosed bone tissue covering the tooth by a bone drill. After tooth extraction, an Epi-Guide® Bioresorbable Barrier Matrix (Kensey Nash, Pennsylvania) resorbable membrane was placed and sutured in order to accelerate healing and prevent the migration of connective tissue to the wound area (Figure 5,6).

Figure 5: An intraoral view after flap removal.

Figure 6: After the flap was removed in the lower left premolar region during the operation, a biopsy was taken from the sclerosed bone tissue and after tooth extraction a resorbable membrane was placed and sutured.

The patient was followed up after the operation. The histopathologic examination of the biopsy tissue revealed no pathologic condition and that it was condensed healthy bone tissue. In the control radiograph taken 3 months after the operation, it was observed that bone formation occurred at the extraction cavity. (Figure 7).

Figure 7: Orthopantomograph of the patient taken 3 months after the operation

Discussion

Tooth impaction is a common dental anomaly and several authors reported that most often impacted teeth are the third molars followed by maxillary canines. Although studies on the rate of impacted premolar teeth are limited, rates ranging from 0.2 to 1.79% have been reported. There may be local or systemic causes of impacted premolars in the jawbones. These reasons are the lack of the existing space in the jaws due to early loss of primary molars, pathological lesions such as dentigerous cysts as well as genetic diseases characterized by multiple impacted teeth, such as cleidocranial dysplasia (3,10-13).

The techniques used for detecting impacted teeth are intraoral radiographs, orthopantomographs, occlusal radiographs, and in the recent years cone beam computerized tomography (CBCT) technique due to its advantages in 3D imaging the relationships with structures such as adjacent teeth, sinus floor or mandibular canal (2,8). Alamri et al. (1) investigated the prevalence of impacted teeth by evaluating orthopantomographs in 539 patients and reported that 71 patients (13.2%) had impacted teeth. Siotou et al. (12) evaluated the intraoral photographs and OPGs of 1400 orthodontic patients in their study in which they investigated the prevalence of impacted teeth, and reported that the most impacted teeth were the upper canines with a rate of 32.28%. In the aforementioned study, the rate of impacted lower second premolar teeth was found to be 11.39%. In our patient, impacted lower left second premolar and lower third molars were observed on panoramic radiograph, and the patient was referred to the Department of Oral and Maxillofacial Surgery for surgical treatment.

Different treatment options have been suggested for the impaction according to the condition of the impacted tooth and the occlusal relations with other teeth in the mouth, such as observation, surgical exposure, orthodontic intervention, extraction, and autotransplantation (6,8,14). Alberto (6), after evaluating with OPG and CBCT in her study in which she presented the treatment of the two maxillary canines and the second left premolar, applied surgical exposure and orthodontic alignment. Manjunatha et al. (10) in the study of 4 cases where they presented the treatment of impacted upper premolar teeth, surgically removed the impacted teeth after radiographic examination of the patients with OPG and CBCT. Mc Namara & Mc Namara (15) treated two patients with impacted premolar teeth in the lower jaw with surgical exposure and orthodontic intervention. Bae et al. (16), after evaluating the patient with an impacted and inverted upper premolar tooth with OPG and cephalomatric radiography, provided the right occlusion by the rotation of the impacted tooth with orthodontic treatment. In our case, after the radiographic examination, it was decided that the impacted mandibular second premolar could not be erupted with orthodontic treatment and should be removed by intraoral surgery, and the operation was performed with the patient's consent.

