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Stomatološki vjesnik

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LOCATION AND INCIDENCE OF THE ZYGOMATICOFACIAL FORAMEN (ZFF): AN ANATOMIC STUDY ON DRY SKULLS OF THE BOSNIAN AND HERZEGOVINIAN POPULATION

THE SHORT TITLE: ZYGOMATICOFACIAL FORAMEN (ZFF)

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ABSTRACT

Introduction: Medical interventions involving the zygomatic region, including maxillofacial surgery, implantology, and aesthetic procedures, require a comprehensive understanding of the zygomaticofacial foramen (ZFF) to minimize the risk of injury during surgical manipulation.

Materials and Methods: This study examined the location, number and prevalence of zygomaticofacial foramina (ZFF) in fifty-seven dry human skulls of known age and sex. The lateral surface of the zygomatic bone was divided into four regions (A, B, C, and D) to assess the regional distribution of ZFF. Additionally, the distance between each ZFF and the most prominent point of the lateral zygomatic surface (ZP) was measured, using this point as the center of an imaginary clock to precisely determine foramina positioning.

Results: Among the 114 sides analyzed, the ZFF was absent in 4.4% of cases. The distribution of foramina per side was as follows: one (40.4%), two (36.8%), three (10.5%), four (5.3%), and five (2.6%). The mean distance between the ZFF and the most prominent point of the zygomatic bone was 8,62 ± 2.54 mm. On the right side, mZFF were most frequently located at 1 o'clock (23.8%), 12 o'clock (25.0%), and 11 o'clock (28.5%), while on the left side, they were most commonly found at 1 o'clock (26.1%), 11 o'clock (28.9%), and 12 o'clock (31.9%).

Conclusions: The anatomical variability of the zygomaticofacial foramen (ZFF) in terms of its number and position should be carefully considered when administering regional block anesthesia or performing surgical and aesthetic procedures in the zygomatic region.

Keywords: Zygomatic bone, zygomaticofacial foramen, maxillofacial surgery, anatomical variation.

Introduction

The zygomatic bone is responsible for creating the protruding contour of the cheek. On its lateral surface, the zygomaticofacial foramen is typically present, although it can occasionally be absent or double. This foramen serves as a conduit for the zygomaticofacial nerve and its accompanying vessels. The nerve travels through the inferolateral section of the orbit, pierces the orbicularis oculi muscle, and exits through the zygomaticofacial foramen. The zygomaticofacial nerve innervates the skin over the cheek's prominence, connecting with both the zygomatic branches of the facial nerve and the palpebral branches of the maxillary nerve. Occasionally, this nerve may be absent [1].

Knowledge of the anatomy of this region is crucial because the zygomatic nerve and its branches are vulnerable to injury during surgical procedures in the periorbital area [2]. Surgeries in this area may also result in damage to blood vessels, leading to hematomas [3]. The zygomaticofacial foramina show considerable variability, and their occurrence has been utilized as an anthropological marker to differentiate between various populations and ethnic groups [4, 2]. Understanding potential ethnic variations is not only important for anthropological research but also provides valuable insights for dental surgeons when planning surgeries in this region, such as zygomatic implants (ZI). ZI serves as an alternative for patients who lack sufficient maxillary bone to support a conventional dental implant [5]. This method boasts a success rate of over 90% [6] and offers the advantages of reducing the need for extensive bone grafts and minimizing both treatment and hospitalization times [7, 8]. The apex of the implant reaches the body of the zygomatic bone, where it encounters the greatest support area [9]. Alves [10] suggested that the optimal location for anchoring the ZI is in the middle portion of the zygomatic bone.

This study aimed to examine the prevalence and anatomical positioning of the zygomaticofacial foramen in the Bosnian and Herzegovinian population, as well as to analyze its variations across different populations.

Materials and Methods

In this study, a total of fifty – seven dry and well-preserved adult human skulls (114 hemicrania) with known sex and age were examined. The specimens were acquired from the Institute of Anatomy, Faculty of Medicine, University of Sarajevo. To uphold the integrity of the analysis and minimize potential confounding variables, only skulls free from structural deformities, trauma-related fractures, or pathological bone alterations were included in the study. Any specimens displaying such anomalies were carefully excluded from the dataset to maintain methodological rigor.

Each skull was positioned in the Frankfort horizontal plane according to standardized procedures, followed by a detailed examination of the lateral surface of the zygomatic bone (ZB). The number of zygomaticofacial foramina (ZFF) was identified bilaterally.

Measurements of the distances from the ZFF to the most prominent point of the lateral surface of the zygomatic bone (ZP) were performed on both sides, and the mean and standard deviation were determined. Morphometric measurements were taken using manual and digital Vernier calipers (Mitutoyo Co., Japan) with a 0.1 mm precision. Each skull was measured twice on both sides, and the mean value was recorded in millimeters. The data was then organized in Microsoft Excel 2019© for analysis.

To establish the precise anatomical position of the main zygomaticofacial foramen, the study implemented two methodological approaches, which are elaborated on in the subsequent sections.

In each examined skull, the surface of the zygomatic bone was systematically divided into four distinct regions by drawing two precise reference lines. The first line was positioned tangentially to the lateral margin of the orbit, ensuring it connected two specific anatomical landmarks: the lowest point of the zygomaticomaxillary suture (ZMS) and the lowest point of the frontozygomatic suture (FZS). This line served as a key boundary separating the upper and lower regions of the bone. The second line originated from the junction where the frontal and temporal processes of the zygomatic bone meet,

forming an angle. From this anatomical intersection, the line extended downward, running tangentially to the lowest point along the inferior orbital margin. This secondary reference line effectively divided the lateral and medial sections of the zygomatic bone. Once these divisions were established, the zygomatic bone was categorized into four distinct regions: A, B, C, and D. The presence and precise location of the zygomaticofacial foramen (ZFF) within each of these regions were meticulously recorded and analyzed. Figure 1 provides a visual representation of this division.

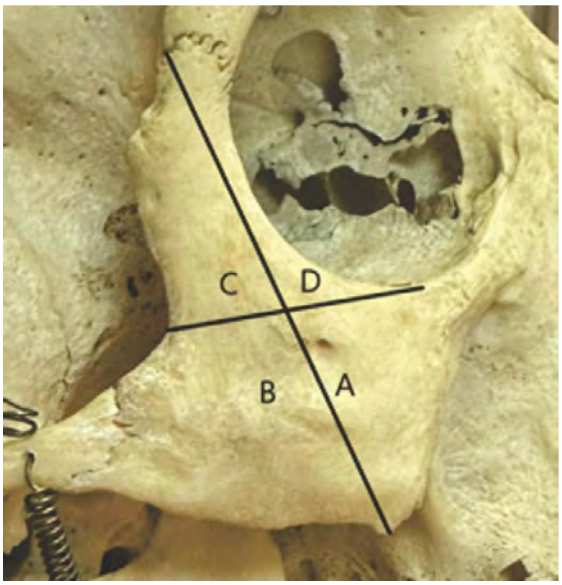

Figure 1.
Zygomatic bone was divided into four regions: A, B, C, and D

The exact position of the main zygomaticofacial foramen (mZFF) was determined by measuring its location relative to the most prominent point of the zygomatic bone (ZP). To achieve a standardized and reproducible method of localization, an imaginary clock face was superimposed onto the ZP, with its center aligned at the most convex region of the bone. The 12 o'clock position was designated superiorly, oriented toward the frontal process of the zygomatic bone. Measurements were recorded in a clockwise direction, with the angular position of the foramen noted at the nearest corresponding hour or degree value. This system allowed for precise documentation of foraminal placement, facilitating comparative anatomical studies and clinical applications, particularly in maxillofacial surgery and regional anesthesia techniques (Figure 2). The methodology employed in this study is adapted from the work of Malakhov et al. as published in their study (11).

Figure 2.
The relative position of the mZFF to the ZP is illustrated using a clock face representation. ZFF – zygomaticofacial foramen, ZP – zygomatic prominence.

For statistical significance, the „Independent-Samples t-test“ was used for measurable variables, and the „Chi-Square test" for analyzing differences between the right and left sides. A significance threshold of $P < 0.05$ was accepted“.

Results

The zygomaticofacial foramen (ZFF) was identified in 55 out of the 57 examined skulls (114 hemicrania). All foramina located on the lateral surface of the zygomatic bone (ZB) were classified as ZFF and further divided into main ZFF (mZFF) and accessory ZFF (aZFF). A total of 112 mZFF and 86 aZFF were recorded across all samples. The number of ZFF per skull ranged from 0 to 5.

A single foramen was most common (40.4%), followed by two foramina (36.8%) (Table 1). There was a significant relationship between the numbers of foramina on the left and right sides ($P < 0.001$). Two skulls had no foramina on either side, while the third lacked it on only one side. In 34 skulls, the number of foramina was equal on both sides, while 23 showed asymmetry. More foramina were present on the right side in 18 skulls and on the left in 9 skulls, but this difference was not statistically significant ($P = 0.123$).

Side	Total (n = 114)		Right side (n = 57)		Left side (n = 57)	
Numbers	%	n	%	N	%	N
0	4.4	5	3.5	2	5.3	3
1	40.4	46	38.6	22	42.1	24
2	36.8	42	38.6	22	35.1	20
3	10.5	12	10.5	6	10.5	6
4	5.3	6	3.5	2	7.0	4
5	2.6	3	5.3	3	0	0

Table 1.
Distribution of the number of foramen in left and right hemicrania.

The distribution of the zygomaticofacial foramen was not uniform across the four defined regions, with region „C“ exhibiting the highest incidence compared to regions A, B, and D (Table 2). This suggests a potential anatomical predilection for the foramen in this region, which may have clinical implications.

The ZP points were identified as essential anatomical landmarks because they can be easily felt on the face. To map the locations of mZFF, an imaginary clock was superimposed on the ZP point, as shown in Figure 2. On the right side, the mZFF were most frequently observed at 1 o'clock (23.8%), 12 o'clock (25.0%), and 11 o'clock (28.5%). On the left side, they were most often found at 1 o'clock (26.1%), 11 o'clock (28.9%), and 12 o'clock (31.9%). There were no mZFF detected at the 4, 5, 6, 7, or 9 o'clock positions on either side. The results suggest that mZFF are typically located superior to the ZP point. A significant statistical difference was found in the mZFF locations between the left and right sides ($P < 0.001$).

Regions	Right	Left	Total
A	10	20	30 (27.69%)
B	17	7	25 (22.73%)
C	26	28	**54 (49.58%)**
D	0	0	0

The bold value highlights that the occurrence of the zygomaticofacial foramen was highest in region „C“.

Table 2.
Distribution of the foramina according to regions.

Discussion

The presence of the zygomaticofacial foramen (ZFF) may serve as a potential risk factor for neurovascular injury. Numerous studies have investigated its incidence and the variability in the number of foramina, yet findings have varied significantly. Reported counts range from 0 to 3 [12], 0 to 4 [2,9,13,14,15,16,17], and 0 to 5 foramina [5,8,18]. Nteli Chatzioglou et al. [19] documented a maximum of six foramina, whereas Zhao Y. et al. [8] found an average of 1.98 ± 0.93 foramina per specimen. The most commonly observed number was one, occurring in 30.4% (19) to 53.3% [14] of cases. Two foramina were present in 12.12% [12] to 32.7% (16) of cases, aligning with the findings of this study. Interestingly, prior research has reported a higher percentage of specimens lacking a foramen, reaching up to 21.8%, while this study recorded an

	This Study	Zhao et al. [8]	Martins et al. [9]	Mangal et al. [2]	Hwanga et al. [15]	Loukas et al. [21]	Akus et al. [5]	Der Neri et al. [13]
Hemicarnia	114	120	102	330	110	400	160	302
0 foramen	4.4	2.4	21.6	21.8	9	39	15.6	18.9
1 foramen	40.4	34.6	50	44.9	50.9	42	44.4	44
2 foramina	36.8	41.1	23.5	27.9	30	16	28.1	28,5
3 foramina	10.5	16.1	3.9	5.1	9	7	6.3	8
4 foramina	5.3	4.8	1	0.3	0.9	1	4.4	0.7
5 foramina	2.6	0.8	0	0	0	0	1.3	0
Population	Bosnia and Herzegovina	African American	Unspecified	Aryo-Dravidian	Korean	Unspecified	West Anatolia	Brazilian

Table 3. Differences in the number of zygomatic foramina reported in various studies.

absence rate of just 4.4%, which is closest to the results reported by Zhao Y. et al. [8]. Notably, Mokryk et al. [17] did not observe any cases of ZFF absence.

Research suggests that when the zygomaticofacial foramen is absent, the zygomaticofacial nerve may also be missing, with sensory innervation of the malar region being maintained by other branches of the trigeminal nerve [2]. Several studies have examined the distribution of foramina based on ethnicity, sex, and cranial morphology. While some have reported significant sex-related differences [16], others have found no statistically significant variation between male and female skulls [14,20].

Researchers have used various methods to map the location of the zygomaticofacial foramen (ZFF) on the zygomatic bone (ZB), often dividing its lateral surface into zones or regions. One common approach segments the lateral ZB into four regions using horizontal and vertical reference lines. Studies indicate that the ZFF is most frequently found in region „C“, posterior to the vertical line and above the horizontal line [5,12,14,15,19].

This study found that the zygomaticofacial foramen (ZFF) was most common in region 'C' (49.58%), followed by region „A“ (27.69%) and region „B“ (22.73%), with no occurrences in region „D“. The studies conducted by Akus and Mangesh yielded comparable results, albeit with minor differences. Akus's research also identified a low incidence (1.3%) of zygomaticofacial foramina in region „D“. These findings suggest that region „D“ is the safest anatomical area for surgical interventions in comparison to the other three regions. A comparative summary of previous studies alongside the present study is provided in Table 4.

Regions	This study	Mangesh et al. [22]	Aksu et al. [5]
A	30 (27.69%)	35 (25.54%)	67 (29.4%)
B	25 (22.73%)	31 (22.62%)	51 (22.4%)
C	**54 (49.58%)**	**71 (51.82%)**	**107 (46.9%)**
D	0	0	3 (1.3%)

Table 4.
Comparison of the findings of the present study with previous research.

Predicting the ZFF location in living individuals remains a critical question. Our study addressed this by analyzing its position relative to the ZP, the most lateral point of the zygomatic bone's lateral surface. As an easily identifiable anatomical landmark, the ZP provides a straightforward reference for ZFF localization. We measured the ZFF's distance from the ZP, which averaged 8,62 ± 2.54 mm, with a range of 2.75–14.20 mm. Additionally, by superimposing an imaginary clock face over the ZP, we determined that the ZFF was most commonly found at 12, 11, and 1 o'clock on the right and at 11, 12, and 1 o'clock on the left. Comparable findings were recorded in the study conducted by Malakhov et al. [11].

Conclusion

The clinical importance of the zygomatic region is significantly influenced by the presence and contents of the ZFF. Variability in the number and positioning of these foramina must be taken into account when administering regional anesthesia, performing surgical interventions, or conducting aesthetic procedures, particularly in proximity to the infraorbital margin. Failure to consider these factors may result in avoidable complications and suboptimal outcomes. The results of this study will assist surgeons in understanding the morphometry and variations of the ZFF region, serving as a guide for surgical procedures in this area.

Authors' contributions: Conception and design: ET, AV; Acquisition, analysis and interpretation of data: AV, ET; Drafting the manuscript: AV, ET; Revising it critically for important intellectual content: ET, AV..

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APICAL MICROLEAKAGE EVALUATION IN MONOBLOCK AND CONVENTIONAL SEALERS

THE SHORT TITLE: MICROLEAKAGE IN MONOBLOCK VS. CONVENTIONAL SEALERS

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Introduction

Microleakage is the clinically undetectable passage of bacteria, fluids, molecules, or ions between a tooth and its restorative material [1] . In endodontics, apical microleakage occurs when bacteria and their by-products penetrate voids in the root canal filling. Persistent bacterial infiltration inside the root canal may trigger an inflammatory response, initiating or exacerbating periapical lesions and ultimately leading to endodontic treatment failure [2] .

Various materials and obturation techniques have been developed to reduce apical microleakage. In an effort to apply adhesive dentistry principles to endodontics, resin-based sealers were combined with resin-coated gutta-percha cones. This approach aims to create a dense, void-free mass that fully adapts to the root canal walls, forming what is referred to as a "monoblock" within the root canal system [3] .

EndoRez (Ultradent Products Inc, South Jordan, UT, USA) is a hydrophilic, urethane dimethacrylate-based sealer that creates a monoblock when mixed with resin-coated gutta-percha cones [3]. RealSeal SE (SybronEndo, Orange, CA, USA) is a root canal obturation material that uses a self-etching methacrylate-based sealer and Resilon cones (Resilon Research LLC, Madison, CT, USA) as an alternative to traditional gutta-percha cones [4] . This is also the first obturation system reported to generate a mono-block between the canal wall and the obturation material [5]. A glass ionomer-based monoblock system is represented by ActiV GP system (Brasseler USA, Savannah, GA, USA), which combines a glass ionomer sealer with gutta-percha cones coated in glass ionomer particles [4] .

The objective of this study was to evaluate the apical microleakage of three monoblock obturation systems EndoREZ, RealSeal SE, and ActiV GP using the penetration method in combination with the clearing technique. Furthermore, the sealing ability of these systems was compared with the conventionally used epoxy-based sealer AH Plus (Dentsply, Konstanz, Germany) in combination with standard gutta-percha cones.

Patients and methods

The research was approved by the Ethics Committee of the Faculty of Dentistry, Sarajevo (09-522-2/2013).

Sample selection

A total of 140 extracted permanent maxillary and mandibular incisors and canines were used in this study. Teeth with root fractures or cracks, incomplete root development, prior to endodontic treatment, calcifications, or signs of resorption were excluded. Data on gender, age and the reason for extraction were not recorded.

Sample preparations

The crowns were removed and root lengths standardized to 15 mm using calipers. A #10 K-reamer was inserted into the canal until it reached the apical foramen. This length was transferred to an endometer, reduced by 1 mm, and recorded as the working length. Root canal instrumentation was performed using Mtwo® rotary files (VDW GmbH, Munich, Germany), with the final file size being 40/.04. During instrumentation, canals were irrigated with 1.5% sodium hypochlorite (NaOCl), and the smear layer was removed using an 18% EDTA solution (Ultradent, South Jordan, USA).

Sample distribution

The 140 samples were divided into four experimental groups and two control groups.

- Experimental group 1 (n=30): obturated with the EndoREZ system (EndoREZ sealer and EndoREZ points),
- Experimental group 2 (n=30): obturated with the RealSeal SE system (RealSeal SE sealer and Resilon cones),
- Experimental group 3 (n=30): obturated with the Active GP system (Glass-ionomer sealer and ActiV GP gutta-percha),
- Experimental group 4 (n=30): obturated using AH Plus sealer and standard gutta-percha cones.

The quality and apical extent of root canal fillings were evaluated radiographically.

Two control groups were included:

Figure 1. (A) The samples of the experimental and positive controle groups; (B) Samples of the negative controle groups.

- Positive control (n=10): instrumented but not obturated,
- Negative control (n=10): instrumented but not obturated; apical ends sealed with composite material.

All samples were coronally sealed with composite resin.

Dye penetration and clearing technique procedure

Samples in the experimental and positive control groups were coated with two layers of varnish, leaving the apical 2 mm exposed. Negative control samples were completely covered with varnish (Figure 1). To ensure proper setting and adhesion of the obturation materials, all experimental samples were stored in 0.9% NaCl solution at 37°C in a thermostatically controlled environment for 7 days.

All samples were then immersed in Indian ink dye (Lefranc & Bourgeois, France) for 7 days. Following dye exposure, the varnish was removed and a clearing procedure was performed.

Demineralization was conducted using 5% nitric acid (Semikem doo, Sarajevo, Bosnia and Herzegovina) for 5 days at room temperature, with daily acid renewal. Samples were then dehydrated in ascending concentrations of ethanol (70%, 96%, and 99%), spending 12 hours in each solution. Finally, samples were immersed in methyl salicylate (Semikem doo) to achieve transparency.

Assessment of apical microleakage

Apical dye penetration was evaluated under a stereomicroscope (Novex RZ-series, Euromex Microscopes BV, The Netherlands) equipped with a micrometer. The extent of microleakage was measured in millimetres from the anatomical apex to the most coronally observed point of dye penetration.

Table 1. T descriptive values of apical microleakage of EndoREZ, RealSeal SE, ActiV GP and AH Plus

Sealer	N	M	SD	Skewness	Kurtosis	Min	Max	Q1	Med	Q3
				SE=0.43	SE=0.83					
EndoREZ	30	1.56	2.11	2.21	4.05	0.00	7.81	0.54	0.91	1.37
RealSeal SE	30	0.84	1.29	1.98	3.35	0.00	4.63	0.00	0.43	0.94
ActiV GP	30	2.31	1.88	1.45	1.73	0.00	7.37	1.17	1.73	2.91
AH Plus	30	0.43	1.31	4.47	21.61	0.00	6.85	0.00	0.00	0.16

N=Sample size; M=Arithmetic mean; SD=Standard deviation; Min=Minimal value in distribution; Max=Maximal value in distribution; Q1=First quartile; Med=Median; Q3=Third quartile; SE=Standard error

Table 2. Differences in apical microleakage among sealers assessed by Mann-Whitney test

Sealer	N	Mean range	Sum of ranks	Mann-Whitney U	Z	p
EndoREZ	30	35.35	1060.50	304.50	-2.192	0.28
RealSeal SE	30	25.65	769.50			
EndoREZ	30	24.03	721.00	256.00	-2.872	0.00408
ActiV GP	30	36.97	1109.00			
EndoREZ	30	39.53	1186.00	179.00	-4.254	0.000021
AH Plus	30	21.47	644.00			
RealSeal SE	30	21.53	646.00	181.00	-4.015	0.000594
ActiV GP	30	39.47	1184.00			
RealSeal SE	30	35.17	1055.00	310.00	-2.366	0.18
AH Plus	30	25.83	775.00			
ActiV GP	30	42.37	1271.00	94.00	-5.464	0.00
AH Plus	30	18.63	559.00			

Results

Statistical analysis of the results was performed in the Statistical Package for Social Science (SPSS) program, version 20. Stereomicroscopic examination showed complete dye penetration along the full length of the root canals in the positive control group, while no dye penetration was observed in the negative control group. The extent of leakage differed among the materials in experimental groups (Figure 2).

According to the descriptive statistics (Table 1), ActiV GP demonstrated the highest mean leakage value (2.31±1.88 mm), indicating the greatest extent of microleakage among the tested materials. In contrast, AH Plus sealer exhibited the lowest mean leakage value (0.43±1.31mm). EndoREZ and RealSeal SE showed intermediate levels of leakage, with mean values of 1.56±2.11 mm and 0.84±1.29 mm, respectively.