There are limited studies in the literature on the treatment of severely impacted teeth. Pippi et al. (17) detected a horizontally impacted canine tooth in the left lower jaw inferior to the premolars and molars in the OPG of an 18-year-old female patient. In the axial section of the CBCT image of the patient, it is observed that the tip of the crown of the tooth disrupts the continuity of the lingual cortex of the mandible. Surgical treatment of the tooth was performed extraorally under general anesthesia. Göçmen et al. (18) detected a vertically impacted first molar in the left lower jaw of a 32-year-old male patient in orthopantomographic examination. In the sagittal section of the patient's CBCT image, it was observed that the tooth has reached the base of the mandible and the cortex has been thinned. Surgical treatment of the tooth was performed by opening the bone lid with an extraoral approach under general anesthesia. In our case, the root of the impacted second premolar tooth exceeded the base of the mandible by 2.3 mm. Although the extraoral extraction is used in some cases in such deeply impacted teeth, this method has risks such as mandibular nerve damage, fracture of the mandible and scar formation (19, 20). For this reason, in our patient, tooth extraction was performed intraorally under local anesthesia. In the control radiograph taken 3 months after the extraction of the tooth, it was observed that bone formation occurred in the tooth extraction cavity and there was no complaint of paresthesia or infection.

Conclusion

Choosing the correct radiographic method is important in the diagnosis of impacted teeth. After the presence of impacted teeth is detected by techniques such as intraoral radiographs or orthopantomographs, cone beam computed tomography is used to examine the relationship of the tooth with the surrounding tissues in 3D. While deciding on the orthodontic or surgical treatment of the tooth, certain criteria are evaluated such as the age of the patient, the distance of the dental arch, the regulation of chewing function, and aesthetic factors.

Declarations

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A Case of Epulis Granulomatosa With Clinical and Radiological Findings Resembling Langerhans Cell Histiocytosis

Suay Yağmur ÜNAL[1], Gaye KESER[1], Filiz NAMDAR PEKİNER[1], Vakur OLGAÇ[2]

ABSTRACT

Aim Langerhans cell histiocytosis (LCH) is a rare disease characterized by the proliferation of Langerhans cells. The differential diagnosis of LCH from epulis granulomatosa may be more difficult, given that the major symptoms of LCH are swelling and a floating tooth appearance. The purpose of this study was to provide a case of epulis granulomatosa that resembled LCH in the jaw bones based on clinical and radiological symptoms, as well as to warn against the possibility of misdiagnosis.

Case Report Smooth-surfaced, lobular, erythematous, sessile, and fibrotic tissue hyperplasias were seen in the maxilla anterior edentulous area and the mandible's left posterior region. The patient's radiographic findings revealed extensive alveolar bone destruction in the maxilla and mandible, as well as severe bone destruction in the posterior area of the left mandible, consistent with a floating tooth. Under local anesthetic, an excisional biopsy of the lesion was performed in the left posterior region of the mandible. Histopathological examination revealed that the patient had inflammatory fibrous tissue hyperplasia.

Discussion The clinical symptoms of LCH patients vary depending on their location and degree of involvement. When completing a full mouth examination on a patient, it is critical to detect soft tissue abnormalities as well as provide an accurate diagnosis and treatment plan.

Conclusion LCH, together with surrounding inflammatory alterations, should be considered in the differential diagnosis of osteolytic lesions of the jaw.

Keywords Differential diagnosis, Epulis granulomatosa, Histopathologic examination, Langerhans cell histiocytosis, Oral diagnosis

Introduction

Langerhans cell histiocytosis (LCH), formerly known as "histiocytosis X," is a rare condition characterized by strong and aberrant proliferation of bone marrow-derived immature myeloid dendritic cells-Langerhans cells (LCs) in the skin, bone, lymph nodes, and other organs (1,2). LCH is more prevalent in children with a male predisposition. The disease's incidence is reported to be 8.9 cases per million in children and 1-2 cases per million in adults (3, 4). LCH may form in a wide range of tissues including bone, lung, liver, skin, or endocrine systems, lymph nodes, neurological, and digestive systems (5, 6). In half of the LCH patients, bone involvement is seen, particularly in the mandibular region (5). LCH causes osteolytic lesions in these individuals, which are manifested by pain, edema, and tooth mobility (7,8).

LCH is formed by the clonal growth of immunophenotypical and functionally immature LCH cells, as well as eosinophils, macrophages, lymphocytes, and, on rare occasions, multinucleated giant cells. Histiocytosis X, eosinophilic granuloma, Letterer-Siwe illness, and Hand-Schüller-Christian disease are all names for LCH. Nevertheless, the recommended nomenclature is LCH since the diseased histiocyte common to all of these diagnoses was found to include typical Birbeck granules using electron microscopy (9, 10). There is controversy about whether clonal proliferation of LCH cells is caused by malignant transformation or by an immune trigger. Regardless of the mechanism causing clonal proliferation, the main therapy, if indicated, includes chemotherapeutic drugs (11).

Epulis is a clinical word that refers to a reactive localized connective tissue growth in the gingiva, the specific histological basis of which is uncertain. Epulis can affect individuals of any gender or age, however it is more frequent in women and young people (12). While epulis is classified differently in the literature, the most frequently recognized classification divides it into three major categories based on tissue origin: granulomatous epulis, fibrous epulis, and giant cell epulis. Granulomatous epulis, also known as gingival pyogenic granuloma, lobular capillary haemangioma of the gingiva, and epulis granulomatosa, is a smooth or lobulated exophytic lesion with a deep red or purplish color. Local irritants such as calculus, hormonal factors, certain medicines, and poor oral hygiene may all play a role in the development of granulomatous epulis (12, 13).

The treatment of granulomatous epulis is determined by the clinical symptoms. When the lesion is tiny, painless, and bleeding-free, removal of the causative irritants, clinical observation, and follow-up may be indicated. Although conservative excision, which reaches down to the periosteum and reserves the teeth, is the standard therapy, intrusive resection, which involves removing the neighboring teeth, should be performed to treat the vast lesion with significant loose teeth or the recurring lesion (13). Given that the main signs of LCH include edema and a floating tooth appearance, differentiating LCH from epulis granulomatosa

Correspondence: Gaye KESER, gaye.sezgin@marmara.edu.tr

[1] Marmara University, Faculty of Dentistry, Department of Oral and Maxillofacial Radiology, Istanbul, Turkiye

[2] İstanbul University, Institute of Oncology, Department of Clinical Oncology, Istanbul, Turkiye

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may be more challenging. The aim of this case report was to provide a case of epulis granulomatosa in the jaw bones that resembled LCH based on clinical and radiological symptoms, as well as to warn against misdiagnosis.

Case Report

A 55-year-old female patient presented at the Department of Oral and Maxillofacial Radiology at Marmara University Faculty of Dentistry with complaints of teeth mobility and difficulty in chewing. The medical history was not significant for any medical conditions other than hypertension. Smooth-surfaced, lobular, erythematous, sessile, fibrotic tissue hyperplasias were seen in the maxilla anterior edentulous region and the maxilla left posterior region of the patient (Figure 1a, b). Panoramic radiography and Cone Beam Computed Tomography (CBCT) images revealed widespread alveolar bone destruction in the maxilla and mandible, as well as extensive bone loss in the left mandible posterior area consistent with the floating tooth. (Figure 2, 3).

Figure 1: Smooth-surfaced, lobular, erythematous, sessile, fibrotic tissue hyperplasias were observed a) in the maxilla anterior edentulous region and b) the left posterior region of the maxilla.

Excisional biopsy of the associated lesion with tooth number 38 was performed under local anesthesia in the left posterior area of the jaw, and bleeding control was maintained. Histopathological examination revealed acanthosis and papillomatous tissues in the stratified squamous epithelium covering the surface, as well as a fiber-rich connective tissue with intense lymphocyte and plasma cell infiltration beneath it. Histopathologically, the diagnosis is inflammatory fibrous tissue hyperplasia. When the patient arrived at the control, he showed improvements in condition week after excision (Figure 4). The patient is currently stable and asymptomatic for oral lesions, with no new complaints of tooth mobility or discomfort.