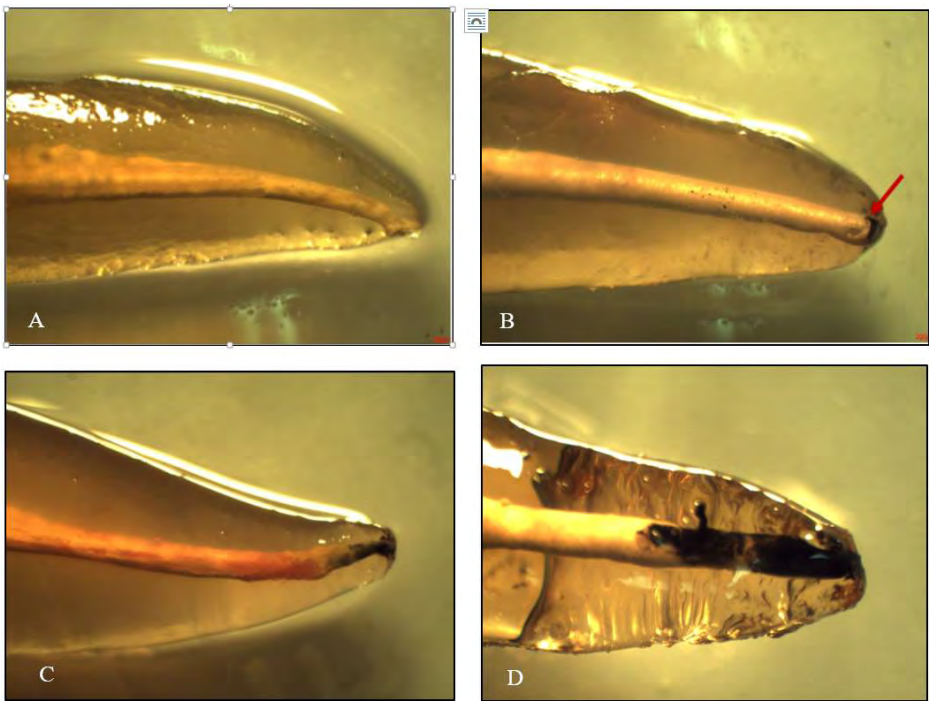

Figure 2.

Different apical microleakage values observed in the experimental groups.

(A) A sample from the AH Plus group showed no detectable leakage;

(B) Minimal dye penetration was evident in a RealSeal SE specimen;

(C) The EndoREZ group exhibited leakage confined to the apical third;

(D) The sample from RealSeal SE group with significant microleakage.

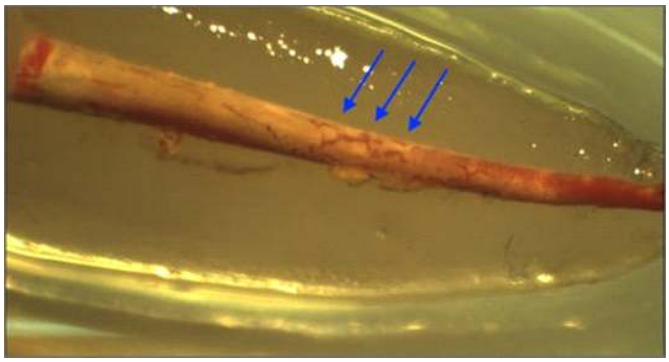

Figure 3. Specimen obturated with the EndoREZ system. The arrows point to cracks within the sealer matrix likely caused by polymerization shrinkage.

Further analyses revealed significantly higher apical microleakage in ActiV GP group compared to other experimental groups ($p<0.05$). EndoREZ also demonstrated significantly greater leakage compared to the AH Plus/gutta-percha group ($p<0.0005$). No other statistically significant differences were found among the remaining experimental groups (Table 2).

Discussion

The idea that certain root canal filling materials can form an endodontic monoblock, extending uniformly from one dentinal wall to the other, has attracted considerable attention. Creating a true monoblock through effective sealer bonding could eliminate or significantly reduce microleakage.

All specimens were subjected to the same protocols for canal preparation, dye penetration, and clearing procedure. The only variable was the tested obturation systems.

As stated in the Results section, statistical analysis using the Mann-Whitney U test revealed that ActiV GP had significantly higher apical leakage than all other evaluated materials. The results were statistically significant when compared to EndoREZ ($p = 0.00408$), RealSeal SE ($p = 0.000594$), and AH Plus ($p < 0.0001$).

Several studies have shown that the ActiV GP system tends to have weaker sealing properties compared to other root canal filling materials. Khanvilkar et al. [6] and Kassar et al. – [7] reported the sealing performance of ActiV GP was significantly lower than AH Plus/gutta-percha and RealSeal/Resilon systems. In a similar in vitro study, Muhammed [8] found that the AH Plus/gutta-percha demonstrated the least apical leakage when compared to ActiV GP and GuttaFlow2. Likewise, Monticelli et al. [9] found a significantly higher leakage value in the ActiV GP system relative to AH Plus/gutta-percha, in line with the present study's outcomes. Although Fransen et al. [5], did not find statistically significant differences among groups, the AH Plus/gutta-percha combination again showed reduced leakage compared to ActiV GP.

The weak apical sealing ability of ActiV GP may be attributed to several factors. Due to its glass-ionomer composition, ActiV GP is prone to water sorption and the gradual leaching of its components [10]. Previous research has shown that glass-ionomer materials tend to undergo slight dimensional changes as they transition from a gel-like phase to a hardened state. This shrinkage during setting may result in microcracks forming at the interface between the sealer and the root canal dentin [7,9]. Additionally, the manufacturer permits adjustment of the powder-to-liquid ratio, which may lead to inconsistency in the sealer's composition and physical properties across different applications.

In our study, EndoREZ exhibited significantly higher apical leakage compared to AH Plus, with a p-value of 0.000021. These findings are consistent with those reported by Rai et al. [11], who used the same methodology as in our study, as well as by Ersahan et al., [12] who used the fluid filtration technique. In study published by Leal et al. [13], statistical differences were not found, but EndoREZ presented inferior sealing ability compared to AH Plus and Apexit Plus sealers. Similarly, Schäfer et al. [14] found that AH Plus exhibited lower solubility, higher radiopacity, and longer bonding time than EndoREZ and RealSeal SE. Conversely, Ballullaya et al. [15] reported lower leakage with EndoREZ compared to AH Plus sealer, likely due to methodological differences and sample size variation.

Our findings are consistent with those of Kim et al. (16) , who reported lower microleakage in the AH Plus/gutta-percha combination compared to RealSeal SE, using the glucose penetration method. Veríssimo et al. [17] found superior sealing ability of the Resilon/Epiphany system (chemically identical to Resilon/RealSeal) over AH Plus, attributing this to the formation of a hybrid layer. However, in our study,

no significant difference was observed between AH Plus and RealSeal SE, which may be explained by the larger sample size and the use of a different obturation technique.

Mahdi et al. [18] investigated the leakage of AH Plus/gutta-percha, EndoREZ, and RealSeal using the fluid transport method, reporting no significant differences among the tested systems. Similarly, our study found no statistically significant difference in leakage between RealSeal SE and the AH Plus/gutta-percha. In contrast to Mahdi et al., [18] our results revealed a statistically significant difference between EndoREZ and AH Plus/gutta-percha.

El Sayed et al. [19], using the glucose penetration method, found significantly lower microleakage in the RealSeal SE group compared to the AH Plus sealer, suggesting the superior sealing ability of RealSeal SE. Our study showed no statistically significant difference between these two techniques, although mean microleakage values were descriptively lower in the AH Plus/gutta-percha group. Tay et al. [20] concluded that the chemical bonding between methacrylate-based sealers and Resilon is relatively weak, and significantly lower than the bond strength observed in composite resin systems. This is attributed to the suboptimal concentration of dimethacrylate in Resilon, which reduces its potential for forming strong chemical bonds with methacrylate-based sealers [20]. Opposite results were found in study by Eldeniz and Østravik [21] where Epiphany (chemically identical to RealSeal) prevented leakage significantly better than AH Plus and EndoREZ.

It is apparent that the evaluation of apical microleakage across different studies involved a wide range of techniques and methodologies that are difficult to interpret. Despite mixed results in previous studies, gaps and voids have been observed in root canal fillings using resin-based sealers, including both monoblock systems (such as EndoREZ and RealSeal SE) and conventional resin-based sealers like AH Plus. Apical microleakage in these obturation systems can be attributed to several contributing factors, including polymerization shrinkage, the high configuration factor (C-factor), structural differences in the apical root dentin, and biological degradation.

During polymerization, resin materials shrink as monomers form chains [22,23]. The polymerization contraction can exceed the adhesive bond strength, causing cracks, typically between the resin-coated gutta-percha and the resin sealer [24]. In our specimens, shrinkage-induced cracks were clearly observed under stereomicroscopic examination (Figure 3).

The configuration factor (C-factor) represents the ratio between bonded and unbonded surfaces [25]. A higher C-factor indicates a increased shrinkage due to reduced material flow during polymerization. In the root canal system, the C-factor can reach high values [25], since nearly every dentin wall has an opposing wall, leaving few free interfaces. The root canal geometry creates an unfavorable conditions that promotes polymerization shrinkage [26]. Unlike direct composite restorations, where incremental layering techniques can be used to minimize volumetric shrinkage, such approaches are not feasible in the root canal [25]. Consequently, the use of a sealer in a thin layer is a logical and clinically recommended strategy, as it helps to reduce the overall polymerization contraction [26,27].

In the apical third of the root, dentinal tubules are less numerous and often sclerotic which limits the formation of resin tags and limits the penetration of resin-based sealers. The differences in the composition and microstructure of root dentin can compromise the sealing ability in apical region and contribute to apical leakage [28].

Previous studies report that Resilon undergoes significant degradation [29,30]. Payne et al. [30] found 78% degradation in nonhealed cases filled with Resilon, compared to 0% with gutta-percha. According to Payne et al. [30], this degradation is related to cholesterol esterase activity, an enzyme secreted by macrophages commonly present in periapical granulomas of infected teeth. The susceptibility of methacrylate-based fillings to bacterial degradation [31] may compromise apical seal by promoting porosity and structural irregularities.

The findings of this study favor AH Plus over EndoREZ, RealSeal SE, and ActiV GP. Its superior performance may be attributed to properties such as low solubility, high flow, minimal polymerization shrinkage, and good adaptation to canal walls [32].

Study limitation

This study was conducted under in vitro conditions, and assessed short-term sealing ability of tested materials.

Conclusion

Monoblock obturation systems have not demonstrated superior sealing ability compared to the conventional AH Plus sealer combined with gutta-percha. Although developed to improve the quality of root canal obturation, these systems have not fulfilled expectations. Consequently, the AH Plus/gutta-percha combination remains a reliable and clinically relevant option in current endodontic practice.

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IMPACT OF INITIAL PERIODONTAL THERAPY ON PERIODONTAL STATUS IN TYPE 2 DIABETES MELLITUS PATIENTS IN CORRELATION WITH GLYCOSYLATED HEMOGLOBIN (HBA1C) LEVELS

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ABSTRACT

The purpose of this study was to examine the effect of initial periodontal therapy on the periodontal status of patients with type 2 diabetes mellitus, in correlation with glycosylated hemoglobin (HbA1c) levels. A total of 60 patients diagnosed with type 2 diabetes mellitus and periodontal disease underwent initial periodontal therapy. Relevant data on HbA1c laboratory test results and periodontal parameters were recorded at baseline and again three months later. Statistical analysis was performed using the SPSS software package (version 13.0; SPSS Inc., Chicago, IL, USA). To compare periodontal indices between the initial and follow-up examinations, the General Linear Model – Repeated Measures (GLM-RM) was used. Additional variables that could potentially influence the outcome (therapeutic option, HbA1c levels, and presence of diabetes mellitus) were included as covariates. Descriptive statistics are presented as absolute values (n), relative values (%), and as means with standard deviations or interquartile ranges. Comparisons between variables were conducted using the paired t-test or the Wilcoxon test, depending on the distribution of the data.

Based on our study, it can be concluded that initial periodontal therapy in patients with type 2 diabetes mellitus, when analyzed in correlation with HbA1c levels, resulted in a reduction in clinical periodontal inflammatory parameters. The duration of type 2 diabetes mellitus and HbA1c levels did not have a statistically significant effect on the periodontal indices monitored in this study.

Keywords: Periodontitis, Initial Periodontal Therapy, Type 2 Diabetes Mellitus, Glycosylated Hemoglobin (HbA1c)

Introduction

Diabetes mellitus (DM) is a highly prevalent metabolic disease characterized by a chronic and progressive course. Persistent hyperglycemia leads to complications affecting tissues, organs, and numerous systems [1]. There are two main types of diabetes mellitus. Type 1 is caused by the destruction of pancreatic beta cells, autoimmune or idiopathic diseases, and is more common in younger individuals. Type 2 accounts for approximately 90% of all cases and presents as a spectrum ranging from predominant insulin resistance with relative insulin deficiency to predominant insulin secretory deficiency, with or without insulin resistance. Glycosylated hemoglobin (HbA1c) is one of the most important parameters for retrospective glycemic control. The HbA1c value represents the average blood glucose level over the past eight to twelve weeks. According to the World Health Organization (WHO), an HbA1c value of up to 7% is considered normal. Any value above this threshold is considered a relevant parameter for confirming the diagnosis of diabetes mellitus [2].

Periodontitis is an inflammatory disease that affects the supporting structures of the teeth and develops due to the influence of microorganisms present in dental plaque. Anaerobic microorganisms and their byproducts play the most significant role in the development and progression of periodontal diseases [3,4]. Periodontitis arises as a pathological reaction of the periodontal tissues to external (local) irritants, and this response is influenced by the systemic condition of the body. One of the most common systemic diseases that affect the development, prevalence, and progression of periodontal diseases is diabetes mellitus. Periodontal disease is reported as the sixth complication of diabetes mellitus [5]. Research provides evidence of a bidirectional, mutually detrimental correlation between diabetes mellitus and periodontal disease. This negative correlation has been demonstrated in studies conducted worldwide, under various conditions, and using diverse methodologies. Several researchers support the view that poor glycemic control contributes to the deterioration of periodontal health. The severity of periodontal changes is influenced by both the level of glycemic control and the duration of diabetes mellitus [6,7].

Periodontal therapy involves procedures for the mechanical removal of the causes of periodontal inflammatory diseases. All principles of periodontal therapy can be grouped into two main concepts: initial therapy (causal and corrective) and surgical therapy (supportive and access).

Initial periodontal therapy aims to eliminate supra- and subgingival plaque and to create conditions that prevent plaque accumulation on tooth surfaces, thereby reducing the risk of relapse and disease progression [8,9].

The initial treatment is followed by several months of supportive therapy, which requires patient cooperation, regular check-ups, and monitoring of periodontal pocket regeneration [10].

The purpose of the study was to examine the effect of initial periodontal therapy on the periodontal status of patients with type 2 diabetes mellitus, in correlation with glycosylated hemoglobin (HbA1c) levels. HbA1c values were recorded at the first visit and again three months later. The following indices were used to assess periodontal status: Plaque Index (PI), Papilla Bleeding Index (PBI), and the Community Periodontal Index of Treatment Needs (CPITN). These indices were recorded at the first visit and again three months later.

Method and materials

The study included 60 patients diagnosed with type 2 DM and periodontal disease, of both sexes, aged between 18 and 70 years.

Patients presented for examination at the Department/Clinic for Oral Medicine and Periodontology, Faculty of Dentistry, Dental Clinical Center in Sarajevo.

All patients with type 2 DM had their glycosylated hemoglobin (HbA1c) levels recorded at the initial examination and again after three months as part of their regular diabetes treatment.

After taking their medical history, a clinical periodontal examination was performed, including the following indices: PI, PBI, and CPITN.

Patients diagnosed with type 2 DM and periodontal disease underwent initial periodontal therapy. All data were recorded in a form specifically designed for this study, both at the initial examination and at the three-month follow-up.

Statistical design

Statistical analysis was performed using the SPSS software package (version 13.0; SPSS Inc., Chicago, IL, USA).

During the clinical periodontal examination, at both the initial and follow-up examinations, an individual index was assessed for each tooth, scored numerically from 0 (no pathological substrate) to grades 1–4, depending on the size and extent of the pathological substrate. A total pathological index was then calculated for each participant, separately for each of the four quadrants (Q1, Q2, Q3, and Q4).

To compare these periodontal indices between the initial and follow-up examinations, a General Linear Model – Repeated Measures (GLM-RM) was used. Additional variables that could potentially influence the outcome (therapeutic option, HbA1c levels, and presence of diabetes mellitus) were included as covariates. Descriptive statistics are presented as absolute values (n), relative values (%), and as means with standard deviations or interquartile ranges. Comparisons between variables were conducted using the paired t-test or the Wilcoxon test, depending on the distribution of the data.

Results

The study included 60 subjects of both sexes: 29 men (48.3%) and 31 women (51.7%). The average age of the men was 64.8±5.6 years, while the average age of the women was 61.0±9.3 years. The difference

Table 1. Mean, minimum, and maximum PI values at baseline and after initial therapy

Plaque Index	N	Min.	Max.	25th percentile	Median	75th percentile
Q1 – Examination 1	60	0	10.0	1.2	2.0	5.0
Q1 – Examination 2	60	0	4.0	0	0	1.0
Q2 – Examination 1	60	0	12.0	1.0	2.5	5.0
Q2 – Examination 2	60	0	6.0	0	0	1.0
Q3 – Examination 1	60	1.0	15.0	4.0	6.0	8.0
Q3 – Examination 2	60	0	7.0	0	2.0	3.0
Q4 – Examination 1	60	0	18.0	4.0	5.0	8.0
Q4 – Examination 2	60	0	7.0	0	2.0	3.0

Table 2. Mean, minimum, and maximum PBI values at baseline and after initial therapy

Papillary Bleeding Index	N	Min.	Max.	25th percentile	Median	75th percentile
Q1 – Examination 1	60	0	12.0	1.0	4.0	6.7
Q1 – Examination 2	60	0	8.0	0	0	2.0
Q2 – Examination 1	60	0	15.0	1.0	3.0	6.0
Q2 – Examination 2	60	0	5.0	0	0	1.7
Q3 – Examination 1	60	1.0	15.0	4.0	6.0	8.0
Q3 – Examination 2	60	0	7.0	0	1.0	2.0
Q4 – Examination 1	60	0	18.0	3.0	6.0	8.0
Q4 – Examination 2	60	0	8.0	0	2.0	2.0

in age was not statistically significant (p=0.06).

The mean HbA1c (%) was 7.00 (6.20–8.17)% at baseline and 6.85 (6.10–8.02)% at the follow-up examination three months later. The difference was not statistically significant (p=0.085). The average duration of diabetes mellitus among participants was 2 years (1–3 years).

Tables 1, 2, and 3 show the mean values, medians, and percentiles of periodontal indices at baseline and at the three-month follow-up. Tables 4, 5, and 6 present the indices monitored after initial periodontal therapy, analyzed in correlation with HbA1c values and the duration of type 2 DM, reported separately by quadrant.

Table 3. Mean, minimum, and maximum CPITN values at baseline and after initial therapy

CPITN	N	Min.	Max.	25th percentile	Median	75th percentile
Q1 – Examination 1	60	0	18.0	3.0	7.5	11.7
Q1 – Examination 2	60	0	10.0	.0	2.0	4.0
Q2 – Examination 1	60	0	19.0	2.2	7.0	11.0
Q2 – Examination 2	60	0	12.0	.0	1.0	3.0
Q3 – Examination 1	60	2.0	19.0	8.0	10.0	13.7
Q3 – Examination 2	60	0	12.0	.0	2.0	6.0
Q4 – Examination 1	60	0	21.0	6.0	9.5	12.0
Q4 – Examination 2	60	0	14.0	.0	2.0	5.50

Table 4. PI differences between two examinations, after initial periodontal therapy in correlation with glycosylated hemoglobin (HbA1c) levels and type 2 DM duration, by quadrants (Q1–Q4)

GLM-RM	Q1 Quadrant			Q2 Quadrant		
Variables	F	p	Partial η²	F	p	Partial η²
Index (1–2 measurement)	11.513	0.001	0.135	7.278	0.009	0.115
DM duration (years)	2.469	.122	0.031	.009	0.923	.0001
HbA1c (%)	0.196	.660	0.001	2.469	0.122	0.042
Initial therapy	0.135	.715	0.002	.196	0.660	0.003
	Q4 Quadrant			Q3 Quadrant		
Variables	F	p	Partial η²	F	p	Partial η²
Index (1–2 measurement)	6.362	.015	.102	5.272	0.025	0.086
DM duration (years)	1.156	.287	.020	2.323	0.133	0.040
HbA1c (%)	.174	.678	.003	.153	0.697	0.003
Initial therapy	2.722	.105	.046	3.985	0.051	0.066

F- represents the ratio of the variance between groups to the variance within groups.
p- represents the probability, and if it is greater than 0.06, it indicates statistical significance.

Analysis of variance revealed a statistically significant difference in PI values in the Q1 quadrant between the first and second visits, $F(1, 56) = 11.51$; $p = 0.001$, and in the Q2 quadrant between the first and second visits, $F(1, 56) = 7.27$; $p = 0.009$, with a large effect size. Analysis of variance revealed a statistically significant difference in PI values in the Q3 quadrant between the first and second visits, $F(1, 56) = 5.27$; $p = 0.025$. Analysis of variance revealed a statistically significant difference in PI values in the Q4 quadrant between the first and second visits, $F(1,56) = 6.36$; $p = 0.015$, with a medium effect size (*partial* $\eta^2 = 0.102$). The duration of diabetes and HbA1c values at the first examination had no significant effect ($p > 0.05$), while initial therapy showed borderline significance ($p = 0.051$).

Table 5. PBI differences between two examinations, after initial periodontal therapy in correlation with glycosylated hemoglobin (HbA1c) levels and type 2 DM duration, by quadrants (Q1–Q4)

GLM-RM	Q1 Quadrant			Q2 Quadrant		
Variables	F	p	Partial η^2	F	p	Partial η^2
Index (1–2 measurement)	1.275	0.264	0.022	2.362	0.130	0.040
DM duration (years)	0.785	0.379	0.014	0.038	0.845	0.001
HbA1c (%)	0.629	0.431	0.011	0.207	0.651	0.004
Initial therapy	0.083	0.774	0.001	0.636	0.429	0.011
	Q4 Quadrant			Q3 Quadrant		
Variables	F	p	Partial η^2	F	p	Partial η^2
Index (1–2 measurement)	5.572	0.022	0.090	4.226	0.044	0.070
DM duration (years)	1.086	0.302	0.019	2.451	0.123	0.042
HbA1c (%)	0.066	0.798	0.001	0.543	0.464	0.010
Initial therapy	1.303	0.259	0.023	1.471	0.230	0.026

F- represents the ratio of the variance between groups to the variance within groups.
p- represents the probability, and if it is greater than 0.06, it indicates statistical significance.

Analysis of variance did not reveal a statistically significant difference in PBI values in quadrants Q1 and Q2 between the first and second visits ($p > 0.05$).
Analysis of variance revealed a statistically significant difference in PBI values in the Q3 quadrant between the first and second visits, $F(1, 56) = 4.22$; $p = 0.044$, and in the Q4 quadrant between the first and second visits, $F(1, 56) = 5.57$; $p = 0.022$, with a medium effect size. PBI values were significantly lower at the second examination. Additionally, the duration of diabetes (in years), HbA1c values at the first examination, and initial therapy did not have a significant effect on the change in PBI values ($p > 0.05$).

Table 6. CPITN differences between two examinations, after initial periodontal therapy in correlation with glycosylated hemoglobin (HbA1c) levels and type 2 DM duration, by quadrants (Q1–Q4)

GLM-RM	Q1 Quadrant			Q2 Quadrant		
Variables	F	p	Partial η^2	F	p	Partial η^2
Index (1–2 measurement)	2.490	0.120	0.043	4.796	0.033	0.079
DM duration (years)	0.025	0.875	0.0001	0.132	0.717	0.002.
HbA1c (%)	0.053	0.819	0.001	0.394	0.533	0007
Initial therapy	0.008	0.929	0.000	0.614	0.437	0.011
	Q4 Quadrant			Q3 Quadrant		
Variables	F	p	Partial η^2	F	p	Partial η^2
Index (1–2 measurement)	4.033	0.049	0.067	5.747	0.020	0.093
DM duration (years)	1.508	0.225	0.026	1.882	0.176	0.033
HbA1c (%)	0.021	0.884	0.000	.033	0.857	0.001
Initial therapy	5.828	0.019	0.094	8.295	0.006	0.129

F- represents the ratio of the variance between groups to the variance within groups.
p- represents the probability, and if it is greater than 0.06, it indicates statistical significance.

Analysis of variance did not reveal a statistically significant difference in CPITN values in the Q1 quadrant between the first and second visits ($p = 0.120$). In the Q2 quadrant, a statistically significant difference was found between the first and second visits, $F(1, 56) = 4.79$; $p = 0.033$, with a medium effect size (partial $\eta^2 = 0.067$). CPITN values were significantly lower at the second examination. In the Q3 quadrant, analysis of variance showed a statistically significant difference between the first and second visits, $F(1, 56) = 5.74$; $p = 0.020$. In the Q4 quadrant, a statistically significant difference in CPITN values was also recorded, $F(1, 56) = 4.03$; $p = 0.049$, with a medium effect size. CPITN values were significantly lower at the second examination. The duration of diabetes (in years), HbA1c values at the first examination, and the initial therapy applied did not show a significant impact on changes in CPITN values ($p > 0.05$).

Discussion

The results of this study highlight the importance of initial periodontal therapy in reducing inflammatory periodontal parameters. In contrast, HbA1c levels and the duration of type 2 DM were not found to be statistically significantly associated with these parameters.

Preshaw et al. confirmed the interaction between the duration of type 2 DM and HbA1c levels in relation to severe periodontitis. At baseline, severe periodontitis was associated with an increased risk of poor glycemic control (HbA1c > 9.0%), suggesting that long-term, uncontrolled periodontitis may hinder effective diabetes management [11].

In our study, the mean HbA1c value was 7.00% (6.20–8.17) at the initial examination and 6.85% (6.10–8.02) at the three-month follow-up. The observed difference was not statistically significant (p = 0.085). The mean duration of type 2 DM was 2 years (1–3 years).

Although HbA1c levels decreased after three months, our results did not show a statistically significant effect on changes in periodontal parameters, which may be attributed to the short duration of type 2 DM in our patient cohort. Teeuw et al. confirmed a reduction in HbA1c levels in patients with treated periodontitis compared to those with untreated periodontitis. This finding is consistent with our study, in which the mean HbA1c value decreased from 7.00% to 6.85%; however, the observed difference was not statistically significant (p = 0.085) [12].

In our study, statistically significant differences were observed in PI values during the follow-up measurement. Analysis of variance revealed a significant difference between the first and second visits, $F(1, 56) = 7.27$; $p = 0.009$, with a large effect size (partial $\eta^2 = 0.115$). The PI at the second examination was significantly lower. The CPITN index was $F(1, 56) = 4.03$; $p = 0.049$, with a medium effect size ($p = 0.049$), while being significantly lower at the second visit. Similarly, Sho et al. investigated the impact of initial periodontal therapy on periodontal status, noting that the control group received antibiotic therapy. The periodontal parameters monitored showed improvement, as did HbA1c levels [13].

Initial periodontal therapy led to a significant reduction in periodontal inflammation but had no statistically significant effect on parameters used to diagnose metabolic syndrome (MetS). This finding was confirmed by Fernanda et al. and is consistent with our results [14].

Treatment of periodontal disease improves glucose control and reduces inflammatory markers. Improvement in periodontal health in patients with type 2 DM can be achieved through enhanced oral health education and regular dental check-ups. The primary approach to treating periodontal infection involves the removal of the pathogenic biofilm. Our findings are consistent with those of Mathew et al. [15].

Analysis of variance revealed a statistically significant difference in PBI values between the first and follow-up examinations, $F(1, 56) = 4.22$; $p = 0.044$, with a medium effect size. The bleeding index was significantly lower at the second examination. The duration of type 2 DM, HbA1c levels, and initial therapy did not have a significant effect on the reduction of PBI values between the first and follow-up examinations ($p > 0.05$).

Rajashri et al. monitored clinical parameters, including PBI and HbA1c values, at 3 and 6 months after initial periodontal therapy. Their results demonstrated a statistically significant decrease in metabolic parameters following the therapy [16].

Our study, along with those of other authors, has confirmed that initial periodontal therapy in patients with type 2 DM leads not only to improvements in clinical periodontal inflammatory parameters but also to reductions in HbA1c levels, an important marker of metabolic control [17–22]. Given the interrelationship between type 2 DM and periodontal disease, regular check-ups with periodontologists and endocrinologists are essential [23].

Conclusions

Based on our study, it can be concluded that initial periodontal therapy in patients with type 2 DM, in correlation with HbA1c levels, significantly reduced clinical inflammatory parameters of the periodontium. However, the duration of type 2 DM and HbA1c levels, in combination with initial periodontal therapy, did not have a statistically significant effect on the periodontal indices monitored in this study. Given that patients with type 2 DM are at increased risk for the development and progression of periodontal disease, regular dental check-ups and diligent oral hygiene maintenance are essential.

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PREVALENCE OF IMPACTED CANINES IN ORTHODONTIC PATIENTS – A RADIOGRAPHIC STUDY

SHORT TITLE: PREVALENCE OF IMPACTED CANINES

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ABSTRACT

Objectives: The aim of this study was to assess the prevalence of impacted canines among the orthodontic patients, and to examine the distribution of impactions in relation to gender (male vs. female), affected jaw (upper vs. lower), type of impaction (unilateral vs. bilateral) and affected side of the jaw (right vs. left).

Materials and Methods: This cross-sectional study was conducted using digital panoramic radiographs of 3432 patients (1467 males and 1965 females) who attended the Department of Orthodontics, University of Sarajevo – Faculty of Dentistry with Dental Clinical Center. The radiographs were screened to determine the position of the canines, its angulation and relationship with adjacent teeth and surrounding structures. All data were analyzed using descriptive statistics, and differences between categorical variables, (such as gender /male and female/, affected jaw /upper vs. lower/, type of impaction/unilateral vs. bilateral/, and affected side of the jaw /right vs. left/) were tested using the chi-squared and Z-test.

Results: In the sample of orthodontic patients, impacted canines were found in 3.82% subjects. The prevalence was higher in females (2.24%) compared to males (1.57%). The majority of the impacted canines were unilateral (3.29%) compared to bilateral (0.52%). The ratio of maxillary to mandibular impaction was 17.714:1 in favor of maxillary impactions.

Conclusion: Impacted canines were found in 131 out of 3432 patients (3.82%). Females (2.24%) demonstrated a higher impaction rate than males (1.57%). However, the difference was not statistically significant.

Key words: prevalence, impaction, impacted canines, orthopantomogram, orthodontics

Introduction

Canines are teeth that, primarily due to their position in the dental arch, play an important role, anatomically and functionally, as well as aesthetically. Consequently, their absence represents a significant orthodontic problem, which requires adequate and timely therapy, and often an interdisciplinary approach in treatment[1,2].

An impacted tooth can be defined as a tooth with in which, after the end of normal growth and development, the eruption was partially or completely absent [3,4]. In relation to this, a canine is considered impacted when it has not erupted after the completion of root development or 6 or more months have passed since the eruption of the contralateral canine [5].

Due to a complex sequence of events in the eruption of canines, especially because of their very long eruptive path, it is assumed that canines have a greater chance of "detouring" [6]. Factors leading to this orthodontic anomaly can generally be divided into three etiological groups: local, systemic and genetic factors. In most cases, impaction is caused by local factors such as lack of space, absence of the maxillary lateral incisor, and prolonged retention or early loss of primary teeth [7,8]. In line with this, the presence of a persistent primary canine has been highlighted as a particularly important factor contributing to the increased risk of permanent canine impaction [9]. When it comes to palatally displaced maxillary canines, some authors favor the guidance theory, and others the genetic theory [10].

Impacted teeth can lead to some severe complications, primarily regarding root resorption of lateral or central incisors, but can also cause development of infections, cystic lesions and tumors [11].

The prevalence of impacted canines has been investigated in many different communities and ethnic groups, and the results are presented in various studies. Canines are found to be the second most impacted teeth in the oral cavity, right after third molars. The reported canine impaction rates range from 1% to 2.5%, taking into consideration both dental arches [2]. It should be noted that the prevalence of canine impaction is much more common in the maxilla. Therefore, the research on the prevalence of canine impaction so far has focused more on maxillary than mandibular canines. Statistically, maxillary canines are affected by impaction approximately 20 times more often [12], with rates from 0.27% in Japanese population, to 6.04% in Mexico [13,14]. On the contrary, mandibular canine impaction rates range from 0.07% among the population of Hong Kong, to 1.7% in Italy [12,15].

Additionally, research studies show a higher prevalence of unilateral impaction, as well as an approximately 8:1 ratio in favor of palatal maxillary impaction, comparing to buccal. Gender differences in the prevalence of canine impaction have also been reviewed, suggesting that females are more affected than males [10]. In regions where systematic interceptive orthodontic treatment has been implemented, the prevalence of impacted maxillary canines has been found to be lower compared to previously reported data [16].

Given that the condition is asymptomatic in most cases, it is usually detected accidentally during a routine dental examination or on panoramic images. The first step to a diagnosis is a clinical examination and evaluation, which should include visual inspection and palpation to assess the position of the canine in the alveoli. A great emphasis is placed on palpating the buccal prominence, ideally in the ninth year of life [17]. It is necessary to complete the diagnostic procedure with radiographic examination, to get a better insight into the position and angulation of the impacted tooth. Currently, panoramic radiographs are the most used type of imaging, and take a mandatory part in the diagnostic protocol in orthodontics [18]. Using radiographic images, impacted canines can be classified according to their position in relation to the occlusal plane and their angulation to the midline of teeth [2].

Consequently, impacted canines can be classified as vertically and horizontally impacted, with mesial or distal crown inclinations [19].

The aim of this study was to assess the prevalence of impacted canines among a group of orthodontic patients, since no similar studies have been conducted in Bosnia and Herzegovina.

Materials and methods:

Ethical approval and consent

This study received approval from the Ethics Committee of the Faculty of Dentistry with Dental Clinical Centre, University of Sarajevo, number: 02-3-4-19-1-5/2024, dated 24.01.2024. The patients have previously consented that their data and radiographs could be used for research and education purposes.

Data and sample collection

A cross sectional study of 3432 digital panoramic radiographs - orthopantomograms (OPGs) was conducted using data from the files of the Department of Orthodontics, University of Sarajevo – Faculty of Dentistry with Dental Clinical Center, from January 2022 to December 2023. The total of 3432 recordings included 1965 OPG images of female patients, and 1467 OPG images of male patients. While reviewing the database, technically defective and repeated recordings were excluded beforehand. The aim of reviewing the database was to assess the prevalence of impacted teeth and their radiographic characteristics. On the other hand, demographic details, such as patients' age, gender, and treatment, were obtained from their dental records.

Inclusion criteria

This study included all patients who needed orthodontic treatment, and whose diagnostic protocol included panoramic radiographs, which were analyzed for the purpose of this study. Only clear OPG images with high quality were analyzed, which demanded good visibility of certain anatomic structures and completed root formation of impacted teeth. All patients included in this study were of Bosnian and Herzegovinian origin.

Exclusion criteria

After the initial analysis, 271 OPG images with an incorrect position of the maxillary and/or mandibular canines, were selected. In order to definitively confirm the diagnosis of canine impaction, medical/dental documentation (dental records) and Cone Beam Computed Tomography (CBCT) images were obtained and additionally analyzed. All patients who were undergoing or had previously received orthodontic treatment (a total of 15), were excluded from this sample. Another 125 patients were excluded due to the following criteria: patient age below 12, incomplete documentation (lack of additional OPG images to confirm the diagnosis), patients with syndromes or general development disorders (such as cleft lip, alveolar ridge and/or palate).

Radiographic analysis

Every OPG image was analyzed for the position of the maxillary and mandibular canines, their angulation in relation to the occlusal plane, and their relationship with adjacent teeth.

Impaction was diagnosed when the eruption was completely absent, in a patient with permanent dentition and completed roots of all teeth. The overall prevalence of impacted canines was studied, as well as the pattern of their occurrence regarding the gender (male vs. female), affected jaw (upper vs. lower), type of impaction (unilateral vs. bilateral) and affected side of the jaw (right vs. left). All analysis of panoramic radiographs was supervised by an orthodontic specialist.

Statistical analysis

The collected data was processed in MS Excel and analyzed using descriptive statistics.

Statistical analysis was done with the help of the Pandas and SciPy libraries in the Python programming language, within the PyCharm environment. Differences in the distribution of impaction between the genders were analyzed using the Z-test.

A Chi-square test for independence was conducted to examine the association between categorical variables, such as upper/lower; unilateral/bilateral and right/left impaction. The level of significance was set at $p < 0.05$ for all tests. The research results were presented graphically.

Results

In the sample of 3432 digital panoramic radiographs of orthodontic patients, there were 1467

(42.74%) males and 1965 (57.26%) females. From the total of 3432 selected and analyzed radiographs, impaction was found in 131 (3.82%) subjects, among which 54 (1.57%) were male, and 77 (2.24%) were female subjects (Figure 1). There was no statistically significant difference between the genders (Z-value: 0.376; p-value: 0.353; p > 0.05). (Table 1)

Figure 2 shows the data on the presence of impacted canines in relation to jaws. In the upper jaw, the diagnosis of canine impaction was confirmed in 124 (3.61%) subjects, among which 48 (1.39%) were males and 76 (2.21%) were females. The appearance of canine impaction in the lower jaw was found in only 7 (0.20%) subjects, thereby including 5 (0.15%) male, and 2 (0.05%) female subjects. The difference between the upper and lower jaw impaction was statistically significant (p-value < 0.0001; p < 0.05), in favor of a more frequent impaction in the upper jaw (Table 2). However, there was no statistically significant difference between the genders neither with maxillary (Z-value: 0.964; p-value: 0.168; p > 0.05) nor with the mandibular canine impactions (Z-value: 1.6; p-value: 0.218; p > 0.05).

Unilateral canine impaction was more often than bilateral, and in this sample was found in 113 (3.29%) subjects (1.39% males and 1.89% females). However, bilateral canine impaction appeared in 18 (0.52%) subjects (0.17% males and 0.35% females) (Figure 2). The difference between the appearance of unilateral or bilateral canine impaction had a statistically significant value (p-value < 0.0001; p < 0.05), while the gender distribution for both unilateral (Z-value: 0.069; p-value: 0.472; p > 0.05) and bilateral (Z-value: 0.83; p-value: 0.402; p > 0.05) canine impaction was not statistically significant (Table 3).

From 113 unilateral impactions in this sample, 106 (3.09%) of them were found in the upper jaw, and 7 (0.20%) were found in the lower jaw. The difference was statistically significant (p-value <0.0001; p < 0.05).

All of the bilateral canine impactions in this sample were diagnosed in the upper jaw. Figure 3 shows the data on the presence of unilateral canine impaction in relation to the right or left side of the jaw. Canine impaction on the left side of the jaw was found in 60 (1.75%) patients, among which 26

Figure 1.
Frequency of canine impaction according to gender

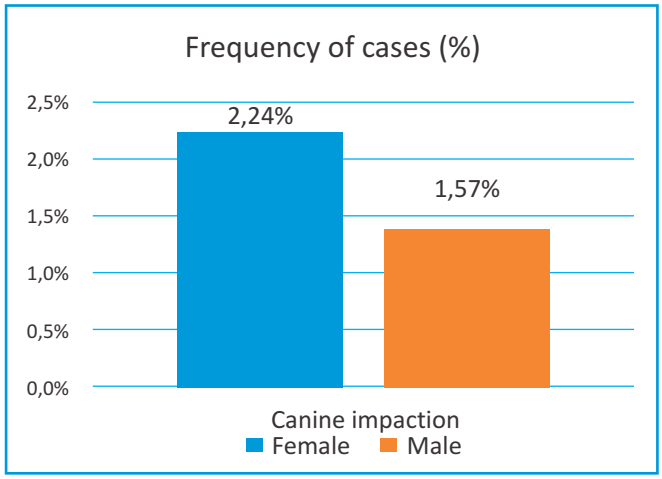

Table 1.
Prevalence of impacted canines among males and females

	Total number of impacted cases	Prevalence of impacted canines	P - value
Females with impacted canine	77	2.24%	p = 0.353
Males with impacted canine	54	1.57%	
Subjects with impacted canine	131	3.82%	

*p > 0.05, Statistically not – significant

Figure 2.
Frequency of canine impaction according to jaw, type of impaction and gender

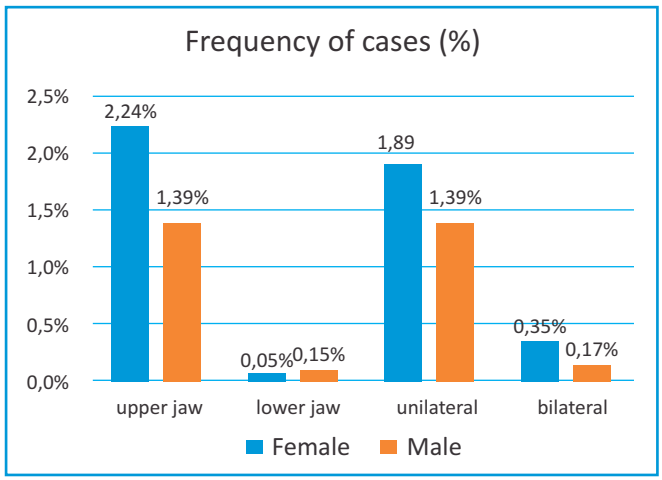

Table 2.
Percentage distribution of impacted canines in the upper and lower jaw

	Frequency	Percentage	Prevalence	P - value
Upper jaw	124	94.66%	3.61%	p < 0.0001*
Lower jaw	7	5.34%	0.20%	
Total	131	100.0%	3.82%	

*p > 0.05, Statistically significant

Figure 3.
Frequency of canine impaction according to affected side and gender

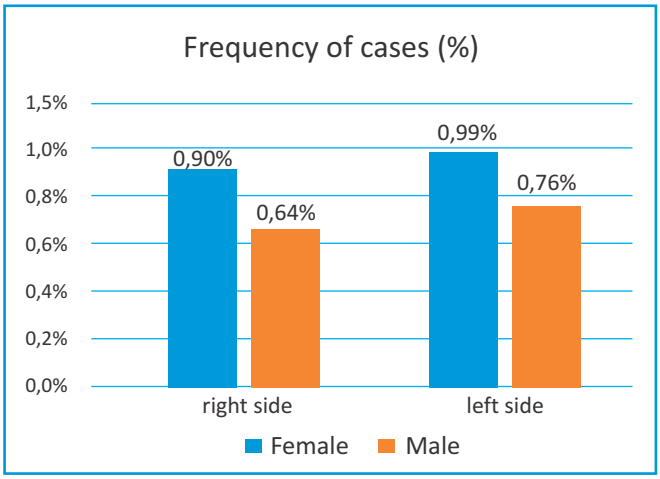

Table 3.
Frequency distribution of type of impaction

	Frequency	Percentage	Prevalence	P - value
Unilateral	113	86.26%	3.29%	p < 0.0001*
Bilateral	18	13.74%	0.52%	
Total	131	100.0%	3.82%	

*p > 0.05, Statistically significant

Table 4.
Association of gender with affected side (right vs. left) and type of impaction (unilateral vs. bilateral)

Gender	Type of impactions		
	Right	Left	Bilateral
Male	22 (0.64%)	26 (0.76%)	6 (0.17%)
Female	31 (0.90%)	34 (0.99%)	12 (0.35%)
Total	53 (1.54%)	60 (1.75%)	18 (0.52%)

*p > 0.05, Statistically significant

(0.76%) were male and 34 (0.99%) were female subjects. On the right side of the jaw, unilateral canine impaction was diagnosed in 53 patients (1.54%), including thereby 22 (0.64%) male and 31 (0.90%) female subjects (Table 4). In this case, the difference between impactions on the right or left side of the jaw was not statistically significant (p-value: 0.512; p > 0.05). Similarly, there was no statistically significant difference between the genders, when it comes to impactions on the right (Z-value: 0.918; p-value: 0.421; p > 0.05) and left (Z-value: 0.091; p-value: 0.464; p > 0.05) side of the jaw.

Discussion

The findings of this cross sectional study provide valuable insights into the prevalence of impacted canines in the study population of Bosnia and Herzegovina, along with information on impaction distribution in relation to gender, jaw and other variables.

The results of this study showed that out of 3432 analyzed digital panoramic radiographs (OPG images) of orthodontic patients, 131 of them had one or more impacted canines. The resulting number indicated a prevalence of impacted canines of 3.82% among orthodontic patients from 2022 and 2023.

Due to similar values, this data can primarily be compared with results conducted on the population of Northern Cyprus in 2014, which show a slightly lower prevalence of canine impaction - 3.53% [20].

The reported prevalence of maxillary canine impaction varies from 0.27% to 6.04% [13,14]. The results of our study suggested a prevalence of maxillary canine impaction of approximately 3.61%, which is in accordance with previous, similar investigations. These results are in agreement with results of the study presented in 2010 by Greek and Turkish authors, who, based on a review of the available literature published up to 2010, found a prevalence of maxillary canine impaction ranging from 0.8 to 5.2% [10].

It should not be overlooked that the ethnic background of a particular sample may result in a higher or lower prevalence. In addition, possible differences in data caused by different

methodologies, sample sizes, and selection of respondents should always be taken into consideration.

When it comes to mandibular canines, the prevalence of their impaction in our sample was 0.20%, which is fully consistent with the currently available data. It can be considered to be the lowest prevalence, if we exclude the Hong Kong population with a prevalence of mandibular canine impaction of 0.07% [15]. It is necessary to emphasize that mandibular canine impaction is less frequently the focus of research. In this regard, small differences in the prevalence of impacted mandibular canines among different populations are not significant, as they rarely exceed 1%.

Considering the number of impactions in the upper versus lower jaw, we can talk about a ratio of 17,714:1, with maxillary impaction occurring in over 94% of subjects of our sample. Similar to the results of other studies, which suggest roughly 20 times more frequent impaction in the maxilla compared to the mandible, the calculated ratio of our study fits into the initial assumption [12].