Figure 2: Panoramic radiography revealed widespread alveolar bone destruction in the maxilla and mandible, as well as extensive bone loss in the left mandible posterior area consistent with the floating tooth

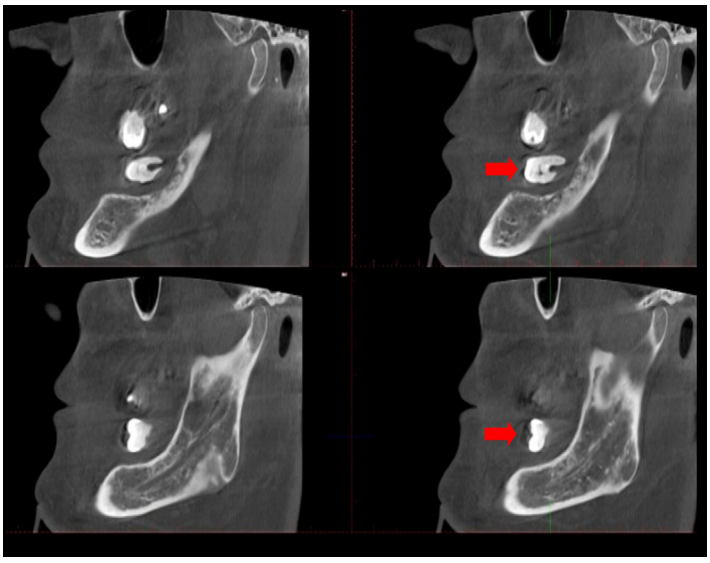

Figure 3: Extensive bone loss in the left mandible posterior area consistent with the floating tooth (red arrow) in CBCT.

Figure 4: Recovery after excision of the lesion.

Discussion

The term histiocytosis X was used to refer to a group of clinopathologic diseases defined by the proliferation of histiocyte-like cells. Langerhans cells have been identified as the characteristic histiocytic cells present in this lesion, and the disorder is now known as LCH (1-3, 10)

LCH can affect any bone, but mainly the skull (1-3, 14, 15). It is distinguished by a single or several lytic bone lesions (14, 16, 17). Lesions may grow in size and number or merge, and oral alterations are frequently the first clinical manifestation of the disease (15, 17). This circumstance highlights the critical function of dentists in diagnosis and treatment. The mandible is impacted more frequently than the maxilla, and posterior parts are afflicted more frequently than anterior regions (14, 17, 18). LCH lesions in the alveolar bone are often numerous, whereas intraosseous lesions are single (14, 18). In the affected regions, clinicians may notice pain, sensitivity, gingival necrosis, and swelling (2, 3, 18, 19).

Clinical-radiological-pathological evidence should be used to determine the diagnosis (1-3). The characteristic presentation of LCH in the jaws frequently leads to tooth loosening or early exfoliation, as well as premature eruption of permanent teeth. In these circumstances, a differential diagnosis should include juvenile or diabetic periodontitis, hypophosphatasia, leukemia, cyclic neutropenia, and metastatic malignant neoplasms. Periapical lesions may resemble a periapical cyst or granuloma. Isolated radiolucent lesions in the jaws should be distinguished from odontogenic tumors and cysts, and many well-circumscribed radiolucencies may indicate multiple myeloma (10, 17-19). LCH's primary diagnostic imaging modalities are computed tomography and magnetic resonance imaging. In order to make a definite diagnosis, a biopsy and an immunohistochemistry investigation are performed (14, 20). As compared to computed tomography, CBCT is a favored imaging tool for evaluating bone destruction in these patients due to advantages such as low radiation dosage, good resolution, less time and lower cost (20-22).

67% of oral symptoms involve bone tissue, specifically the posterior mandible (5, 23-27). They might be isolated or many in numbers, and they can range in severity from mild to severe. Periodontal bone loss appears as "floating teeth" on X-rays. Soft tissue lesions can be gingival ulcerations or enlargements, as in the present case (23, 25). Periodontal disease and squamous cell carcinoma are major differential diagnoses for alveolar lesions. The differential diagnosis of intraosseous lesions includes metastatic malignant neoplasms and malignant tumors (28). In general, both benign and malignant bone lesions of the oral cavity and soft tissue should be evaluated in the differential diagnosis (29).