Maxillary canine impaction was more prevalent in females (2.21%) than in males (1.39%) in our study; however, this difference was not statistically significant, consistent with many other studies where gender differences rarely reach statistical significance. In contrast, a study conducted in Saudi Arabia in 2023 reported a higher prevalence among males compared to females [21], while research from the Dental College in North India in 2024 found a significantly higher prevalence in females than males [8].

Numerous studies have shown that canine impaction is more often unilateral than bilateral, and these results were in agreement with our study [8,21]. Most results from the literature report a frequency of unilateral impaction in 2/3 or more than 2/3 of subjects canine impactions. The reported ratio in our sample was 6,2:1 in favor of the unilateral impaction, so the difference was consequently statistically significant (p-value < 0.0001; $p < 0.05$).

In this research, there wasn't a big difference in the frequency of canine impaction on the right and left side of the jaw. In contrast to our results, there are similar surveys that show a higher prevalence on either side of the jaw [4,12,22].

The prevalence of impacted canines of 3.82% emphasizes the clinical significance of this irregularity in the population of Bosnia and Herzegovina, since it seeks proper and timely treatment in order to prevent potential complications. This study contributes to existing knowledge in dental research, as there is currently no data on the prevalence of impacted canines in Bosnia and Herzegovina. However, it should be noted that the current study has its limitations, especially regarding the sample size and its focus exclusively on patients who attended the Department of Orthodontics, University of Sarajevo – Faculty of Dentistry with Dental Clinical Center. In order to overcome these limitations, future research should include a bigger and more diverse sample of population in Bosnia and Herzegovina, to ensure greater accuracy..

Conclusion

- The prevalence of canine impaction was observed in 3.82% of subjects among orthodontic patients, and was more prevalent in female than in male subjects, but with no statistical significance.
- The already existing data which suggests more frequent unilateral impaction and impaction in the upper jaw, was again confirmed in this research.
- Knowledge of data on the prevalence of impacted canines is important for preventive and interceptive measures, for preventing complications and planning orthodontic treatment.

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Declaration of Interest:

The authors declare that they have no conflict of interest.

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THE ROLE OF TORQUE IN ROOT CANAL INSTRUMENTATION
RUNNING HEAD:
TORQUE IN ROOT CANAL SHAPING

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ABSTRACT

Root canal instrumentation is essential for the success of endodontic treatment. Among the various factors that influence the effectiveness of instrumentation, torque is particularly important. Adjusting the torque during root canal instrumentation not only improves dentin cutting efficiency but also decreases the potential for instrument fracture, canal transportation, or perforation. This paper explores the role of torque in endodontics, including its definition, measuring methods, effects on instrumentation, and implications for clinical outcomes. It specifically examines the parameters that influence torque generation during root canal instrumentation.

Keywords: root canal instrumentation, torque, instrument fracture

Introduction

From the moment they appeared on the market in the 1990s until today, NiTi rotary instruments have taken endodontics to the next level. Compared to hand instruments made of stainless steel, NiTi instruments have superior flexibility, which enables the treatment of root canals with complex morphology. In addition, they have a better ability to canter the root canal decreasing the risk of procedural errors. NiTi files reduce root canal treatment time, which benefits both dentists and patients [1].

Despite the aforementioned advantages as well as advances in design and manufacturing processes, fracture of NiTi endodontic instruments is still a relatively common problem in daily practice, especially when treating calcified and curved root canals. This problem can compromise both the outcome of the root canal treatment and the patient's confidence. NiTi instrument fracture can be a result of material fatigue, i.e., repeated compressive and tensile stresses along the working part of the instrument. Fracture can also occur as a result of torsional stress that occurs when one part of the instrument (most often the apical part) gets stuck and the other part continues to rotate [2].

The use of rotary instruments may also lead to phenomena that increase the risk of the instrument fracture. The first phenomenon is taper lock, which occurs due to the extensive contact surface between the instrument and the root canal wall, instantly increasing torsional stress [3]. The second phenomenon is the screw-in effect, which refers to the tendency of the rotating instrument to retract apically, detectable through tactile sensation. The screw-in effect can cause instrument jamming and fracture due to torsional stress. Files with active tips, common in root canal retreatment, are more likely to experience this effect [4].

Most clinical work in dentistry is based on the action of rotating force on instruments. Torque and speed are the basic characteristics of rotational motion. The effectiveness and safety of instrument use depend on the adaptation of these characteristics to the conditions within the root canal. Therefore, the aim of this paper is to explain the meaning of these terms and the implications they have for root canal instrumentation. In particular, factors that influence torque generation during endodontic treatment will be explained.

Operative torque

Mathematically speaking, torque is the product of force and its distance from the axis of rotation. The unit for torque is Nm, and since small distances are used in endodontics, the common unit is Ncm. In terms of mechanics, torque is the amount of force required to rotate an object around its longitudinal axis. Applied in endodontics, torque is the force required to rotate NiTi instruments [5].

However, what interests every dentist performing root canal treatment is the operative torque. Operative torque is a measure of the force required for an instrument to progress through the root canal, cut dentin, remove debris, and reach a specified working length without fracturing it. Therefore, it is a balance between the efficiency of the instrument on the one hand and the safety of its application on the other. Operative torque is a dynamic quantity, meaning that it changes at different stages of root canal treatment. This value depends on a number of factors, including root canal anatomy, dentin hardness, instrumentation technique, root canal instruments characteristics, operator experience, and torque and speed settings on the endomotor itself [6].

Influence of root canal anatomy on operative torque values

A large number of studies have found that the shape of the root canal affects the fatigue and lifespan of endodontic instruments [7,8,9]. There are differences in the number, length, diameter, and curvature of root canals between different groups of teeth. During the instrumentation of smaller diameter canals, a greater operative torque is generated compared to larger diameter canals. Additionally, the radius of curvature has a greater

influence on the operative torque generation than the angle of curvature during instrumentation of curved root canals. The shorter the radius of curvature, the greater the torque generated. It has been found that changing the radius of curvature from 15 mm to 5 mm reduces the lifespan of the instrument by a factor close to 10 [10].

Higher operative torque values were recorded during instrumentation the apical third of the root canal. In some cases, the operative torque values are higher when shaping the coronal compared to the middle third of the root canal, which is explained by the presence of calcifications at the entrances to the root canals [11].

Influence of instrument characteristics on operative torque values

The quality of mechanical root canal preparation is directly influenced by the design of endodontic instruments. There are numerous factors that affect the efficiency of endodontic files [12].

Over the past years, the cross-sectional design of endodontic instruments has changed. The main tendency has been to reduce the contact area between the instrument and the root canal wall. It has been found that instruments with a rectangular cross-section generate almost twice as much torque as triangular ones. This is explained by the fact that instruments with a triangular cross-section are more flexible and therefore have a longer lifespan [13,14].

Some modern endodontic instruments have a variable cross-section along their working part [15]. Additionally, modern endodontic files might have an eccentric axis of rotation, in contrast to the centric axis of rotation of traditional NiTi files. This reduces the contact area of the file with the root canal wall and thus the flexural and torsional fatigue. Furthermore, instruments with an eccentric axis of rotation facilitate the removal of debris during root canal preparation [16].

The taper of endodontic instruments can be constant or variable. In a constant taper instrument, the increase in diameter per unit length is constant. Instruments with variable taper can be progressive or regressive, depending on whether the diameter of the instrument increases or decreases from the tip to the handle. Endodontic files with constant taper are suitable for straight canals and canals with minimal curvature. Even though there are very conservative dentin removal files available on the market with constant taper 0.04 or less, using the file with greater conicity could result in a larger amount of dentin being removed. Variable taper endodontic files are more flexible and suitable for curved, i.e., anatomically more complex canals although this also depends on other properties of the cutting part of the instrument and alloy. When working with these endodontic files, there is less chance of taper lock and screw-in phenomena [17].

The modification of the cutting edges of the instrument could also contributed to the generation of lower operative torque values. A lower screw-in effect, and thus the generated torque, was observed when using a radially landed cutting edge compared to sharp cutting edge [18,19]. In addition, the use of a radially landed cutting edge allows the instrument to remain centrally positioned in the root canal [20,21].

The distance between the cutting edges determines the pitch of the instrument. Instruments with a small pitch generate a higher torque because dentin accumulates faster within the grooves, reducing cutting efficiency, which can result in the application of a higher apical force [17]. A large number of modern endodontic instruments have a variable pitch along the active part [22].

The angle that the cutting edge of the instrument makes with its longitudinal axis is called the helicoid angle. Instruments with a higher helicoid angle generate a lower torque and thus lower torsional stress on the instruments [23].

NiTi alloy can exist in two crystal structures called austenitic and martensitic phases, which depend on stress and temperature [24]. Conventional NiTi instruments are in the austenitic phase at room temperature. When external stress is applied, such as torsional stress or friction of the instrument against the root canal walls, transformation to martensite occurs [1].

The martensitic phase helps reduce the risk of endodontic instrument fracture under high stress

conditions because it can deform rather than break. Since the martensitic state induced by stress is not stable at room temperature, once the stress is removed, the deformed NiTi alloy immediately returns to the austenitic phase. This transformation is responsible for the super-elastic properties of conventional NiTi instruments, i.e., their ability to return to their original shape after deformation, which is called the spring-back or shape memory effect [25].

Improved properties of endodontic instruments are achieved through heat treatment, surface modifications and slight changes of the ratio between alloy components. Heat treatment aims to influence the transition temperatures of the NiTi alloy and modify the fatigue resistance. The heat treatment process reduces the internal stress of the NiTi alloy and increases the phase transformation temperature of NiTi, resulting in a more martensitic phase at clinically relevant temperatures. Heat-treated NiTi instruments have greater flexibility and fatigue resistance than conventional NiTi instruments. The whole point of heat treatment is to make the martensitic phase stable under clinical conditions [25,26].

Microcracks are often formed on the surface of the instrument, which indicate the first stage of the fatigue phenomenon. Therefore, a treatment that improves surface smoothness is expected to prevent cracking and increase fatigue resistance.

Electropolishing refers to any electrochemical process aimed at reducing material surface irregularities and achieve high gloss. It is performed by immersing the instrument in a specially formulated, usually acidic, electrolyte solution and passing direct current through it to facilitate the selective dissolution of the material. However, there is conflicting evidence about the benefits of this surface treatment [27].

To create a protective oxide coating on their surface, most NiTi endodontic files, such as ProTaper Gold and Reciproc Blue, use a patented heat treatment method that frequently involves air or a controlled atmosphere. In some cases, the surface hardness and wear resistance of heat-treated NiTi instruments have been improved by surface engineering techniques. This involves physical vapor deposition in a vacuum, where the instruments are covered with a thin film or coating. Several manufacturers have therefore devised thermomechanical processing methods to create a titanium oxide surface layer on NiTi instruments. Differences in the thickness of the titanium oxide layer result in different colours of the instrument. However, some heat treatment processes do not necessarily result in the formation of a titanium oxide layer that will cause instrument colour change, such as M-wire [28-30].

Characteristics and indications for the use of austenitic and martensitic instruments

Instruments in the austenite phase have the shape memory effect described above. These instruments have increased resistance to torsional fatigue and fracture at higher torque values. They cut dentin more efficiently and advance through the root canal faster, but have less flexibility than instruments in the martensitic phase. Due to the mentioned characteristics, instruments in the austenite phase are used for the treatment of straight and slightly curved root canals [31]. In addition, the use of an austenitic alloy in pathfinding files can potentially compensate for the decreased torque resistance caused by their smaller diameter. Retreatment procedures are also shorter when performed with austenitic instruments compared to martensitic ones [32].

Instruments in the martensitic phase can be bent at room temperature and retain their shape, which is called the control memory effect. They have increased resistance to cyclic fatigue, but fracture at lower torque values. Therefore, instruments in the martensitic phase are used when shaping strongly curved root canals, when bypassing ledge and in situations of difficult access, e.g., when the patient cannot open his mouth sufficiently. They cut dentin less effective and advance more slowly towards the apical part, but they have greater flexibility [33].

The irrigation protocol recommends heating the NaOCL to increase its animicrobial and organolytic activity. However, increasing the temperature of the

irrigant affects the properties of the heat-treated endodontic files. As the temperature rises, the instrument becomes stiffer because the temperatures of its phase transformations change [34,35]. It has been proven that 33% more force is required to bend the last five millimeters of the instrument with irrigant heated to 46°C than with irrigant at 37°C. To reconcile the improved properties of heated irrigate and the super elastic properties of NiTi instruments, it is recommended to use room temperature irrigant during root canal treatment, and to use heated NaOCl as a final irrigant after root canal instrumentation [36].

The influence of operator- dependent factors on operative torque values

The generation of operative torque is influenced by factors that depend on the operator himself such as: creation of a glide path, depth and number of insertions, movement during instrumentation, choice of system kinetics, lubrication and experience of the therapist [37].

Creating a glide path before root canal instrumentation has been proven to reduce operative torque values on subsequent instruments. This implies the importance of creating a glide path during root canal treatment [38].

When treating a root canal, it is necessary to cover a shorter vertical path (pecking motion), i.e., make inward-outward movements with an amplitude of 1 to 3 mm (shorter in curved and narrowed canals). This movement counteracts the twisting forces that occur during rotation. Progressive canal enlargement through repeated, controlled insertion may lower torque during subsequent passes, provided that debris is effectively removed and the file is not binding [39-41]. Usually, three vertical movements and cleaning of the file grooves are performed in each cycle. Removal of debris significantly contributes to reducing the operative torque. Brushing movements generate lower torque than pecking movements [42].

During a dental procedure, the dentist adopts different hand positions, looking appropriate support for work. By analysing the torque generated by moving the hand in all three spatial planes, it was found that the strongest forces were generated apically, rightward and posteriorly [43]. Every dentist should take care that the hand controlling the endomotor does not generate additional operative torque.

The choice of NiTi file system with a specific kinetics also affects the generation of torque. In systems with reciprocal rotation, clockwise and counterclockwise motion alternate at a certain angle. When the direction of rotation changes from clockwise to counterclockwise, a higer torque is generated. Therefore, the amplitude of the generated torque in continuous motion is lower than in reciprocal motion [44]. The recently introduced adaptive motion implies both continuous and reciprocal rotation, which depend on the torque values. Optimum Torque Reverse (OTR) is a function on the endomotor that enables automatic torque measurement, whereby the measured value controls the direction of rotation. If the load is less than the torque value set on the endomotor, the instrument continuously rotates clockwise. As soon as the torque exceeds a setpoint value, the rotation reverses to an alternating 90° counterclockwise and 180° clockwise until the torque falls below the setpoint. OTR is a more refined version of auto-reverse, but uses a smaller angular rotation for safe feedback about the file's stress. This adaptive motion produces lower torque than continuous rotation [45,46].

The use of lubricants reduces the generated torque, with aqueous solutions have a greater advantage in comparison with gel-type formulations [47,48].

Clinical instrument use varies for each clinician and may result in different blade engagement and torsional stresses during intracanal instrumentation. The torque generated during the work of inexperienced practitioners is greater than that of those with many years of experience [49]. However, it is interesting that in relation to apical force, inexperienced operators produce less apical force than experienced ones [50]. No matter how familiar a dentist becomes with their system, it is still essential not to apply force with a rotating instrument. In addition, pecking at higher speed rotation generates

higher vertical forces and torque then pecking at low-speed rotation [51].

Inherent torque and measurement techniques

Each endodontic file has its own specific torque (inherent torque) which is stated in the instruction manual. Inherent torque is, in principle, the maximum force that a file can withstand without breaking. This practically means that endodontic file manufacturers must suggest the right torque values or each individual file to achieve optimal cutting performance while reducing the risk of fracture. Unfortunately, it is not easy to find such a good balance. To optimize clinical use, a rotary NiTi instrument should require low operative torque values and exhibit a high fracture-inducing torque value or exhibit a wider "torque range" between these two values [52].

To assess the torsional resistance of NiTi files, a rotational force is applied until the instrument fractures. The in vitro torsion resistance test according to International Organization for Standardization (ISO) 3630-1 involves immobilization of the 3 mm tip of the instrument, with continuous rotation of the shaft until fracture at a speed of 2 rpm [53]. This method was developed in the 19th century to test the torsional resistance of stainless steel hand instruments, but it is not adapted for testing NiTi rotary instruments, which in clinical practice rotate at much higher speeds than 2 rpm. Currently, there are no international guidlines or standards for assessing the fracture resistance of endodontic rotary instruments [25]. Another problem is that the predefined torque values are based on the mechanical properties of new instruments. Unfortunately, the repeated use of NiTi rotary instruments dramatically affects their fatigue resistance. This concept has been clearly demonstrated in many studies [54-56].

To bring the testing conditions closer to real clinical situations, several in vitro methods have been developed to measure the stress during root canal instrumentation. Root canal shaping can weaken the canal wall due to the removal of dentin and the stress generation. Therefore, methods have been developed that involve counting microcracks before and after root canal instrumentation. Microcrack assessment was performed using stereomicroscopes [57] and micro CT analyses [58,59].

Applying a strain gauge to the root surface has allowed real-time stress measurement during canal instrumentation. However, the stress on the root surface is not identical to the stress on the root canal walls [60].

Several studies have measured stresses using the finite element method, which allows for analysis of stress distribution and concentration depending on material properties and loading conditions [61]. Stress levels during shaping vary depending on the instrument design. The mechanical response of the instruments is influenced by their cross-sectional design, volume, and elasticity, as well as the elastic modulus of the root canal dentine [62-64].

Recently developed torque sensors and improved software have enabled the creation of devices capable of assessing and recording torque in real time during root canal shaping. The operative torque generated by the instrument is measured every 0.1 s and the average torque value can be calculated. The device accurately records a multitude of torsional stresses along the entire working part of the instrument. In this way, the instrument is dynamically evaluated because the torque is measured at all stages of instrumentation from orrifice to apical constriction [42,65,66].

The relationship between speed and torque

The speed represents the number of rotations of the endodontic instrument in one minute and is the driving force for creating torque. If the speed is low, it cannot generate the torque needed to cut the dentin. High speed will create excessive torque, disable the autoreverse function and lead to instrument fracture [67,68]. Speed constancy is of utmost importance to enable the NiTi instrument to be used in a consistent manner during instrumentation. When using an endomotor, the instrument rotates in the canal at a constant speed regardless of root canal conditions and this is possible by adjusting the torque [5]. Unlike speed, torque is influenced by the conditions of the

root canal itself, but also by the force applied by the operator, which can be multidirectional [14].

Speed and torque settings are not the same for all clinical situations [40, 44, 69]. Although it is generally necessary to respect the torque and speed values recommended by the manufacturer, it should be remembered that the endomotor reads and controls the torque values through the feedback it receives through the instrument handle. However, the instrument is very flexible, especially near the top. The more flexible the instrument, the weaker the torque values are transmitted from the tip to the handle of the instrument, i.e. the endomotor cannot estimate the actual torque values to which the file is exposed in the apical third. This especially applies to instruments of small diameter and taper, for which lower torque values can be set [5, 44.]

Using a higher torque increases the activity of the instrument inside the root canal, but also increases the possibility of its jamming, deformation and fracture. In contrast, using a lower torque reduces the activity of the instrument, i.e., cutting the dentin and progression towards the apex. This can lead the operator to force the instrument in the canal, which in turn can cause it to fracture [71].

Working with different files requires adjusting torque and speed to prevent fracture and maintain efficiency. As the taper and diameter of the file increases, its stiffness also increases. As the stiffness of the file increases, the speed settings on the endomotor decrease and the torque values increase [72].

Instruments with longer shaft are more flexible, so lower torque values are set and speed is increased. The longer the instrument, the greater its resistance to torsional stresses. Accordingly, during instrumentation of narrow or curved canals, if the patient's condition allows, it is advisable to use instrument with longer shaft to increase its torsional resistance and reduce the likelihood of instrument fracture [73].

The conditions within the root canal also dictate the need for torque adjustment. In situations of instrumentation of curved and/or narrow and obliterated root canals, both speed and torque should be reduced [40].

With repeated use of the instrument, the value of its inherent torque decreases. Therefore, it is necessary to reduce the torque values on the endomotor. This will result in reduced cutting efficiency and longer canal instrumentation time, but also reduce the risk of instrument fracture [2].

Conclusion

Effective dentine removal, root canal integrity and original morphology preservation, and enhanced procedural safety are all impacted by torque modification during endodontic treatment. Dentists can increase endodontic therapy's efficacy, safety, and success by understanding and regulating torque. Despite the development of torque controlled devices, several challenges remain in endodontic practice. This first implies that root canal anatomy, instrument design, and operator skill are all variable. Future studies should focus on optimizing torque values for various clinical scenarios, enhancing instrument design, and improving torque measuring methods.

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ANCIENT WISDOM MEETS MODERN SCIENCE: THE ROLE OF MEDICINAL HERBS IN ORAL CARE

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ABSTRACT

Herbal medicine has long been essential in preventing and treating oral health issues, dating back to prehistoric times. Over the centuries, different cultures have developed advanced herbal remedies for conditions such as toothaches, gingivitis, oral ulcers, and bad breath. Recent research highlights the therapeutic benefits of plants like sage, aloe vera, miswak, clove, neem, chamomile, and mint, many of which are now incorporated into modern oral care products. The combination of ancient wisdom with contemporary scientific research reinforces the ongoing role of phytotherapy in modern dental practice.

Keywords: phytotherapy, oral health, medicinal herbs, dentistry

1. Introduction

Medicinal plants have been used for thousands of years. Thanks to the research of bioarcheologists, paleo-odontologists, and paleop-harmacologists, we now have valuable evidence that prehistoric humans were already aware of the healing properties of various plants. Natural remedies have been discovered preserved at archaeological sites. Studies suggest that even Neanderthals used medicinal plants. For example, Hardy et al. found fossilized molecules of yarrow and chamomile in the dental calculus of a Neanderthal from El Sidrón, Spain. In one female specimen with a dental abscess, traces of poplar were found—a plant that contains salicylic acid, a natural substance with anti-inflammatory and pain-relieving properties. [1]

Many ancient civilizations developed advanced medical practices in which medicinal herbs played a vital role. The use of healing plants has evolved over time and has been passed down through generations. Numerous studies have shown a strong connection between the modern use of herbs and the medicinal knowledge of ancient civilizations. [2] [3] [4]

The oldest known written medical document is a Sumerian clay tablet from Nippur. Dating back 5,000 years, it contains lists of medicinal plants such as myrrh, thyme, poppy, mandrake, coriander, and senna. Chewing fresh aromatic herbs was among the earliest remedies used for bad breath and maintaining gum health. [5] [6]

Evidence of ancient Egyptian medicine has been recorded in several papyri, most notably the Ebers Papyrus. This text contains information on over 850 medicinal plants, including garlic, juniper, cannabis, castor, beans, aloe, and mandrake. It also describes treatments for bad breath and toothache. For example, a mixture of vinegar and crushed fresh cloves was recommended for relieving toothache. Clove oil contains eugenol, an active compound that, when combined with zinc oxide, is still used in modern dentistry for its antiseptic and pain-relieving properties. [7] Another ancient remedy for toothache involved chewing anise seeds. A paste made from ground cumin, incense, and carob was also recommended for relieving dental pain. The earliest known recipe for toothpaste originates from ancient Egypt and included a mixture of salt, pepper, mint leaves, and iris flowers. [8]

The physicians of ancient Greece inherited much of their knowledge of medicinal plants from the Egyptians. Theophrastus, a Greek philosopher and scientist, made significant contributions to the description and classification of medicinal plants. Through his works De Causis Plantarum and De Historia Plantarum, he laid the foundation for botanical science. These books offer a systematic study of plant descriptions and classifications, containing many of his own observations. He categorized over 500 known medicinal plants, including sage, cinnamon, basil, parsley, iris, rhizome, mint, pomegranate, and cardamom. Chewing the leaves of aromatic herbs such as hellebore or mint was recommended for combating bad breath. Mixtures of aromatic herbs with wine were used as mouthwashes to reduce oral odor, while gargling with rose water was also advised. For treating diseases of the oral mucosa, a blend of egg yolk, olive oil, myrtle, and honey was recommended. [9] [10]

Roman physicians built upon the medical knowledge of the ancient Greeks while also developing many new remedies. The renowned Roman medical writer Aulus Cornelius Celsus, in his work De Re Medica, described around 250 medicinal plants, including aloe, henbane, flax, poppy, pepper, cinnamon, gentian, cardamom, and false hellebore.

Pedanius Dioscorides, a Greek botanist, pharmacologist, and physician who practiced in Rome, authored a five-volume pharmacopeia titled De Materia Medica. This influential work listed over 600 herbal remedies and served as a foundational medical reference for more than 1,500 years. Dioscorides also provided one of the earliest classifications of oral and dental diseases. He recommended over 120 natural treatments for toothache and conditions affecting the gums and oral mucosa. Various substances were used to relieve dental pain. Decoctions of vinegar combined with plants such as milkweed, cedar, hyssop, or mullein were used as mouthwashes. Chewing wild olives or freshly cut oregano was prescribed for treating aphthous ulcers and mouth sores. A mixture of honey with pomegranate flowers or olive leaves was also

used to treat aphthous conditions. [10] [11] Many of the herbs described possess therapeutic and potentially analgesic properties. Their leaves and roots contain powerful alkaloids such as scopolamine and hyoscyamine, which act as central nervous system depressants. When used as a mouthwash, these compounds may have provided some local pain relief. However, a significant number of the remedies recommended by Dioscorides would be considered ineffective by modern medical standards. [12]

Claudius Galen is one of the most influential physicians in medical history and was a strong advocate for the healing power of herbal remedies. He maintained a large garden to cultivate plants he believed could aid in treatment and carefully developed new medicines. As a skilled pharmacist, Galen systematized the preparation of drugs made from multiple ingredients, which later became known as galenicals. [12] The most commonly used medicinal plants for treating oral diseases and toothache included sage, garlic, cloves, mint, willow, chamomile, and calendula. [13] The Romans improved upon Greek toothpaste recipes by adding abrasives such as crushed bones or shells, along with flavoring agents. Galenicals continued to be used throughout the entire Middle Ages.

Meanwhile, herbal medicine has been an integral part of Traditional Chinese Medicine for thousands of years. [14] Ginseng is one of the most well-known herbs in traditional Chinese medicine. Recent clinical research suggests its potential benefits in treating periodontal disease, protecting against dental caries, and managing various types of stomatitis. [15]

Herbal medicine was also highly advanced in ancient Indian culture. Over the centuries, Ayurvedic practitioners developed numerous herbal preparations for treating oral and dental diseases. Ayurveda recommends chewing sticks made from neem, whose bark possesses antibacterial properties. Neem is especially effective for treating gum problems and maintaining oral health naturally. Neem twigs have traditionally been used as oral deodorants, toothache relievers, and natural teeth cleaners. Notably, neem oil is now an ingredient in some modern toothpastes and mouthwashes. Neem mouthwash is recommended for treating oral infections, gingival bleeding, and promoting wound healing. A study by Jalaluddin et al. investigated the effectiveness of neem mouthwash on plaque and gingivitis, concluding that it can be a viable alternative to chlorhexidine mouthwash. [16]

In the early Middle Ages, dental treatment relied primarily on herbal remedies, prayers, and magical practices. Benedictine monasteries served as centers of medical knowledge and culture. Roman Emperor Charlemagne (742–814 AD) decreed that every monastery should maintain a "healing garden" where monks cultivated medicinal herbs. Treatments commonly used about 16 medicinal plants, including sage, mint, anise, chamomile, savory, iris, marshmallow, and tansy. [9] The monks prepared medicines following the prescriptions of ancient Greek and Roman physicians and herbalists. To prevent inflammation and bleeding gums, medieval monks would wrap a sage leaf around their finger and massage their teeth and gums. For bad breath, a paste made from crushed pepper, mint, and rock salt was recommended. [17] [18] [19]

The most famous figure associated with monastic medicine was the German Benedictine abbess Saint Hildegard of Bingen, who lived around the turn of the 11th and 12th centuries. She became well known for her healing abilities, especially through the practical use of herbs and tinctures. Hildegard left behind nearly 2,000 medicinal recipes. For bad breath, she recommended rinsing the mouth with a drink made from sage boiled in wine. [20] [21] Today, we know that sage possesses many beneficial medicinal properties, including anti-inflammatory, antiseptic, and antibacterial effects. [22] [23] [24]

The Schola Medica Salernitana is considered the oldest medical school in Europe. Trotula of Salerno, a physician and instructor at this school, was one of the most renowned medieval medical practitioners. While she primarily focused on women's health—covering pregnancy, childbirth, breastfeeding, and newborn care—she also wrote about cosmetics and oral hygiene. For maintaining oral hygiene and fresh breath, Trotula recommended chewing aromatic plants such as mint, eucalyptus, fennel, and parsley. To treat gingivitis and halitosis, she used a remedy made from fast lime nature sulfur, mineral orpiment, burnt pumpkin, and pepper seeds.

This medicine was applied to diseased gums that had been washed beforehand with a solution prepared by cooking the root of the mullein plant in vinegar. An analysis of the therapeutic efficacy of the herbs used by Trotula reveals that many of these plants are still ingredients in modern toothpastes and mouthwashes. [25] [26]

Medieval Arab physicians and pharmacologists made significant advances in medicine and science. They adapted the ancient medicinal practices of Egypt, Greece, and Rome while introducing many new remedies and therapies. Their materia medica included plants such as aloe, ginger, strychnos, saffron, turmeric, pepper, cinnamon, and senna—many of which are still used today. Their pharmacies also contained numerous remedies of animal and mineral origin, often combined with medicinal plants.

One of the most renowned scholars in history is Ibn Sina, known in the West as Avicenna. His Canon of Medicine served as a key medical reference for centuries in both Western and Eastern countries. In this work, he summarized centuries of experience from Greek, Indian, and Central Asian medicine, including pharmacology, pharmacy, and pharmacotherapy. In the third book of the Canon, Avicenna discussed diseases of the oral cavity and dentistry. He addressed conditions such as trauma, taste disorders, ranula, halitosis, tooth sensation and various types of tooth pain, bruxism, attrition, gingival bleeding, recession, and hyperplasia. For managing these ailments, he introduced over 80 herbal remedies, many derived from plants rich in essential oils. [27] [28] [29]

Abu al-Qasim al-Zahrawi (Albucasis, 936–1013) recommended washing or gargling with mint decoctions to alleviate swelling and erosion of the mouth, tongue, and throat caused by the toxic effects of topically applied mercury, a substance already used in Islamic medicine [30]

It is important to note the long-standing tradition of using miswak as a natural toothbrush in the Arabic world. Miswak comes from the Salvadora persica plant. Numerous studies have confirmed its antiplaque, anticariogenic, antimicrobial, and antifungal properties. Scientific research has proven that miswak helps reduce plaque, prevent tooth decay, eliminate bad breath, and promote healthy gums. [31] [32] [33] Because of these beneficial properties, miswak is included as an ingredient in some modern toothpastes and mouthwashes. [34] It is also used as a root canal irrigate. [35] A study by Almas compared the cytotoxicity of chlorhexidine gluconate and miswak extracts on mouse fibroblasts, finding that miswak extracts were less cytotoxic and demonstrated superior antimicrobial effects compared to chlorhexidine gluconate and sodium hypochlorite. [36] Although aloe vera has been used for thousands of years, Arab physicians placed great value on it. Today, its benefits are scientifically recognized. In modern dental practice, aloe vera is valued for its biological properties, including antimicrobial, immunomodulatory, anti-inflammatory, and antioxidant effects. Additionally, aloe vera promotes wound healing. [37] Therefore, aloe vera is commonly used to treat oral lesions, periodontal diseases, and alveolar osteitis. [38] [39] [40]

There were also many misconceptions about the use of herbs in medicine. One of the most famous is the "Doctrine of Signatures," which claims that a plant's shape, smell, or texture serves as a “signature” indicating its use in treating certain diseases. Although this idea dates back to ancient times, one of its most prominent advocates was the Renaissance physician and philosopher Paracelsus. According to this theory, the root of cut leaf (toothwort) was believed to be effective against toothache because it resembles a human tooth. Celsus, meanwhile, believed that everything needed for healing exists in nature, and that science's challenge is to discover it. [41] [42]

The study of medicinal plants and their properties intensified during the Renaissance and subsequent periods. Many books on medicinal herbs were written and printed, describing well-known plants and recipes, while also introducing new plants from Asia and the New World. With the advancement of chemical methods in the early 19th century, alkaloids were isolated from sources like poppies, quinine, and pomegranates. Numerous bioactive compounds—including glycosides, tannins, saponins, essential oils, and vitamins—were discovered in medicinal plants, paving the way for the development of scientific pharmacy. [43]

5. Conclusions

Numerous scientific and clinical studies confirm the effectiveness of ancient herbal medicines. Many plants used in traditional remedies continue to be applied today in treating oral diseases. Modern phytotherapy employs techniques such as active compound extraction and dose standardization, whereas traditional methods relied on empirical knowledge. Today, many commercial oral care products combine traditional herbal ingredients with modern formulations, demonstrating how science and tradition can work together to improve oral health.

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9th DENTAL CONGRESS BOSNIA AND HERZEGOVINA WITH INTERNATIONAL PARTICIPATION
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ABSTRACTS OF INVITED LECTURES

MOGUĆNOSTI LIJEČENJA PACIJENATA OBOLJELIH OD TEŠKIH OBLIKA PARODONTITISA

Doc. dr. sc. Marija Roguljić
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SAŽETAK

Osobe oboljele od najtežih oblika parodontitsa (parodontitis stadija IV), osim što se suočavaju s problemom upale potpornih tkiva zuba, vrlo često se suočavaju i s problemom narušene funkcije usne šupljine, mastikacije, fonacije i estetike. Ova populacija pacijenata ima povećani rizik ne samo od gubitka pojedinih zubi, već i cijele denticije. Stoga, ovakvi slučajevi predstavljaju veliki izazov za terapeute jer traže pomno planiranje terapije i interdisciplinarni pristup. Terapija je često dugotrajna te zahtijeva visoku motiviranost i međusobno povjerenje između terapeuta i pacijenta.

Vođeni idejom dentalne medicine zasnovane na dokazima, kliničke smjernice za liječenja parodontitisa stadija IV predstavljaju veliku pomoć pri donošenju odluka u svakodnevnom kliničkom radu. Prema smjernicama, preporučeno je nekoliko terapijskih modaliteta za osobe oboljele od najtežih oblika parodontitisa. Uz potpornu parodontološku terapiju preporučuje se konzervativna, ortodontska, protetska i implantoprotetska terapija. U ovom predavanju bit će pokazano kako prema postavljenoj personaliziranoj dijagnozi parodontitisa napraviti interdisciplinarni terapijski plan u svrhu dugotrajnog očuvanja prirodne denticije. Kroz prikaze kliničkih slučajeva bit će predstavljene indikacije i terapijska rješenja preložena u kliničkim smjernicama. Predloženi terapijski pristup trebao bi smanjiti indikacije za ekstrakcije zubi te pridonijeti dugoročnoj stabilnosti i dobroj kvaliteti života kod osoba s teškim oblicima parodontitisa.

TREATMENT OPTIONS FOR PATIENTS WITH SEVERE FORMS OF PERIODONTITIS

Doc. Dr. Sc. Marija Roguljić
(Faculty of Medicine, University of Split, Croatia)

ABSTRACT

Patients suffering from the most severe forms of periodontitis (Stage IV periodontitis) not only face inflammation of the supporting tooth structures but also frequently experience compromised oral function, including mastication, phonation, and aesthetics. This group of patients is at an increased risk of losing not just individual teeth but potentially their entire dentition. As a result, these cases pose significant challenges for clinicians, requiring meticulous treatment planning and an interdisciplinary approach. Therapy is often prolonged, demanding a high level of motivation and mutual trust between the clinician and the patient.

Guided by the principles of evidence-based dentistry, clinical guidelines for treating Stage IV periodontitis provide valuable support in everyday clinical decision-making. According to these guidelines, several treatment modalities are recommended for patients with severe periodontitis. In addition to supportive periodontal therapy, conservative, orthodontic, prosthetic, and implant-prosthetic treatments are advised.

This lecture will demonstrate how to develop an interdisciplinary treatment plan based on a personalized periodontitis diagnosis to ensure the long-term preservation of natural dentition. Through clinical case presentations, indications and treatment solutions recommended in clinical guidelines will be discussed. The proposed therapeutic approach aims to reduce the need for tooth extractions and contribute to long-term stability and an improved quality of life for individuals with severe periodontitis.

PROTETSKI VOĐENA ORTODONCIJA: PERSONALIZIRANI DIGITALNI PRISTUP ESTETSKOJ I FUNKCIONALNOJ REHABILITACIJI

Prof. dr. Andreja Carek
(Stomatološki fakultet Sveučilišta u Zagrebu)

SAŽETAK

Ovo predavanje će istražiti multidisciplinarni pristup estetskoj i funkcionalnoj rehabilitaciji maksilarnih i mandibularnih zubnih lukova, naglašavajući sinergiju između ortodoncije i protetike. Poseban fokus bit će stavljen na ključne preprotetske ortodontske intervencije, uključujući ortodontsku ekstruziju, repoziciju zuba, korekciju malokluzije i zatvaranje dijasteme.

Predprotetski ortodontski tretman je ključna komponenta moderne minimalno invazivne i aditivne stomatologije, koja olakšava stvaranje estetskih i funkcionalnih rješenja uz očuvanje što je moguće više prirodne strukture zuba. Optimiziranjem pozicioniranja i nagiba susjednih i antagonističkih zuba, ortodontska priprema poboljšava predvidljivost i dugovječnost protetskih nadoknada.

Clear aligner terapija (CAT) pojavila se kao moćan alat u upravljanju protetskim slučajevima, omogućavajući kliničarima da planiraju ortodontske pokrete imajući na umu protetske rezultate. Ovo predavanje će predstaviti koncept protetski vođene ortodoncije (Prosthetically Guided Orthodontics, PGO), ilustrirajući njegovu primjenu kroz stvarne kliničke slučajeve koji integriraju digitalne i analogne tokove rada. Diskusija će naglasiti strukturirani sistem dizajniran da pojednostavi tretman multidisciplinarnih ortodontsko-protetskih slučajeva uz konformni pristup.

U savremenoj dentalnoj medicini efikasnost i predvidljivost su najvažniji. Ova prezentacija će pokazati kako digitalne i analogne metodologije prototipa, u kombinaciji s CAT, poboljšavaju preciznost i estetske rezultate u protetskoj rehabilitaciji.

PROSTHETICALLY GUIDED ORTHODONTICS: A PERSONALIZED DIGITAL APPROACH TO AESTHETIC AND FUNCTIONAL REHABILITATION

Prof.Dr. Andreja Carek
(School of Dental Medicine, University of Zagreb)

ABSTRACT

This lecture will explore a multidisciplinary approach to the aesthetic and functional rehabilitation of maxillary and mandibular dental arches, emphasizing the synergy between orthodontics and prosthodontics. Special focus will be placed on key pre-prosthetic orthodontic interventions, including orthodontic extrusion, tooth repositioning, malocclusion correction, and diastema closure.

Pre-prosthetic orthodontic treatment is a key component of modern minimally invasive and additive dentistry, facilitating the creation of aesthetic and functional solutions while preserving as much of the natural tooth structure as possible. By optimizing the positioning and inclination of adjacent and opposing teeth, orthodontic preparation enhances the predictability and longevity of prosthetic restorations.

Clear aligner therapy (CAT) has emerged as a powerful tool in managing prosthetic cases, enabling clinicians to plan orthodontic movements with prosthetic outcomes in mind. This lecture will introduce the concept of Prosthetically Guided Orthodontics (PGO), illustrating its application through real clinical cases that integrate both digital and analog workflows. The discussion will highlight a structured system designed to streamline the treatment of multidisciplinary orthodontic-prosthetic cases using a conformative approach.

In modern dental medicine, efficiency and predictability are paramount. This presentation will demonstrate how prototype digital and analog methodologies, combined with CAT, improve precision and aesthetic outcomes in prosthetic rehabilitation.

TRETMAN TEMPOROMANDIBULARNOG BOLA NEUROMODULATORIMA - BOTULINUM TOKSIN

Prof. dr. Aneta Mijoska
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SAŽETAK

Temporomandibularni poremećaj (TMD) opisuje miofascijalno stanje koje utječe na temporomandibularnog zgloba (TMZ) i okolne strukture. Prevalencija je veća u posljednjoj deceniji, pri čemu 25% stanovništva traži stručnu pomoć. Simptomi koji okružuju zglob mogu uključivati glavobolju, periaurikularni bol, bol u vratu, smanjenu ekskurziju čeljusti, zaključavanje vilice i zvuke u zglobu pri pokretu. Miofascijalni TMD je povezan s bolom od hiperfunkcionalnih mišića žvakanja što dovodi do kroničnog bolnog stanja. Najčešće zahvaćeni mišići su temporalis, maseter i lateralni pterigoidni mišići. Skoro uvijek su uključeni temporalni i žvačni mišići koji se obično manifestiraju kao direktan bol u mišićima. Zahvaćenost lateralnog pterigoida obično se manifestira kao bukalni bol, bočna devijacija vilice ili bruksizam.

Tradicionalni tretmani uključuju dijetu, mirovanje, okluzalne udlage, farmakoterapiju i dodatnu terapiju injekcijom botulinum toksina (BoNT) kod pacijenata koji pate od uporne boli koji ne postižu potpuni odgovor konzervativnim liječenjem. Danas se BoNT koristi za ublažavanje bolova u brojnim stanjima uključujući tenzijske glavobolje, migrenske glavobolje, post-herpetičku neuralgiju i miofascijalni TMD.

Može proći nekoliko sedmica za maksimalno olakšanje bola od BoNT-a. Efikasnost toksina je 12 sedmica, uz varijabilnost među pacijentima u pogledu optimalne učestalosti doziranja. Danas znamo da BoNT ne djeluje striktno periferno, već je uključen u neuromodulaciju na nivou centralnog nervnog sistema.

Može se zaključiti da neuromodulatori nude dokazani, neinvazivni tretman koji cilja na preaktivne mišiće vilice kako bi se smanjio bol, napetost i bruksizam. Važno je biti upoznat s anatomijom ciljanog područja, kao i djelovanjem i odobrenim metodama za najbolji ishod neuromodulacije u svakom tretmanu.

TREATMENT OF TEMPOROMANDIBULAR PAIN WITH NEUROMODULATORS – BOTULINUM TOXIN

Prof. Dr. Aneta Mijoska
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IABSTRACT

Temporomandibular disorder (TMD) describes a myofascial condition affecting the temporomandibular joint (TMJ) and surrounding structures. Its prevalence has increased over the past decade, with 25% of the population seeking professional care. Symptoms related to the joint may include headaches, periauricular pain, neck pain, reduced jaw excursion, jaw locking, and joint sounds during movement. Myofascial TMD is associated with pain caused by hyperfunctional masticatory muscles, leading to chronic pain conditions. The most commonly affected muscles include the temporalis, masseter, and lateral pterygoid muscles. The involvement of the temporal and masticatory muscles typically manifests as direct muscle pain, while lateral pterygoid involvement is often associated with buccal pain, lateral jaw deviation, or bruxism.

Traditional treatments include dietary modifications, rest, occlusal splints, pharmacotherapy, and additional botulinum toxin (BoNT) injections for patients experiencing persistent pain who do not achieve full relief with conservative management. Today, BoNT is used to alleviate pain in various conditions, including tension headaches, migraines, post-herpetic neuralgia, and myofascial TMD.

It may take several weeks to achieve maximum pain relief from BoNT, with its efficacy lasting approximately 12 weeks, though optimal dosing frequency varies among patients. Current research indicates that BoNT does not act strictly peripherally but is also involved in neuromodulation at the central nervous system level.

In conclusion, neuromodulators provide a proven, non-invasive treatment targeting overactive jaw muscles to reduce pain, tension, and bruxism. A thorough understanding of the targeted anatomical structures, as well as the mechanisms of action and approved techniques, is essential for achieving the best neuromodulation outcomes in each treatment.

PROFILAKTIČKA PRIMJENA I TOKSIKOLOŠKI ZNAČAJ FLUORIDA

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SAŽETAK

Programi javnog zdravlja nastoje da obezbijede maksimalan učinak u očuvanju oralnog zdravlja primjenom fluorida uz istovremeni napor da se umanje štetni efekti prekomjernog unosa fluorida. Upotreba fluorida u vodi, hrani, suplementima, može značajnije da popravi kvalitet zuba i poveća njihovu otpornost prema kariogenim noksama. Istraživanja koja datiraju još od tridesetih godina prošlog vijeka, ukazala su da postoji direktna zavisnost između prisustva fluorida u vodi za piće i smanjene rasprostranjenosti karijesa. Konzervativnom terapijom ovog oboljenja nisu postignuti zadovoljavajući rezultati, te su brojna istraživanja usmjeravana da se pronađu načini i sredstva da se ovo oboljenje spriječi, između ostalog i stvaranjem otpornijeg zubnog tkiva primjenom fluorida. Ukoliko se u početnoj fazi demineralizacije promijene uslovi sredine (ukloni dentalni biofilm, koriguje ishrana, koriste fluoridi), favorizuju se procesi remineralizacije, uspostavlja biološka ravnoteža na površini cakline i onemogućava stvaranje karijesne šupljine stvaranjem fluoroapatita. Istraživanja ukazuju da je kariostatički posteruptivni efekat fluorida zasnovan na njihovoj lokalnoj primjeni. Ovaj efekat može da bude snažniji ukoliko se kombinuje sa dobrom oralnom higijenom uz upotrebu pasti za zube i ostalih suplemenata sa fluoridima. Sa druge strane, poznato je da prekomjerna upotreba fluorida sa sobom nosi i štetne efekte kod hronične ekspozicije u lokalitetima sa visokim nivoom fluorida u vodi za piće – endemska fluorotična područja u smislu nastanka fluoroze zuba i skeletene fluoroze tokom kritičnog perioda amelogeneze mliječnih i stalnih zuba u periodu od rođenja do osme godine života sa izuzetkom trećih stalnih molara kod kojih se sazrijevanje cakline završava između 12 i 16 godine života. Mehanizmi toksičnosti obuhvataju uticaj fluorida na aktivnost brojnih enzimskih sistema poput kinaza, enolaza, mutaza, fosfataza i hidrolaza, kompeticiju sa jonima Mg2+ ili Ca2+, inhibiciju transmembranskog protonskog gradijenta dejstvom na transportne pumpe, aktivaciju signalnih molekula, oksidativni stres i sl. Toksični efekti fluorida mogu biti posredovani mehanizmima koji uključuju i neuroendokrini sistem, što ih svrstava u endokrine ometače ili endokrine modulatore – molekule koje imitiraju, moduliraju, blokiraju i intereaguju sa hormonima endokrinog sistema uzrokujući poremećaj nivoa hormona u krvi. Studije ukazuju da fluoridi povećavaju nivo serumskog tironina, smanjuju nivo tiroksina i TSH. U animalnim studijama pokazan je uticaj na smanjenje nivoa testosterona. Istovremeno, epidemiološka istraživanja pokazala su da se prevalenca fluoroze zuba kod djece posljednjih godina povećala u razvijenim zemljama svijeta, ne samo u lokalitetima sa visokim, već istovremeno i u lokalitetima sa niskim prirodnim sadržajem fluorida zbog rasprostranjene upotrebe suplemenata sa fluoridima.