When observed in the oral cavity, LCH presents a substantial difficulty for the dental professional since some clinical characteristics of the disease mirror more frequent disorders such as periodontal disease, malignancies, and granulomatous or ulcerative lesions (2, 6, 25). As a result, the clinical and radiological results of the reported patient revealed advanced periodontitis, which may have suggested near-total extraction. Therefore, reevaluating the patient and performing an incisional biopsy for histological analysis assisted the authors in avoiding disease misdiagnosis and perhaps incorrect therapy.

LCH is treated by surgical curettage and bone grafting, as well as low-dose radiation, chemotherapy, and local steroid treatment into the lesion (15, 22). The treatment technique is governed by the patient's age, the location of the lesion, the number of implicated bones and lesions, the size of the lesion, and the disease's natural course (22, 30). Since jaw lesions have a low recurrence probability, surgical treatment is typically favored (1). After therapy, the patient should be regularly monitored for an extended period of time. The prognosis is determined by the patient's age and the number of organs affected. Those with LCH who show the first signs of the disease at a young age have a worse prognosis than children who get LCH later in life (19-25).

Conclusion

The clinical symptoms of LCH patients vary depending on their location and degree of involvement. When completing a full mouth examination on a patient, it is critical to detect soft tissue abnormalities as well as provide an accurate diagnosis and treatment plan. LCH, together with surrounding inflammatory alterations, should be considered in the differential diagnosis of osteolytic lesions of the jaw.

Declarations

Author Contributions: *Conception/Design of Study- F.N.P.; Data Acquisition- S.Y.U., G.K.; Data Analysis/Interpretation- F.N.P. , S.Y.U., V.O.; Drafting Manuscript- G.K., S.Y.U.; Critical Revision of Manuscript- F.N.P.; Final Approval and Accountability- F.N.P.; Material and Technical Support- V.O.; Supervision- F.N.P.*

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Xeroderma Pigmentosum: Case Report

Fatma GÜLER DÖNMEZ[1] , Filiz NAMDAR PEKİNER[1] , Ayşe Nur SADIKOĞLU[1]

ABSTRACT

Aim Xeroderma pigmentosum, which is commonly known as XP, is an inherited condition characterized by an extreme sensitivity to ultraviolet (UV) rays from sunlight. This condition mostly affects the eyes and areas of skin exposed to the sun. Some affected individuals also have problems involving the nervous system. In affected individuals, exposure to sunlight often causes dry skin (xeroderma) and changes in skin coloring (pigmentation). The aim of this report is to present a case of xeroderma pigmentosum in a female patient.
Case Report A 33-year-old female patient was referred to Marmara University, Faculty of Dentistry Oral Diagnosis Clinic. A 33-year-old female patient was admitted to Marmara University Faculty of Dentistry Oral Diagnosis Clinic with the complaint of pain. All systemic findings of the syndrome were observed. In the intraoral examination, no findings were found in the oral mucosa.
Discussion People with xeroderma pigmentosum have a greatly increased risk of developing skin cancer. Without sun protection, about half of children with this condition develop their first skin cancer by age 10. Most people with xeroderma pigmentosum develop multiple skin cancers during their lifetime. These cancers occur most often on the face, lips, and eyelids. Cancer can also develop on the scalp, in the eyes, and on the tip of the tongue.
Conclusion Patients should be kept under control because of squamous cell carcinoma that can be observed in the oral mucosa.

Keywords Oral cancer, Oral diagnosis, Oral mucosa, Squamous cell carcinoma , Xeroderma pigmentosum

Introduction

Xeroderma pigmentosum (XP) is an autosomal recessive disease characterized by severe photosensitivity, abnormal pigmentation and a more than 1000-fold increase in the frequency of all types of major skin cancers (basal cell cancers, squamous cell cancers, malignant melanoma) in areas exposed to sunlight compared to normal population (1,2).

The prevalence of XP is relatively high in the Middle East and Japan. In addition, several cases have been reported in Africa. Xeroderma pigmentosum is estimated to affect about 1 in 1 million people in the United States and Europe (3-9).

Researchers have identified at least eight inherited forms of xeroderma pigmentosum: complementation group A (XP-A) through complementation group G (XP-G) plus a variant type (XP-V). The types are distinguished by their genetic cause. All of the types increase skin cancer risk, although some are more likely than others to be associated with neurological abnormalities. This condition mostly affects the eyes and areas of skin exposed to the sun (10).

The signs of xeroderma pigmentosum usually appear in infancy or early childhood. Many affected children develop a severe sunburn after spending just a few minutes in the sun. The sunburn causes redness and blistering that can last for weeks. Other affected children do not get sunburned with minimal sun exposure, but instead tan normally. By age 2, almost all children with xeroderma pigmentosum develop freckling of the skin in sun-exposed areas (such as the face, arms, and lips); this type of freckling rarely occurs in young children without the disorder. In affected individuals, exposure to sunlight often causes dry skin (xeroderma) and changes in skin coloring (pigmentation). This combination of features gives the condition its name, xeroderma pigmentosum (2,11).

People with xeroderma pigmentosum have a greatly increased risk of developing skin cancer. Without sun protection, about half of children with this condition develop their first skin cancer by age 10. Most people with xeroderma pigmentosum develop multiple skin cancers during their lifetime. These cancers occur most often on the face, lips, and eyelids. Cancer can also develop on the scalp, in the eyes, and on the tip of the tongue. Studies suggest that people with xeroderma pigmentosum may also have an increased risk of other types of cancer, including brain tumors. Additionally, affected individuals who smoke cigarettes have a significantly increased risk of lung cancer (11).

The eyes of people with xeroderma pigmentosum may be painfully sensitive to UV rays from the sun. If the eyes are not protected from the sun, they may become bloodshot and irritated, and the clear front covering of the eyes (the cornea) may become cloudy. In some people, the eyelashes fall out and the eyelids may be thin and turn abnormally inward or outward. In addition to an increased risk of eye cancer, xeroderma pigmentosum is associated with noncancerous growths on the eye. Many of these eye abnormalities can impair vision (12).

The aim of this report is to present a case of xeroderma pigmentosum in a female patient.

Case Report

A 33-year-old female patient was referred to Marmara University, Faculty of Dentistry Oral Diagnosis Clinic. The patient

Correspondence: Filiz NAMDAR PEKİNER, fpekiner@gmail.com

[1] Marmara University, Faculty of Dentistry, Department of Oral and Maxillofacial Radiology, Istanbul, Turkiye

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came to the faculty to have dental treatment. She has had a xeroderma pigmentosum since 8 years old and she has 40 operations since the age of 10. Because of these surgical procedures, she lost her nose and part of her upper and lower lip. She has been using nose prosthesis since 2002. She went through unilateral exenteratio orbitae due to cancer invading orbital spaces (Figure 1,2).

Figure 1: Atrophic, hypo-hyperpigmented skin in a female patient affected by Xeroderma pigmentosum.

Cutaneous examination revealed area of mottled hyper and hypopigmentation involving the face, neck and the hand base of the patient (Figure 1, 2). She had limitation of mouth openness because of xeroderma pigmentosum and in the intraoral examination, no signs of malignancy in the oral mucosa were detected (Figure 3), and the tooth causing pain was extracted, and the dental examination and treatment was completed (Figure 4). The patient was under plastic surgery control.

Discussion

The first persistent cutaneous change seen in patients with this illness was dry, dyspigmented skin, which was initially described as "xeroderma" by Moritz Kaposi in 1870. In the first dermatological textbook that he co-wrote with Professor Ferdinand Hebra in 1874, Kaposi documented four patients who had xeroderma, also known as "parchment skin". Dr. Albert Neisser initially recorded an XP case with neurological symptoms, and DeSanctis and Cacchione helped create the name "DeSanctis-Cacchione syndrome" in 1932 to refer to XP individuals with severe neurological deficiencies. The condition was previously divided into two categories: classical XP, which only causes skin abnormalities, and DeSanctis-Cacchione syndrome, which causes both skin abnormalities and severe neurological degeneration. There are at least eight hereditary types of xeroderma pigmentosum (11,13,14).