Ipak, kada se klinički dijagnostikuje fluoroza zuba, najčešće predstavlja samo blagi estetski problem, koji nije od zdravstvenog značaja u odnosu na benefite koje fluoridi prema dozi koju propisuje dječiji stomatolog pružaju u prevenciji i profilaksi karijesa, naročito u našoj zemlji gdje su vode za piće u centralnim vodovodima siromašne fluoridima, te ne postoji opasnost od prekomjernog unosa fluorida. Profilaktičke doze fluorida definiše Evropska akademija za dječiju stomatologiju (EAPD), na osnovu visokog nivoa naučnog dokaza po kome je upotreba fluorida u profilaksi karijesa podjednako sigurna, odnosno bezbjedna i visoko efektivna profilaktička mjera. EAPD je posljednji protokol za primjenu fluorida donijela 2019. godine. Svjetska zdravstvena organizacija (SZO) upotrebu fluorida i dalje ubraja u deset najvećih mjera preventivne medicine.

PROPHYLACTIC USE AND TOXICOLOGICAL SIGNIFICANCE OF FLUORIDE

Prof. Dr. Zoran Mandinić
(Faculty of Dentistry, University of Belgrade, Serbia)

ABSTRACT

Public health programs aim to maximize the benefits of fluoride in preserving oral health while simultaneously minimizing the harmful effects of excessive fluoride intake. The use of fluoride in water, food, and supplements significantly improves tooth quality and enhances resistance to cariogenic factors. Research dating back to the 1930s has demonstrated a direct correlation between fluoride presence in drinking water and reduced caries prevalence. Since conservative treatment of dental caries has not yielded entirely satisfactory results, extensive research has focused on preventive measures, including strengthening dental tissues through fluoride application.

In the early stages of demineralization, modifying environmental conditions (removing dental biofilm, adjusting diet, and using fluoride) promotes remineralization processes, restores biological balance on the enamel surface, and prevents cavity formation by creating fluorapatite. Studies indicate that the caries-preventive effect of fluoride is primarily based on its topical application. This effect is further enhanced when combined with good oral hygiene and fluoride-containing toothpaste or supplements.

On the other hand, excessive fluoride intake carries potential risks, particularly in areas with high natural fluoride levels in drinking water—endemic fluorosis regions. Chronic exposure in these areas can lead to dental and skeletal fluorosis, especially during the critical period of amelogenesis from birth to eight years of age (except for third molars, whose enamel maturation is completed between ages 12 and 16). The mechanisms of fluoride toxicity involve its effects on various enzymatic systems, such as kinases, enolases, mutases, phosphatases, and hydrolases. Fluoride competes with Mg^{2+} and Ca^{2+} ions, disrupts transmembrane proton gradients by affecting transport pumps, activates signaling molecules, induces oxidative stress, and more.

Toxic effects of fluoride may also be mediated through the neuroendocrine system, classifying it as an endocrine disruptor or modulator. These molecules mimic, modulate, or block hormones of the endocrine system, causing hormonal imbalances. Studies indicate that fluoride increases serum triiodothyronine (T3) levels while reducing thyroxine (T4) and thyroid-stimulating hormone (TSH) levels. In animal studies, fluoride exposure has been linked to decreased testosterone levels. Epidemiological research has also shown a rising prevalence of dental fluorosis among children in developed countries, not only in high-fluoride areas but also in regions with low natural fluoride levels due to widespread fluoride supplement use.

However, when diagnosed clinically, dental fluorosis is typically a mild aesthetic concern rather than a significant health issue, especially when compared to the substantial caries-preventive benefits of fluoride within the recommended dosage. In countries where drinking water from central supply systems contains low fluoride levels, such as Serbia, there is no risk of excessive fluoride intake. The European Academy of Pediatric Dentistry (EAPD) defines prophylactic fluoride dosages based on strong scientific evidence supporting its safety and efficacy in caries prevention. The EAPD issued its latest fluoride application protocol in 2019. The World Health Organization (WHO) continues to classify fluoride use among the top ten preventive measures in modern medicine.

STRUKA I NAUKA U STOMATOLOŠKOJ PRAKSI (DENTALNOJ MEDICINI) U SLUŽBI OSMIJEHA

Prof. dr. Adem Salihagić

(Univerzitet u Bihaću, PZU MedicoOral-AS, Bihać, BiH)

SAŽETAK

Cilj predavanja je prikazati transformaciju zubarstva od primitivnih metoda, preko zubarskog zanata do moderne dentalne medicine današnjeg vremena. Kako je razvoj te discipline uticao na promjenu kvalitete života humane populacije, te ujedno na razvoj zdravstvene zaštite u području zubi i usta. Danas više nego ikada, nalazimo se na prekretnici inovacija i tradicije, sublimirajući najbolje iz oba svijeta u oblasti dentalne medicine. Struka i nauka u stomatološkoj praksi su neraskidivo vezane komponente koje zajedno unapređuju oralno zdravlje pacijenata. Kombinacija stečenog znanja, praktičnih vještina i dostignuća omogućava doktorima dentalne medicine da pružaju kvalitetnu, sigurnu i savremenu zdravstvenu brigu o oralnom zdravlju naših pacijenata.

Uloga struke: struka se bavi pročavanjem, prevencijom, dijagnostikom i liječenjem bolesti, poremećaja i stanja usne šupljine, zubi, desni, čeljusti i okolnih tkiva. Uključuje teorijsko znanja, praktične vještine i etičke standarde za pružanja kvalitetne oralne zdravstvene njege. Struka uz pomoć kliničkih vještina omogućuje timu doktora dentalne medicine (doktor dentalne medicine, dentalni tehničar, dentalni asistent i higijeničar) edukaciju pacijenata o važnosti oralne higijene te prevenciji oboljenja. Također omogućuje korištenje stečenog znanja za vrijeme obrazovanja (predavanja, literature i elektronskih medija i sl.) i praktične obuke kako bi dijagnosticirali i liječili bolesti zubi, sluznica i patološke promjene u oralnoj šupljini.

Uloga nauke: nauka je ključna za razvoj inovativnih metoda, materijala i tehnologija koje poboljšavaju dijagnostiku, liječenje i prevenciju oralnih bolesti. Naučna otkrića omogućuju timu doktoru dentalne medicine, da budu u toku s najnovijim trendovima i tehnikama;

Preventiva: naučna istraživanja pomažu u razvoju preventivnih mjera poput vodica za ispiranje usta, formulacija pasti za zube, fluoridacije vode, edukacije o oralnoj higijeni, ranog otkrivanja oboljenja, te o povezanosti oralnog zdravlja i općeg zdravlja.

Sinergija struke i nauke: omogućuje stalni razvoj dentalne medicine i pruža pacijentima najbolje moguće rezultate u liječenju i prevenciji oralnih bolesti;

Individualni pristup: naučni podaci se primjenjuju u praksi s ciljem planiranja terapije da bude prilagođena potrebama svakog pacijenta ponaosob (povećava uspješnost terapije).

Podrška zdravlju zajednice uz integraciju nauke i struke koje šire svijest o značaju oralnog zdravlja na nivou populacije;

Interdisciplinarna saradnja-dentalnu medicinu uvijek prate: opća medicina sa svojim postdisciplinama (granama), hemija, biologija te druge naučne oblasti s ciljem unapređenja dijagnostičkih i terapijskih pristupa kod naših pacijenata.

PROFESSION AND SCIENCE IN DENTAL PRACTICE (DENTAL MEDICINE) IN THE SERVICE OF SMILE

Prof. Dr. Adem Salihagić

(University of Bihać, PZU MedicoOral-AS, Bihać, BiH)

ABSTRACT

The aim of this lecture is to present the transformation of dentistry from primitive methods, through the craft of dentistry, to modern dental medicine of today. It explores how the development of this discipline has influenced the quality of life of the human population and, at the same time, contributed to advancements in dental and oral healthcare. Today, more than ever, we stand at the crossroads of innovation and tradition, merging the best of both worlds in the field of dental medicine. The profession and science in dental practice are inseparably linked components that together enhance patients' oral health. The combination of acquired knowledge, practical skills, and scientific achievements enables dental practitioners to provide high-quality, safe, and modern oral healthcare for their patients.

The Role of the Profession: The profession is dedicated to studying, preventing, diagnosing, and treating diseases, disorders, and conditions of the oral cavity, teeth, gums, jaws, and surrounding tissues. It encompasses theoretical knowledge, practical skills, and ethical standards to ensure high-quality oral healthcare. Through clinical expertise, the dental medicine team (dentists, dental technicians, dental assistants, and hygienists) educates patients about the importance of oral hygiene and disease prevention. Furthermore, it allows the application of acquired knowledge from education (lectures, literature, electronic media, etc.) and practical training to diagnose and treat dental diseases, mucosal conditions, and pathological changes in the oral cavity.

The Role of Science: Science plays a key role in developing innovative methods, materials, and technologies that improve the diagnosis, treatment, and prevention of oral diseases. Scientific discoveries enable dental professionals to stay updated with the latest trends and techniques.

Prevention: Scientific research aids in developing preventive measures such as mouth rinses, toothpaste formulations, water fluoridation, oral hygiene education, early disease detection, and understanding the connection between oral and general health.

Synergy of Profession and Science: This synergy fosters the continuous advancement of dental medicine, providing patients with the best possible outcomes in treatment and disease prevention.

Individualized Approach: Scientific data is applied in practice to tailor therapy according to each patient's needs, increasing treatment success.

Community Health Support: The integration of science and the profession raises awareness of the importance of oral health at the population level.

Interdisciplinary Collaboration: Dental medicine is closely linked with general medicine and its sub-disciplines, as well as with chemistry, biology, and other scientific fields, aiming to improve diagnostic and therapeutic approaches for patients.

BUDUĆNOST EKSTRAKCIJE U ORTODONCIJI

Prof. dr. Alisa Tiro
(Stomatološki fakultet sa stomatološkim kliničkim centrom Univerziteta u Sarajevu, Bosna i Hercegovina)

SAŽETAK

U posljednjih 30 godina primjetan je pad ekstrakcija u ortodontskom liječenju. Razlozi su višestruki: od sve veće popularnosti ranog tretmana, pa do upotrebe mini implantata za kontrolu uporišta (TADs). Evidentno je da se savremena ortodoncija okreće ka neekstrakcionom pristupu liječenja malokluzija. Pitanje je da li imamo dokaze koji podržavaju smijer u kojem se krećemo? Da li je tretman bez ekstrakcije uvijek bolji od ekstrakcije, stabilniji i zdraviji za parodontalna tkiva, te da li poboljšava profil i izgled lica, ili ga barem ne narušava? Odgovore na ova pitanja može ponuditi jedino struka i nauka, a nikako marketinške tvrdnje pojedinih brendova bravica, koji promovišu nedokazane koncepte razvoja luka preko bioloških limita. Kretati se isključivo u pravcu neenkstrakcionog tretmana, znači svjesno ignorisati nestabilnost tretmana nakon širenja zubnih lukova. Za najbolje ishode liječenja, nekim pacijentima je potreban tretman bez ekstrakcije, nekima je potrebna ekstrakcija.

Odluka o ekstrakcionom ili neekstrakciono tretrmanu trebala bi biti zasnovana na relevantnim naučnim procjenama ishoda liječenja. Zato je važno pratiti da li najnovija naučna saznanja podržavaju ili odbacuju ekstrakcionu terapiju. U savremenom dobu u kojem je sve postalo moguće, stomatologija raspolaže najsofisticiranijim uređajima, pametnim materijalima, tehnološkim inovacijama. Postavlja se nekoliko sasvim logičnih pitanja: Zašto danas uopšte ekstrahiramo u ortodonciji? Zašto se kod svih pacijenata jednostavno ne može širiti? Šta je sa stabilnošću postignutih rezultata tretmana? Da li ekstrakcija vodi ka poremećajima disanja tokom sna? Odgovoriti na ova pitanja znači istovremeno i saznati da li najnovija naučna saznanja podržavaju ili odbacuju ekstrakcionu terapiju u ortodonciji?

THE FUTURE OF EXTRACTIONS IN ORTHODONTICS

Prof.Dr. Alisa Tiro
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ABSTRACT

Over the past 30 years, there has been a noticeable decline in extractions in orthodontic treatment. The reasons for this trend are multifaceted, including the increasing popularity of early treatment and the use of temporary anchorage devices (TADs) for anchorage control. It is evident that modern orthodontics is shifting toward a non-extraction approach to treating malocclusions. However, the question remains: Do we have scientific evidence supporting this direction? Is non-extraction treatment always superior to extraction therapy in terms of stability, periodontal health, and facial aesthetics? Or does it, at the very least, avoid compromising these factors?

The answers to these questions should come from scientific research rather than marketing claims from certain bracket manufacturers promoting unproven concepts of arch expansion beyond biological limits. Exclusively pursuing non-extraction treatment means deliberately ignoring the potential instability that follows excessive arch expansion. For optimal treatment outcomes, some patients require non-extraction therapy, while others benefit from extractions.

The decision between extraction and non-extraction treatment should be based on rigorous scientific assessment of treatment outcomes. Therefore, it is crucial to examine whether the latest research supports or refutes extraction therapy. In today's era of advanced dental technology, smart materials, and innovative techniques, several fundamental questions arise: Why do we still extract teeth in orthodontics? Why can't arch expansion be applied universally to all patients? How does extraction impact long-term treatment stability? Does extraction contribute to sleep-disordered breathing? Answering these questions is key to determining whether the most recent scientific findings support or challenge extraction therapy in orthodontics?

IZAZOVI I OGRANIČENJA U PEDODONCIJI - IDEMO LI NAPRIJED ILI NAZAD

Prof. dr. Duška Blagojević
(Medicinski fakultet Univerziteta u Novom Sadu, Srbija)

SAŽETAK

U pedodonciji fokus je oduvijek bio na prevenciji i terapiji karijesa kod djece, i zaista, poslije decenija izučavanja etiologije karijesa, terapijskih mogućnosti, razvoja savremenih biokompatibilnih materijala, primjene preventivno-profilaktičkih mjera, čini se da je sve rečeno i sve jasno. Karijes, kao najrasprostranjenije oboljenje dječijeg uzrasta je stavljen pod kontrolu, o njemu se sve zna.

Ipak, sve više djece i dalje imaju karijes ranog djetinjstva, prva posjeta kod stomatologa je najčešće već u podmakloj fazi karijesa na mliječnim zubima, gdje su terapijske mogućnosti ograničene a pojava subjektivnih tegoba i komplikacija prisutna. U takvim situacijama, roditelji imaju visoka očekivanja od stomatologa, očekujući da ćemo uspjeti da uspostavimo saradnju sa djetetom, da postoje terapijske mogućnosti da se taj zub sanira, da će dijete bezpogovorno prihvatiti sve naše zahvate, a da oni, kao roditelji, nemaju nikakvu odgovornost za takvu situaciju.

U svakodnevnom radu, sve više se susrećemo sa problemom u komunikaciji kako sa djecom, tako i sa roditeljima, sa jedne strane, a sa druge strane sa prihvatanjem stomatološkog tretmana posebno kada su urgentna stanja i pružanje prve pomoći pacijentima u pitanju. U radu će biti prikazane mogućnosti primene bihejvioralnih tehnika u svakodnevnim kliničkim situacijama, od najnovijih profilaktičkih mjera do lečenja dentogenih infekcija.

CHALLENGES AND LIMITATIONS IN PEDIATRIC DENTISTRY – ARE WE MOVING FORWARD OR BACKWARD?

Prof. Dr. Duška Blagojević
(Faculty of Medicine, University of Novi Sad, Serbia)

ABSTRACT

Pediatric dentistry has always focused on the prevention and treatment of dental caries in children. After decades of studying caries etiology, therapeutic possibilities, the development of modern biocompatible materials, and the implementation of preventive and prophylactic measures, it seems that everything has been said and understood. Caries, the most widespread childhood disease, appears to be under control, with extensive knowledge available about its prevention and management.

However, early childhood caries remains prevalent, with many children still affected. The first dental visit often occurs when caries is already in an advanced stage on primary teeth, limiting therapeutic options and increasing the likelihood of subjective discomfort and complications. In such cases, parents tend to have high expectations of dentists, assuming that we will be able to establish cooperation with the child, offer effective treatment solutions, and that the child will accept all procedures without resistance—while they, as parents, bear no responsibility for the situation.

In daily practice, pediatric dentists increasingly face communication challenges, both with children and their parents. Additionally, there are difficulties in obtaining acceptance of dental treatment, particularly in urgent cases that require immediate intervention. This presentation will explore the application of behavioral techniques in everyday clinical scenarios, from the latest prophylactic measures to the management of dentogenic infections.

ZNAČAJ OBRTNOG MOMENTA I BRZINE U OPTIMIZACIJI TRETMANA KORIJENSKOG KANALA

Prof. dr. Irmina Tahmiščija
(Stomatološki fakultet sa stomatološkim kliničkim centrom Univerziteta u Sarajevu, Bosna i Hercegovina)

SAŽETAK

Obrtni moment (engl. torque) i brzina su najznačajniji parametri pri mehaničkoj obradi korijenskih kanala. Raznolikost endodontskih instrumentata na tržištu i uslovi unutar samog korijenskog kanala diktiraju potrebu za prilagodbom ovih parametara.

Da bi se postigla adekvatna efikasnost rezanja dentina, uz smanjenje rizika od frakture instrumenta, transportacije ili perforacije zida korijenskog kanala potrebno je izbalansirati brzinu i obrtni moment.

U predavanju će biti prezentirani značaj obrtnog momenta i brzine u endodonciji, obuhvatajući njihovo značenje, tehnike mjerenja, implikacije na instrumentaciju i klinički ishod. Posebno će se evaluirati faktori koji utiču na generiranje obrtnog momenta tokom endodontskog tretmana.

SIGNIFICANCE OF TORQUE AND SPEED IN OPTIMIZING ROOT CANAL TREATMENT

Prof. Dr. Irmina Tahmiščija
(Stomatološki fakultet sa stomatološkim kliničkim centrom Univerziteta u Sarajevu, Bosna i Hercegovina)

ABSTRACT

Torque and speed are the most critical parameters in the mechanical preparation of root canals. The wide variety of endodontic instruments available on the market and the specific conditions within the root canal necessitate the adjustment of these parameters for optimal treatment outcomes.

Achieving an optimal balance between cutting efficiency, instrument safety, and procedural control is essential to minimize the risks of instrument fracture, transportation, or perforation of the root canal walls. Proper calibration of torque and speed enhances cutting efficiency while reducing the likelihood of procedural errors.

This lecture will explore the importance of torque and speed in endodontics, covering their definitions, measurement techniques, and impact on instrumentation and clinical outcomes. Special emphasis will be placed on the factors influencing torque generation during root canal treatment, providing insights into how to optimize these parameters for improved procedural efficiency and patient safety

ESTETSKA STOMATOLOGIJA

(predstavljanje necikličnog studijskog programa)

Prof. dr. Lejla Kazazić
(Stomatološki fakultet sa stomatološkim kliničkim centrom Univerziteta u Sarajevu, Bosna i Hercegovina)

SAŽETAK

Kroz prezentaciju će se predstaviti novi neciklični studij pod naslovom “Estetska stomatologija” koji će se izvoditi na Stomatološkom fakultetu sa stomatološkim kliničkim centrom. U prezentaciji će se opisati ciljevi studija, uslovi za upis na studijski program kao i trajanje studijskog programa, načini evaluacije stečenog znanja i cijena programa. Naime Stomatološki fakultet se odlučio za pokretanje ovog studijskog programa jer u današnje vrijeme sve veći broj pacijenata traži usluge iz domena estetske stomatologije. Ova vrsta edukacije omogućava polaznicima osnovna saznanja iz teorije i praktično ih osposobljava za planiranje i provedbu estetske rehabilitacije.

Polaznici će savladati teoretska i praktična znanja različitih estetskih zahvata (prilagođeno njihovim nivoima znanja iz domena dentalne medicine), te će se upoznati i praktično savladati dermalna punila na bazi hijaluronske kiseline i botulinum toksina, postupak anestezije za ove zahvate, injekcione tehnike – ubrizgavanje po slojevima kože (oštra igla, tupa kanila), tehnike estetske korekcije usana (hidratacija i revitalizacija), perioralne bore i volumen usana, primjena kod gummy smile,bora u predjelu gornje i donje usne, bruksizma, morionetskih bora, kaldrmaste brade. Doktori dentalne medicine / stomatolozi imaju znanje o anatomskim strukturama lica i iskustvo u posmatranju estetike lica, jer svakodnevno rade u tim regijama stomatološke zahvate. Ovo znanje će ih činiti idealnim stručnjacima za sigurno i precizno izvođenje anti-age tretmana u sklopu stomatološkog zahvata.

AESTHETIC DENTISTRY

(Presentation of a Non-Cyclical Study Program)

Prof. Dr. Lejla Kazazić
(Faculty of Dentistry with Dental Clinical Center, University of Sarajevo, Bosnia and Herzegovina)

ABSTRACT

This presentation will introduce the new non-cyclical study program titled "Aesthetic Dentistry", which will be offered at the Faculty of Dentistry with the Dental Clinical Center. The program's goals, admission requirements, duration, methods of knowledge evaluation, and tuition fees will be discussed.

The decision to establish this program stems from the increasing demand for aesthetic dentistry services among patients. This specialized education will provide participants with foundational theoretical knowledge while equipping them with practical skills for planning and performing aesthetic rehabilitation.

Participants will gain both theoretical and hands-on experience in various aesthetic procedures, tailored to their level of expertise in dental medicine. The program will cover the application of hyaluronic acid-based dermal fillers and botulinum toxin, anesthesia techniques for these procedures, and injection techniques, including sharp-needle and blunt-cannula layering methods.

Additionally, attendees will master techniques for aesthetic lip correction, including hydration, revitalization, volume enhancement, and treatment of perioral wrinkles. The program will also address gummy smile correction, wrinkle treatment around the upper and lower lips, bruxism therapy, marionette lines, and cobblestone chin correction.

Dentists possess an in-depth understanding of facial anatomical structures and are experienced in evaluating facial aesthetics due to their daily work in these regions. This knowledge positions them as ideal professionals for safely and precisely performing anti-aging treatments within the scope of dental procedures.