Figure 2: Loss of part of the nose, upper and lower lip after surgical procedures in the patient.

The complementation group, the specifics of the mutation, and other factors all affect the clinical characteristics. As a result, there is a large range in clinical characteristics. Bright environments, outdoor activities, fair skin, smoking, a lack of diagnostic resources, a delay in diagnosis, and inadequate sun protection will increase cutaneous abnormalities, leading to a variety of pigmentation alterations, a variety of skin malignancies, and early death (15). While the other 40% of cases do not exhibit any sunburn reaction, about 60% of cases exhibit acute sensitivity to sunlight as the initial symptom, which takes many days or weeks to cure. A common condition is photophobia (16).

Figure 3: Decreased mouth opening affecting oral hygiene

Without UV protection, the skin ages and atrophies, becoming dry and harsh. Lentigines proliferate and become warty as well as becoming more numerous, darker, and clinically difficult to identify from the numerous, flat, pigmented seborrheic warts. Tiny, hypopigmented macules are frequently found among the lentigines, giving birth to the distinctive salt-and-pepper pattern of skin's mottled hyperpigmented and hypopigmented look. In these patients, the skin of the nose frequently exhibits an atrophic, hypopigmented region. Telangiectasia may appear later. There may be stucco keratosis, which are easily distinguished from sun keratosis (17).

Figure 4: Panoramic radiograph of the patient

Although UV radiation exposure is the cause of all skin changes, the degree of protection the skin has from sunlight, the Fitzpatrick skin type, and the duration of sun exposure all have a direct impact on how severe these changes will be. Individuals experience a wide range of consequences. Due to the photoprotective qualities of melanin, those with darker skin often experience a lower incidence of skin cancer than those with lighter skin. Dark-skinned and light-skinned individuals with XP, however, had comparable rates of skin cancer, highlighting the crucial significance of DNA repair mechanisms even in the presence of melanin protection (18).

Actinic cheilitis and SCC of the lips, as well as leukoplakia, erythroplakia, and SCC of the tongue's tip, are linked to XP [18]. UV radiation is thought to be the cause of the precancerous and cancerous lesions on the tip of the tongue, which are uncommonly affected in the general population. Although it is the only one provided, this explanation is not compelling. The posterolateral and ventral sides of the tongue and the floor of the mouth are most frequently affected by SCC in the general population, and it progresses aggressively among older smokers and drinkers. XP-related SCC, on the other hand, affects those under the age of 20 and manifests as a slowly progressing condition that affects the tip of the tongue. When a patient opens their mouth for breathing, speaking, eating, or doing an oral hygiene routine, a fibrous area that has been the result of multiple labialplasties stretches and causes pain. Because of this, the patient has bad hygiene practices, which contribute to a high prevalence of dental plaque, caries, and periodontal disease. Fissured tongue, keratoacanthoma, and persistent desquamative gingivitis cases have all been documented (19-21).

Although the skin and perioral findings of the case presented in this study are consistent with the literature findings, no pathology was detected in the intra-oral findings.

Conclusion

The quality of life and life expectancy of those who have XP can be significantly increased even if there is no known treatment. This is due to increased awareness, crucially early detection, strict sun protection, and attentive patient management.

Declarations

Author Contributions: *Conception/Design of Study- F.N.P.; Data Acquisition- F.G.D., A.N.S.; Data Analysis/Interpretation- F.N.P., F.G.D., A.N.S.; Drafting Manuscript- F.N.P., F.G.D., A.N.S.; Critical Revision of Manuscript- F.N.P.; Final Approval and Accountability- F.N.P.; Material and Technical Support- F.N.P., F.G.D., A.N.S.; Supervision- F.N.P.*

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