UPRAVLJANJE JATROGENIM GREŠKAMA TOKOM ENDODONTSKOG TRETMANA

Prof. dr. Paula Perlea
(Stomatološki fakultet Univerziteta Carol Davila za medicinu i farmaciju u Bukureštu, Rumunija)

SAŽETAK

Greške u pripremi pristupnog kaviteta, u merenju ili preciznom održavanju radne dužine, u čišćenju i oblikovanju sistema kanala korijena, propušteni kanali, perforacije, formiranje ivice, necentrirane preparacije, nekontinuirani ili neprogresivni taper, apikalni transport, separacija instrumenata, nedostatak dezinfekcije, greške u punjenju kanala korijena, greške u planiranju post endo tretmana su glavni razlog lošeg ishoda endodontskog tretmana.

Tehnološki napredak endodontske opreme i materijala, kao što su dentalni operativni mikroskop, novi rotirajući Ni-Ti instrumenti od termički obrađenih legura, CBCT, ultrazvuk, ali i biokeramički materijali, omogućavaju konzervativne retretmane čak i u teškim slučajevima.

MANAGING IATROGENIC ERRORS DURING ENDODONTIC TREATMENT

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ABSTRACT

Errors in access cavity preparation, inaccurate working length measurement or maintenance, inadequate cleaning and shaping of the root canal system, missed canals, perforations, ledge formation, non-centered preparations, discontinuous or non-progressive taper, apical transportation, instrument separation, insufficient disinfection, errors in root canal filling, and mistakes in post-endodontic treatment planning are the primary causes of endodontic treatment failure.

Technological advancements in endodontic equipment and materials—such as the dental operating microscope, new thermally treated Ni-Ti rotary instruments, CBCT, ultrasound, and bioceramic materials—enable conservative retreatment even in complex cases.

PUŠENJE KAO FAKTOR RIZIKA PARODONTITISA

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SAŽETAK

Parodontitis je bolest potpornih struktura zuba, nastaje kao složena interakcija između specifičnih mikroorganizama i imunološkog odgovora domaćina. Prema aktualnoj klasifikaciji parodontitis je dodatno okarakteriziran stadijima i razredima. U skladu s tim uspostavljene su preporuke za liječenje parodontitisa – kliničke smjernice utemeljene na dokazima. Faktori rizika parodontitisa su pušenje i dijabetes, djeluju na progresiju bolesti i imaju utjecaj ishode liječenja. Kod pušača dolazi do promjene subgingivalne mikroflore, imunog odgovora i vaskularne funkcije. Veliki broj znanstvenih istraživanja utvrdio je da u usporedbi pušača i nepušača koji boluju od parodontitisa pušači imaju: manje izražen gingivitis i manje krvarenja pri sondiranju, veće dubine sondiranja, veći gubitak pričvstka i alveolarne kosti, te više zuba sa zahvaćenim furkacijama što je u skladu sa prezentiranim kliničkim slučajevima. Tijekom potpornih terapija potrebna je posebna pozornost i motivacija pacijenta za prestanak pušenja s obzirom da se kod pacijenata koji su prestali pušiti primjećuje usporena progresija gubitka alveolarne kosti i smanjenje dubine sondiranja.

SMOKING AS A RISK FACTOR FOR PERIODONTITIS

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ABSTRACT

Periodontitis is a disease affecting the supporting structures of the teeth, arising from a complex interaction between specific microorganisms and the host's immune response. According to the current classification, periodontitis is further characterized by stages and grades. Based on this, evidence-based clinical guidelines for the treatment of periodontitis have been established.

Smoking and diabetes are key risk factors for periodontitis, influencing disease progression and treatment outcomes. In smokers, alterations occur in the subgingival microflora, immune response, and vascular function. Numerous scientific studies have demonstrated that, compared to non-smokers with periodontitis, smokers exhibit: less pronounced gingivitis and reduced bleeding on probing, increased probing depths, greater attachment and alveolar bone loss, and a higher number of teeth with furcation involvement, which aligns with presented clinical cases.

During supportive therapy, special attention and motivation for smoking cessation are crucial. Studies show that patients who quit smoking experience slower alveolar bone loss progression and a reduction in probing depth.

OBLAST STOMATOLOGIJE: DENTALNA PATOLOGIJA

UČESTALOST CRNIH HROMOGENIH DISKOLORACIJA BAKTERIJSKOG PORIJEKLA U POPULACIJI BOSNE I HERCEGOVINE

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SAŽETAK

Uvod: Crne hromogene diskoloracije zuba (BS) ubrajaju se u vanjska površinska obojenja zuba koje nastaju kao posljedica djelovanja specifičnih hromatogenih bakterija. Zastupljene su u mliječnoj i u stalnoj denticiji, rijetko samo na jednom zubu, sa učestalošću između 2-20%. Diskoloracije su lokalizirane na caklini u cervikalnoj trećini zuba, prateći rub gingive, u vidu konfluentnih tačaka koje se spajaju u tamne pigmentirane linije. Čvrsto su pričvršćene za zub, i teško ih je ukloniti konvencionalnom četkicom i pastom za zube.

Cilj ovog istraživanja bio je utvrditi zastupljenost crnih hromogenih diskoloracija na zubima u populaciji Bosne i Hercegovine.

Materijal i metode: U provedenom istraživanju slučajnim odabirom bilo je obuhvaćeno 200 pacijenata oba pola, prosječne starosti 25 godina. Kliničkim pregledom izvršena je registracija prevalence BS, te gradacija diskoloracija prema indexu Shourie na tri stepena (BS I, BS II, BS III). Statistička analiza obavljena je pomoću softverskog programa „SPSS Statistics 22.0“, na nivou značajnosti p<0,05.

Rezultati: Diskoloracije su bile prisutne kod 45 (22,5 %) ispitanika i to BS I (13; 6.5%) i BS II (32; 16.0%). Diskoloracije BS I zahvatale su prosječno 16,08 zuba, statistički više kod ispitanica (p=0,026). Nasuprot tome, BS II je zahvaćeno prosječno 6,63 zuba, više kod ispitanika (p=0,003).

Zaključak: Naše istraživanje je pokazalo visoku prevalencu (22,5%) crnih hromogenih diskoloracija u mladoj populaciji Bosne i Hercegovine. Nisu utvrđene diskoloracije trećeg stepena.

Ključne riječi: bakterija, crne pigmentacije, crne mrlje, diskoloracija, estetika.

FIELD OF DENTISTRY: DENTAL PATHOLOGY

PREVALENCE OF BLACK CHROMOGENIC DISCOLORATIONS OF BACTERIAL GENESIS IN THE POPULATION OF BOSNIA AND HERZEGOVINA

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ABSTRACT

Introduction: Black chromogenic tooth discoloration (BS) is an external superficial discoloration of the teeth that occurs as a result of the action of specific chromatogenic bacteria. Their frequency is between 2-20% and they occur in both dentition types. Discoloration is localized on the enamel in the cervical third of the tooth, following the edge of the gingiva, in the form of confluent points that merge into dark pigmented lines. They are firmly attached to the tooth and difficult to remove with a toothbrush and toothpaste.

The aim of this study was to determine the prevalence of BS in the teeth of Bosnia and Herzegovina populations.

Materials and Methods: This study included 200 patients of both sexes. The average age of the participants was 25 years and they were randomly selected. Clinical examination was performed to determine the prevalence of BS and gradation of discolorations according to the Shourie index to three degrees (BS I, BS II, and BS III). Statistical analysis was performed using the software program "SPSS Statistics 22.0", with a significance level of p<0.05.

Results: Discoloration was present in 45 patients (22.5%), BS I in 13 (6.5%), and BS II in 32 (16.0%). BS I discoloration affected an average of 16.08 teeth, statistically more in females (p=0.026). However, BS II affected an average of 6.63 teeth, significantly more in the males (p=0.003).

Conclusion: Our study showed a high prevalence (22.5%) of BS in young populations of Bosnia and Herzegovina. No third-degree discoloration was detected.

Keywords: bacteria, black pigmentation, black spots, discoloration, aesthetics.

OBLAST STOMATOLOGIJE: DJEČJA STOMATOLOGIJA

ULOGA EDUKACIJE RODITELJA I DJECE PREDŠKOLSKE DOBI U ODRŽAVANJU ORALNE HIGIJENE

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SAŽETAK

Oralno zdravlje djece predškolske dobi ključno je za njihov cjelokupni razvoj, a rane navike u održavanju oralne higijene značajno utiču na dugoročno zdravlje usne šupljine. Edukacija roditelja i djece o pravilnom održavanju oralne higijene igra presudnu ulogu u prevenciji karijesa i drugih dentalnih oboljenja.

Cilj istraživanja bio je ispitati ulogu i edukaciju roditelja i djece u održavanju oralne higijene.

U istraživanju je učestvovalo 52 djece iz 2 sarajevska vrtića (uzrast 3-6 godina) i njihovi roditelji. Najprije, online anketa je sprovedena u svrhu procjene početnog znanja i navika roditelja i djece te stavova i prepreka vezanih za oralnu higijenu, a potom su obavljeni pregledi djece u vrtićima tokom kojih su djeci postavljena pitanja vezana za navike oralne higijene. Također je određen kep indeks i procjenjen nivo održavanja oralne higijene. Nakon pregleda djece u vrtićima, roditeljima je poslan online edukativni materijal. Zatim je ponovljen stomatološki pregled u vrtićima gdje se konačno ispitao nivo održavanja oralne higijene, a roditeljima je ponovo sprovedena online anketa u svrhu procjene nivoa znanja i navika nakon odgledanog edukativnog videa.

Nakon pregleda ustanovljeno da kod ispitanika kep indeks iznosi 5,46. Na pitanje ko nadzire ili pomaže djetetu u pranju zuba, 53,6% roditelja je odgovorilo da pomaže ili nadzire povremeno, dok su ostali odgovorili da rijetko ili nikada ne nadziru svoje dijete 46,4%. Pomoću ankete utvrđeno je koji su glavni izazovi u održavanju redovne oralne higijene kod djece. 47,8% roditelja je odgovorilo da je to otpor djeteta, 27,5% nedostatak vremena, 11,6% nedovoljno znanja o pravilnoj higijeni, dok su ostali roditelji naveli i finansijske prepreke i nezainteresovanost djece. Na ponovljenu anketu odgovorilo je samo 22 roditelja od ukupnih 69. Vidljivo je povećanje znanja i prakse vezano za upotrebu fluorida, kao i poboljšanje u održavanju oralne higijene kod djece.

Rezultati ukazuju na to da je edukacija roditelja ključ ka zdravoj usnoj šupljini djece.

Ključne riječi: edukacija, djeca, roditelji, oralna higijena

FIELD OF DENTISTRY: PEDIATRIC DENTISTRY

THE ROLE OF EDUCATION OF PARENTS AND PRESCHOOL CHILDREN IN MAINTAINING ORAL HYGIENE

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ABSTRACT

Oral health in preschool children is crucial for their overall development, and early habits in maintaining oral hygiene significantly impact long-term oral health. Educating both parents and children about proper oral hygiene plays a vital role in the prevention of cavities and other dental diseases.

The aim of this study was to examine the role of parents and children in maintaining oral hygiene.

The study involved 52 children from two Sarajevo preschools (aged 3-6 years) and their parents. Initially, an online survey was conducted to assess the parents' and children's initial knowledge, habits, attitudes, and barriers related to oral hygiene. This was followed by dental examinations in the preschools, during which children were asked questions about their oral hygiene habits. A plaque index was also determined, and the level of oral hygiene maintenance was assessed. After the dental check-ups, online educational materials were sent to parents. A follow-up dental examination was carried out in the preschools, where the level of oral hygiene was reassessed, and a second online survey was conducted with the parents to evaluate their knowledge and habits after watching the educational video.

Following the check-ups, it was found that the plaque index was 5.46. When asked who supervises or helps the child with tooth brushing, 53.6% of parents answered that they help or supervise occasionally, while the rest responded that they rarely or never supervise their child (46.4%). The survey revealed the main challenges in maintaining regular oral hygiene in children: 47.8% of parents mentioned the child's resistance, 27.5% cited lack of time, 11.6% mentioned insufficient knowledge about proper hygiene, while other parents noted financial barriers and the child's lack of interest. Only 22 parents responded to the follow-up survey out of the total 69. There was a noticeable increase in knowledge and practice regarding fluoride use, as well as an improvement in the maintenance of children's oral hygiene.

The results indicate that parental education is key to maintaining children's oral health.

Keywords: education, children, parents, oral hygiene

OBLAST STOMATOLOGIJE: OPŠTA STOMATOLOŠKA PRAKSA

HITNA MEDICINSKA STANJA U STOMATOLOŠKOJ ORDINACIJI

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SAŽETAK

Hitna medicinska stanja (HMS) u stomatološkoj praksi nisu sporadična pojava, te se kao i sva akutna stanja moraju odmah i tretirati.Svi članovi stomatološkog tima trebaju biti dobro obučeni za pravovremenu reakciju i adekvatno zbrinjavanje. Takva stanja se mogu desiti u bilo kojoj fazi stomatološke intervencije. Većinom se događaju zbog stresa i straha od boli. Mogu se javiti kao komplikacija opšteg zdravstvenog stanja pacijenta, te kao reakcije na određene lijekove koji se koriste tokomstomatološke intervencije.

HMS u stomatološkoj praksi su klasificirana na: gubitak svijesti, poremećaji svijesti, poremećaj disanja, bol u prsima i alergijske reakcije.

Sprečavanje nastanka ovakvih stanja u stomatološkoj ordinaciji može se postići samo poznavanjem mogućih komplikacija, poštivanja svih protokola u radu, s posebnim naglaskom na anamnezu, koja ako se adekvatno provede, može spriječiti nastanak istih. S druge strane, većina komplikacija nastaje kao rezultat straha i stresa u stomatološkoj ordinaciji, pa je pristup pacijentu sa psihološkog aspekta veoma bitan i može pomoći sprečavanju nastanka ovih stanja.

Hitna stanja moraju se brzo i adekvatno tretirati. Adekvatno reagovanje svih članova stomatološkog tima i kontrola nad nastalom situacijom, obično dovode do poboljšanja opšteg stanja. Ukoliko sve poduzete mjere ne rezultiraju poboljšanjem, bitno je odmah pozvati hitnu pomoć. U svakoj stomatološkoj ordinaciji od ključne su važnosti edukacijaosoblja za intervencije kod hitnih stanja u stomatologiji i kontinuirano obnavljanje znanja o hitnim stanjima.

Ključne riječi: hitna stanja,anamneza,rizici za HMS, preventivne mjere

FIELD OF DENTISTRY: GENERAL DENTAL PRACTICE

MEDICAL EMERGENCIES IN THE DENTAL OFFICE

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ABSTRACT

Medical emergencies (MEs) in dental practice are not rare occurrences and, like all acute conditions, require immediate treatment. All dental team members should be thoroughly trained to respond promptly and provide adequate care. These emergencies can occur at any stage of a dental intervention. They are most commonly triggered by stress and fear of pain but can also result from complications arising from the patient's overall health or as a reaction to certain medications used during the dental intervention.

MEs in dental practice can be categorized as follows: loss of consciousness, disorders of consciousness, breathing disorders, chest pain, and allergic reactions.

Preventing such conditions in the dental office can only be achieved by understanding potential complications and strictly adhering to all protocols, with particular emphasis on the patient's medical history, which, when properly obtained, can help prevent these complications. Additionally, many complications arise from fear and stress experienced in the dental office, so addressing the patient from a psychological perspective is crucial and can play a significant role in preventing these conditions.

Emergencies must be treated promptly and appropriately. An adequate response from all dental team members and effective control of the situation typically improve the patient's condition. If no improvement is observed despite all the measures taken, it is crucial to call an ambulance immediately. In every dental office, it is essential to educate the staff on how to respond during emergency dental interventions and to continuously enhance their knowledge of handling such situations.

Keywords: emergencies, medical history, risks leading to MEs, preventive measures.

OBLAST STOMATOLOGIJE: ORALNA HIRURGIJA

ZNAČAJ MULTIDISCIPLINARNOG PRISTUPA U LIJEČENJU ONKOLOŠKIH PACIJENATA NA BISFOSFONATNOJ TERAPIJI: DENTALNI ASPEKT

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SAŽETAK

Uvod: Bisfosfonati pripadaju grupi antiresorptivnih lijekova i predstavljaju ključni terapijski modalitet u liječenju onkoloških pacijenata sa koštanim metastazama i osteolitičkim lezijama. Svojim specifičnim djelovanjem doprinose smanjenju skeletnih komplikacija i poboljšanju kvaliteta života onkoloških pacijenata. Međutim, njihova dugotrajna primjena nosi rizik od razvoja teške posljedične, često refraktorne komplikacije označene kao Bisfosfonatima indukovana osteonekroza vilica (BIONJ), koja zahtjeva poseban pristup u liječenju. Multidisciplinarni pristup, koji uključuje onkologe, oralne i maksilofacijalne hirurge, stomatologe, ortopede, radiologe i druge zdravstvene profesionalce, od suštinskog je značaja za pravovremenu procjenu rizika, prevenciju komplikacija i optimalno vođenje terapije. Cilj ovog rada je da istakne važnost multidisciplinarne saradnje u planiranju stomatološkog liječenja onkoloških pacijenata na bisfosfonatnoj terapiji uz poseban osvrt na strategije prevencije, ranu dijagnostiku i terapijske protokole.

Materijali i metode: Rad je baziran na analizi relevantne literature pretražene putem PubMed i Scopus baze podataka, uz fokus na strategije prevencije i liječenja BIONJ. Pored toga, uključeni su i primjeri iz vlastite kliničke prakse, koji ilustriraju ključne aspekte multidisciplinarnog pristupa u liječenju onkoloških pacijenata na bisfosfonatnoj terapiji.

Rezultati: Multidisciplinarna saradnja omogućava: ranu identifikaciju rizičnih pacijenata, individualizovane stomatološke intervencije, bolju kontrolu komplikacija i optimizaciju terapijskih protokola.

Zaključak: Integracija znanja i iskustava različitih specijalnosti ne samo da poboljšava kliničke ishode već i unapređuje kvalitet života pacijenata kroz individualizovani terapijski pristup.

Ključne riječi: bisfosfonati, onkološki pacijenti, osteonekroza vilica, multidisciplinarni pristup, prevencija.

FIELD OF DENTISTRY: ORAL SURGERY

THE IMPORTANCE OF MULTIDISCIPLINARY COLLABORATION IN THE MANAGEMENT OF ONCOLOGY PATIENTS UNDER BISPHOSPHONATE THERAPY: A DENTAL PERSPECTIVE

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ABSTRACT

Introduction: Bisphosphonates belong to the group of antiresorptiv medications and represent a key therapeutic modality in the treatment of oncology patients with bone metastases and osteolytic lesions. Their administration significantly reduces morbidity and improves quality of life. However, their long – term use carries the risk of severe, often refractory complications, classified as bisphosphonate – related osteonecrosis of the jaws (BRONJ), which requires a specialized treatment approach. A multidisciplinary approach, involving oncologists, oral and maxillofacial surgeons, dentists, orthopedic specialists, radiologists, and other relevant healthcare professionals is essential for accurate risk assessment, complication prevention, and optimal therapy management. The aim of this paper is to emphasize the significance of multidisciplinary collaboration in planning dental care for oncology patients receiving bisphosphonate therapy, with a particular focus on prevention strategies, early diagnosis, and therapeutic protocols.

Materials and Methods: This review is based on an analysis of relevant literature retrieved from PubMed and Scopus databases, focusing on strategies for the prevention and management of BRONJ. Additionally, examples from personal clinical practice have been included to illustrate key aspects of the multidisciplinary approach in managing oncology patients undergoing bisphosphonate therapy.

Results: Multidisciplinary collaboration enables : early identification of high –risk patients, individualized dental interventions, improved management of complications and optimization of therapeutic protocols.

Conclusion: The integration of dental and oncological care is essential for reducing the incidence of BRONJ and improving treatment outcomes in oncology patients receiving bisphosphonate therapy.

Keywords: bisphosphonates, oncology patients, osteonecrosis of the jaw, multidisciplinary approach, prevention.

OBLAST STOMATOLOGIJE: ORALNA HIRURGIJA

TREĆI MOLARI – IZAZOVI DIJAGNOSTIKE I HIRURŠKOG TRETMANA

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SAŽETAK

Uvod: Hirurški tretman impaktiranih trećih molara predstavlja čestu intervenciju u oralnoj hirurgiji, te zahtijeva detaljan dijagnostički protokol i hirurški tretman, s obzirom na varijacije u njihovom položaju i činjenicu da mogu dovesti do pojave cističnih lezija.

Cilj: Autori su nastojali kroz rijedak i kompleksan slučaj impaktiranog maksilarnog trećeg molara, prikazati važnost dijagnostičkog i hirurškog protokola.

Materijali i metode: U radu je predstavljen slučaj pacijentice koja je upućena na Kliniku za oralnu hirurgiju, zbog tegoba u području maksile sa lijeve strane, pojave neugodnog mirisa i slankastog okusa u ustima, a koje su perzistirale nekoliko mjeseci.

Prethodno urađeni klinički pregled i OPG snimak nisu ukazivali da bi uzrok tegoba mogao biti impaktirani treći maksilarni molar. Na Klinici su urađeni detaljan klinički pregled i 3D CBCT snimak, na kojem se registruje visoko impaktiran zub 28, te rtg svjetlina koja najvjerovatnije odgovara dentigiroznoj cisti. Hirurški tretman podrazumijevao je ekstrakciju impaktiranog zuba 28, enukleaciju cistične lezije, ekstrakciju zuba 27 usljed koštane destrukcije.

Rezultat: Opisani slučaj imao je pozitivan ishod u vidu mekotkivnog i koštanog cijeljenja, što je potvrđeno postoperativnim pregledima i radiološkim kontrolama.

Zaključak: Pravilna i rana dijagnostika ovakve patologije ključne su za adekvatnu terapiju iste, te sprječavanje eventualnih komplikacija.

Ključne riječi: impaktirani treći molari, rtg dijagnostika, hirurški protokol , dentigirozne ciste.

FIELD OF DENTISTRY: ORAL SURGERY

THIRD MOLARS – DIAGNOSTIC AND SURGICAL TREATMENT CHALLENGES

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ABSTRACT

Introduction: Surgical treatment of impacted third molars is a common intervention in oral surgery. Given their variations in position and the fact that they can lead to the appearance of cystic lesions, this requires a detailed diagnostic protocol and surgical treatment.

Objective: The authors sought to demonstrate the importance of diagnostic and surgical protocols through a rare and complex case of an impacted maxillary third molar.

Materials and methods: The paper presents the case of a patient who was referred to the Clinic due to complaints in the maxillary area on the left side, the appearance of an unpleasant odor, and a salty taste in the mouth that had persisted for several months.

A previous clinical examination and OPG scan did not indicate that the cause of the problems could be impacted maxillary third molar. At the Clinic, another clinic examination and 3D CBCT scan were performed, which revealed a high impacted maxillary third molar (#28), and x-ray brightness that most likely corresponds to a dentigerous cyst. Surgical treatment included extraction of the impacted third molar, enucleation of the cyst lesion, and extraction of tooth 27, due to bone destruction.

Result: The described case had a positive outcome in the form of soft tissue and bone healing, which was confirmed by postoperative examinations and radiological controls.

Conclusion: Correct and early diagnosis of this pathology is crucial for adequate therapy and prevention of complications.

Keywords: impacted third molars, x-ray diagnostics, surgical protocol, dentigerous cysts.

OBLAST STOMATOLOGIJE: ORTODONCIJA

MEDIOTRUZIJSKI KONTAKTI I NJIHOV UTICAJ NA NASTANAK ZNAKOVA I SIMPTOMA TEMPOROMANDIBULARNIH DISFUNKCIJA

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SAŽETAK

Mediotruzijski kontakti se svrstavaju u kategoriju okluzalne traume. Okluzija može biti povezana sa razvojem TMD-a utičući na ortopedsku nestabilnost mandibule. Materijal i metode: 300 ispitanika je bilo podijeljeno u dvije starosne skupine, od 14 do 18 godina i od 25 do 30 godina. Po 75 ispitanika iz obje starosne skupine, podijeljeni na muške i ženske, činili su kontrolne i eksperimentalne grupe. Rezultati: Rezultati ovog istraživanja pokazuju da se mediotruzijski kontakti trebaju smatrati potencijalnim faktorima rizika za nastanak temporomandibularnih disfunkcija. Ispitanici eksperimentalne grupe imali su statistički signifikantno veću (p<0,003) učestalost bola u poređenju na kontrolnu grupu ispitanika. Značajno učestaliju pojavu škljocanja u zglobu imali su ispitanici eksperimentalne grupe (26,7%) u poređenju na kontrolnu grupu (3,3%). Zaključak: Na osnovu dobivenih rezultata može se ustanoviti da je povećana incidenca znakova i simptoma TMD-a kod ispitanika sa prisutnim mediotruzijskim kontaktima.

K**ljučne riječi:** temporomandibularne disfunkcije, malokluzije, mediotruzijski kontakti

FIELD OF DENTISTRY: ORTHODONTICS

MEDIOTRUSIVE OCCLUSAL CONTACTS AND THE IMPACT ON SIGNS AND SYMPTOMS OF TEMPOROMANDIBULAR JOINT DISORDERS

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ABSTRACT

Mediotrusive occlusal contacts fall into the category of occlusal trauma. Occlusion may be associated with TMD development in terms of causing orthopaedic instability of the mandible. . Materials and methods: 300 respondents were devided into two age groups, Group 1- the patients of 14 to 18, and Group 2_ the patients of 25 to 30 years of age. The control and experimental groups were made of 75 patients from each age group, stratified by gender. Results: The results of this study suggest that mediotrusive occlusal contacts should be considered as potential risk factors of the occurence of TMD dysfunction. Patients in the experimental group show a statistically significantly higher (p<0.003) incidence of pain compared to the patients in the control group. A more frequent occurrence of joint clicking was statistically significantly reported by patients in the experimental group (26.7%) compared to the control group (3.3%). Conclusion: The prevalence of signs and symptoms of TMD in patients with mediotrusive contacts is higher than in the control group.

Key words: temporomandibular joint disorders, mallocclusion, mediotrusive contact

OBLAST STOMATOLOGIJE: PREVENTIVNA STOMATOLOGIJA

ORALNO ZDRAVLJE I UPOTREBA UGLJIKOHIDRATA KOD DJECE

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SAŽETAK

Uvod: Najznačajniji uticaj ugljikohidrata na oralno zdravlje, ogleda se u tome što je pri njihovoj konzumaciji povećan rizik od nastanka karijesa.Na osnovu navedenog i mnogih istraživanja koja su provedena, posvećenost roditelja u održavanju pravilne ishrane i oralne higijene kod djece je od presudnog značaja za dobro oralno zdravlje djeteta.

Metodologija i cilj istraživanja: Istraživanje je obuhvatilo anketiranje roditelja od 40 učenika prvog razreda osnovne škole, koji su tokom 2023. godine dolazili na stomatološke preglede u JZU "Dom zdravlja" Živinice. Roditelji ispitanika su davali odgovore na anketni upitnik.Cilj istraživanja bio je utvrditi učestalost upotrebe ugljikohidrata kod djece, kao i njihov uticaj na oralno zdravlje djeteta.

Rezultati: Istraživanje je obuhvatilo odgovore od 40 roditelja. 50% roditelja ispitanika se izjasnilo da dijete svaki dan konzumira čokoladu, samo 8% roditelja je potvrdilo da djeca ugljikohidrate konzumiraju nekoliko puta mjesečno.12% ispitanika se izjasnilo da njihovo dijete svaki dan pije čaj sa šećerom,a 57% roditelja se izjasnilo da su ugljikohidrati sastavni dio međuobroka djeteta.Na pitanje o učestalosti konzumacije zaslađenih napitaka,35% roditelja se izjasnilo da djeca koriste zaslađene napitke.

Zaključak: Na temelju dobivenih rezultata istraživanja došlo se do zaključka da su u svakodnevnoj konzumaciji kod velikog broja djece prisutni ugljikohidrati. Prekomjerni unos ugljikohidrata povećava rizik od oralnih problema kod djece, uključujući karijes i druge zubne bolesti, te je važno više raditi na promociji oralnog-zdravlja, edukaciji roditelja i djece.

Ključne riječi: oralno zdravlje, ugljikohidrati, karijes

FIELD OD DENTISTRY: PREVENTIVE DENTISTRY

ORAL HEALTH AND CARBOHYDRATE CONSUMPTION IN CHILDREN

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ABSTRACT

Introduction: The most notable impact of carbohydrates on oral health is the increased risk of tooth decay associated with their consumption. Based on this and numerous studies conducted, parental involvement in maintaining proper nutrition and oral hygiene in children is crucial for good oral health.

Methodology and Objective: The study surveyed 40 parents of first-grade elementary school students who visited the ''Public Health Center'' in Živinice in 2023. The parents completed a questionnaire regarding their children's carbohydrate consumption. The objective of the study was to determine the frequency of carbohydrate intake in children and its impact on their oral health.

Results: The study received responses from 40 parents. Half of the parents (50%) reported that their child consumes chocolate daily, while only 8% stated that their children consume carbohydrates just a few times a month. 12% of parents mentioned their children drink sweetened tea daily, and 57% confirmed that carbohydrates are a regular part of their child's snacks. Regarding the consumption of sugary drinks, 35% of parents reported that their children use sweetened beverages.

Conclusion: The findings of the study indicate that a significant number of children consume carbohydrates daily. Excessive carbohydrate intake increases the risk of oral health problems, including tooth decay and other dental issues. Therefore, promoting oral health and educating both parents and children is crucial.

Keywords : oral health, carbohydrate, caries

OBLAST STOMATOLOGIJE: PREVENTIVNA STOMATOLOGIJA

ESTETIKA I DIJASTEME U MLIJEČNOJ DENTICIJI – STAV I PERCEPCIJA RODITELJA

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SAŽETAK

Uvod: Izloženost estetskim trendovima putem medija i društvenih mreža evidentna je u stomatološkim ordinacijama, gdje pacijenti često zahtijevaju „bijele zube“, „lijepo poredane“ i „bez razmaka“. Dok su dijasteme u mliječnoj denticiji fiziološki nalaz i ukazuju na prostor za stalne zube, estetski trendovi koji se odnose na stalnu denticiju mogu utjecati na percepciju mliječnih zuba. Cilj ovog istraživanja bio je ispitati odnosi li se estetski trendovi u vezi s stalnim zubima i na mliječnu denticiju.

Materijali i metode: U istraživanju je učestvovalo ukupno 69 ispitanika - roditelja djece predškolskog uzrasta, koja pohađaju dva sarajevska vrtića. Roditelji su ispunili online upitnik s fotografijama i shematskim prikazima mliječnih zuba s dijastemama i bez njih (Baumesova klasifikacija), te odgovorili na pitanja o percepciji dentalne estetike.

Rezultati: Rezultati su pokazali da 81,2% roditelja smatra da su mliječni zubi bez dijastema estetski prihvatljiviji, dok 78,3% preferira shematski prikaz zuba bez dijastema. Također, roditelji često povezuju „lijepu“ mliječnu denticiju sa „zdravim“, „pravilno poredanim“ i „bez razmaka“ zubima.

Zaključak: Preference pacijenata po pitanju izbora i provođenja stomatološkog tretmana u kontekstu dentalne estetike u mliječnoj denticiji, trebaju se pažljivo razmotriti. Zadatak stomatologa je da educira roditelje o značaju i ulozi dijastema u mliječnoj denticiji.

Ključne riječi: dijasteme, mliječna denticija, roditelji, percepcija, estetika

FIELD OD DENTISTRY: PREVENTIVE DENTISTRY

AESTHETICS AND DIASTEMAS IN PRIMARY DENTITION – PARENTS' ATTITUDES AND PERCEPTIONS

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ABSTRACT

Introduction: Exposure to aesthetic trends through media and social networks is evident in dental offices, where patients often demand "white teeth", "nicely aligned" and "gap-free". While diastemas in primary dentition are a physiological finding and indicate space for permanent teeth, aesthetic trends related to permanent dentition can affect the perception of primary teeth. The aim of this research was to examine whether aesthetic trends related to permanent teeth also apply to the primary dentition.

Materials and methods: A total of 69 respondents participated in the research - parents of preschool children attending two kindergartens in Sarajevo. Parents filled out an online questionnaire with photographs and schematic representations of primary teeth with and without diastemas (Baumes classification), and answered questions about the perception of dental aesthetics.

Results: The results showed that 81.2% of parents think that primary teeth without diastema are more aesthetically acceptable, while 78.3% prefer a schematic representation of teeth without diastema. Also, parents often associate "beautiful" primary dentition with "healthy", "properly aligned" and "gap-free" teeth.

Conclusion: Patient preferences regarding the choice and implementation of dental treatment in the context of dental aesthetics in primary dentition should be carefully considered. The dentist's task is to educate parents about the importance and role of diastema in primary dentition.

Key words: diastema, primary dentition, parents, perception, aesthetics

OBLAST STOMATOLOGIJE: STOMATOLOŠKA PROTETIKA

KOMPLETNA ORALNA REHABILITACIJA KOD OVISNIKA O OPIOIDNIM ANALGETICIMA I KANABISU

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SAŽETAK

Upotreba psihoaktivnih supstanci (PAS) je veliki problem u današnjem zdravstvu, uz poseban osvrt na korištenje opioidnih analgetika. Konzumacija istih narušava dugoročno kako psihičko, tako somatsko i oralno zdravlje.

U našem prikazu slučaja radi se o mladiću (28) korisniku PAS od 14. godine sa dominacijom opioidnih alagetika (tramadol i kanabisa), koje su hemijskim uticajem, uz suha usta i uz hiperaciditet, potpuno razorile tvrdu zubnu supstancu što je dovelo do gubitka svih zuba u gornjoj vilici i deset zuba u donjoj vilici.

Materijal i metode: nakon prvog pregleda i niza dijagnostičkih procedura pacijentu je predloženo da se ekstrahiraju zaostali korijenovi u gornjoj vilici; također i ekstrakcija zaostalih korijenova u donjoj vilici, uz endodontski tretman dva zuba, i preparaciju šest zuba za protetski nadomjestak. Nakon provedenih terapijskih procedura uzeti su otisci za završne protetske radove.

Rezultati: Terapijski postupci su rezultirali kompletnom oralnom rehabilitacijom, uspostavom normalne žvačne i govorne funkcije i najboljim estetskim rješenjem.

Uz stomatološki rad obavljena je konsultacija sa adiktologom (neuropsihijatrom) te data preporuka za liječenje aktualne ovisnosti, sto će u konačnici dovesti do većeg samopouzdanja, samopoštovanja i boljeg kvaliteta života.

Zaključci: Ovisnici o PAS zanemaruju kako cjelokupno tako i oralno zdravlje. Stigma i diskriminacija ovih pacijenta dotiče i stomatologe te bi kontiuirana medicinska edukacija ove vrste zdravstvenih profesionalaca iz domena adiktologije u mnogome olakšala rad sa ovom vrstom pacijenata.

Ključne riječi: oralno zdravlje, oralna rehabiliracija, protetski nadomjestak, PAS i ovisnost

FIELD OF DENTISTRY: PROSTHODONTICS

COMPLETE ORAL REHABILITATION FOR OPIOID ANALGESICS AND CANNABIS ADDICTS

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ABSTRACT

The use of psychoactive substances (PAS) is a major issue in today's healthcare, with a particular focus on the use of opioid analgesics. Their consumption has long-term detrimental effects on mental, somatic, and oral health.

Our case report presents a 28-year-old male who has been using PAS since the age of 14, with a dominance of opioid analgesics (tramadol and cannabis). Due to their chemical effects, combined with dry mouth and hyperacidity, the hard dental substance was completely destroyed, leading to the loss of all teeth in the upper jaw and ten teeth in the lower jaw.

Materials and Methods: After the initial examination and a series of diagnostic procedures, the patient was advised to undergo extraction of the remaining roots in the upper jaw, as well as extraction of the remaining roots in the lower jaw, endodontic treatment of two teeth, and preparation of six teeth for prosthetic rehabilitation. Following the completion of therapeutic procedures, impressions were taken for final prosthetic work.

Results: The therapeutic procedures resulted in complete oral rehabilitation, restoration of normal chewing and speech function, and the best possible aesthetic outcome. Alongside dental treatment, a consultation with an addiction specialist (neuropsychiatrist) was conducted, and recommendations for treating the current addiction were provided, ultimately contributing to greater self-confidence, self-respect, and improved quality of life.

Conclusions: PAS addicts neglect both their overall and oral health. The stigma and discrimination faced by these patients also extend to dental professionals. Continuous medical education for dental professionals in the field of addiction medicine would significantly facilitate working with this patient population.

Keywords: oral health, oral rehabilitation, prosthetic restoration, PAS, addiction

FIELD OF DENTISTRY: ENDODONTICS AND DENTAL PATHOLOGY

MULTIDISCIPLINARY APPROACH TO RESOLVING COMPLEX PATHOLOGY IN THE UPPER CENTRAL INCISOR AS A RESULT OF TOOTH TRAUMA

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ABSTRACT

Introduction: Root resorption is the loss of hard dental tissue due to odontoclastic activity. If the resorption occurs inside the tooth, on the canal wall, it is described as internal root resorption, while resorption occurring on the external surface of the root is described as external root resorption. The etiology is unclear. Several potential predisposing factors have been suggested, including traumatic tooth injuries and pulp inflammation as a tissue response to infection approaching the resorption area.

Case Presentation: A 13-year-old female patient presented to the "Dr. Bećirović" clinic with pain and gingival swelling in the region of the upper central incisors. After clinical examination, analysis of radiographs (RVG, CBCT), and consultation with an endodontic specialist, a treatment plan was formulated. The planned treatment included periodontal therapy, elevation of a mucoperiosteal flap, repair of external resorption on tooth 11 (using MTA and a collagen resorbable membrane) to ensure a "clean" endodontic space. The complete endodontic treatment protocol was followed, and final canal obturation was performed using the main gutta-percha point (30/04) and a warm gutta-percha system. Following endodontic treatment and control radiographs, the tooth was restored with a composite filling.

Conclusion: Tooth resorption is a pathological reaction that, if left untreated, leads to tooth loss. The goal of therapy is to stop the resorptive process and preserve tooth structures. After the therapy, the patient was symptom-free (pain, swelling). Control radiographs showed recovery of the surrounding bone of tooth 11, providing hope that the multidisciplinary approach to treating the resorption of tooth 11 was successful and yielded positive results. The patient requires further monitoring, with control radiographs to be taken in six months and again in one year.

Keywords: Trauma, MTA, irrigation, obturation, monitoring.

OBLAST STOMATOLOGIJE: DENTALNA IMPLANTOLOGIJA

SUDSKO-MEDICINSKE IMPLIKACIJE U DENTALNOJ IMPLANTOLOGIJI S PRIKAZOM SLUČAJEVA IZ PRAKSE

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SAŽETAK

Sve veća potreba i želja pacijenata za kvalitetnijom rehabilitacijom usne šupljine rezultirala je pravim „bumom“ u postavljanju dentalnih implantata. Istaknimo da je pritom potrebno dobro planirati, voditi brigu o indikacijama i primjenjivati implantoprotetičke protokole kako bi rezultati bili funkcijski i estetski zadovoljavajući te se poštovala etička načela i zakonske odredbe.

Nepoštovanje etičkih, stručnih i znanstvenih načela te nedostatno informiranje pacijenta o potencijalnim rizicima, komplikacijama i neuspjesima, ali i nesavjestan i neodgovoran rad terapeuta, nakon rehabilitacije usne šupljine dentalnim implantatima dovodi do sve većeg broja tužbi pacijenata. Jasnije smjernice i upute trebale bi pomoći pacijentu da realno procijeni što može očekivati kad je riječ o terapiji i pojednostavniti odnos s doktorom. Dobro dokumentiranje svakoga pojedinog slučaja, potpisivanje informiranog pristanka za terapiju i detaljno usmeno objašnjenje o protokolima i ishodima liječenja itekako mogu pomoći terapeutu u slučaju sudskog procesa i vještačenja.

Prikazana su tri slučaja iz sudske prakse za koja su obavljena vještačenja. Opisane su kirurške i protetičke komplikacije koje su se dogodile i što se u pojedinim vještačenjima smatra pogreškom, a što očekivanom komplikacijom.

Pokušali su se razgraničiti i pojmovi liječničke pogreške i liječničke komplikacije.

Doprinos rada bio bi smanjivanje ili izbjegavanje naknadnih nesuglasica i problema u jasnije definiranim protokolima o radu.

Ključne riječi: dentalna implantologija, tužbe pacijenata, zakonske odredbe

FIELD OF DENTISTRY: DENTAL IMPLANTOLOGY

FORENSIC IMPLICATIONS IN DENTAL IMPLANTOLOGY WITH A CASE REPORT FROM PRACTICE

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ABSTRACT

The growing need and desire of patients for better rehabilitation of the oral cavity has resulted in real "boom" in the placement of dental implants. It should be noted that at the same time good planning is required in order to take care of the indications and to apply implant-prosthetic protocols to gethe resultsthat are functionally and aesthetically satisfactory and to respect t ethical principles and legal provisions.

Non-compliance with ethical, professional and scientific principles and insufficient informing of the patient about potential risks, complications and failures, but also the unscrupulous and irresponsible work of the therapist, after the rehabilitation of the oral cavity with dental implants leads to an increasing number of patient complaints. Clearer guidelines and instructions should help the patient realistically assess what to expect when it comes to therapy and simplify the relationship with the doctor. Good documentation of each individual case, signing an informed consent for therapy and a detailed oral explanation of the protocols and outcomes of treatment can certainly help the therapist in the case of litigation and expertise.

Three cases from court practice for which expertise was performed are presented. The surgical and prosthetic complications that occurred are describedshowing what what was a mistake and what expected complication.

Attempts were also made to distinguish between the concepts of medical error and medical complication.

The contribution of the work would be reducing or avoiding subsequent disagreements and problems in more clearly defined work protocols.

Key words: dental implantology, patient lawsuits, legal provisions

OBLAST STOMATOLOGIJE: DJEČIJA STOMATOLOGIJA

HIPODONCIJA DONJIH STALNIH CENTRALNIH SJEKUTIĆA -DIJAGNOSTIČKI I TERAPIJSKI IZAZOVI

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SAŽETAK

Uvod: Hipodoncija je nepravilnost broja zuba, tačnije nedostatak do šest zuba, ne računajući treće molare. Češća je u stalnoj nego u mliječnoj denticiji, neznatno više prisutna kod djevojčica, češća u mandibuli nego u maksili.

Cilj: prikazati ne tako čestu hipodonciju donjih stalnih centralnih sjekutića, uz još uvijek prisutne donje mliječne centralne sjekutiće kod zdrave osmogodišnje djevojčice, izolovan slučaj bez ostalih sistemskih oboljenja i genetske predispozicije.

Metode: djevojčica dolazi na pregled, bez subjektivnih tegoba. Klinički smo utvrdili različite donje sjekutiće, što nas navodi da detaljnije utvrdimo razlog takve kliničke slike. Roditelji navode da nije bilo klimanja i ispadanja donjih mliječnih centalnih sjekutića i negativnu genetsku predispoziciju za hipodonciju. Uradimo rtg, OPG snimak, koji nam potvrde sumnju na hipodonciju donjih stalnih centralnih sjekutića. Uviđa se kompleksnost dalje terapije, shodno položaju zuba, funkcionalnim i estetskim izazovima.

Diskusija: hipodoncija donjih centralnih sjekutića se vrlo rijetko opisuje na našem podnebnju. Najčešće je prisutna kod azijske populacije, gdje je opisuju kao autohtonu osobinu. Prevalenca kod indijske djece je 26,30% za prve i druge sjekutiće donje vilice, kod španjolske 4,22% za centralne, dok se kod turske, katarske, iranske djece rijetko opisuje.

Zaključak: hipodoncija donjih centralnih inciziva predstavlja vrlo izazovan estetski i funkcionalni problem, koji zahtijeva multidisciplionarni pristup, dugotrajno i učinkovito planiranje liječenja u skladu sa uzrastom i individualnim zahtjevima djeteta

Ključne riječi: hipodoncija, donji sjekutići

FIELD OF DENTISTRY: PEDIATRIC DENTISTRY

HYPODONTIA OF THE LOWER PERMANENT CENTRAL INCISORS – DIAGNOSTIC AND THERAPEUTIC CHALLENGES

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ABSTRACT

Introduction: Hypodontia is a dental anomaly characterized by the absence of up to six teeth, excluding third molars. It is more common in the permanent dentition than in the primary dentition, slightly more prevalent in females, and occurs more frequently in the mandible than in the maxilla.

Objective: To present the uncommon case of hypodontia of the lower permanent central incisors, with the presence of lower primary central incisors in a healthy eight-year-old girl. This is an isolated case without other systemic diseases or genetic predispositions.

Methods: The patient presented for an initial dental assessment without any subjective complaints. Clinically, we observed different lower central incisors, prompting further investigation to determine the cause of this clinical presentation. The parents reported no history of mobility or loss of the primary lower central incisors and a negative family history for hypodontia. An X-ray (OPG) was performed, confirming the suspicion of hypodontia of the lower permanent central incisors. The complexity of further treatment was noted, considering the position of the teeth, as well as functional and aesthetic challenges.

Discussion: Hypodontia of the lower central incisors is rarely described in our region. It is more commonly observed in Asian populations, where it is considered an indigenous trait. The prevalence of hypodontia in Indian children is 26.30% for the first and second lower incisors, while in Spanish children it is 4.22% for central incisors. It is rarely described in Turkish, Qatari, and Iranian children.

Conclusion: Hypodontia of the lower central incisors presents a significant aesthetic and functional challenge, requiring a multidisciplinary approach, long-term, and effective treatment planning in accordance with the child's age and individual needs.

Keywords: hypodontia, lower incisors

OBLAST STOMATOLOGIJE: DJEČIJA STOMATOLOGIJA

PREVALENCA KARIJESA PREDŠKOLSKE I ŠKOLSKE DJECE NA PODRUČJU OPĆINE TEŠANJ

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SAŽETAK

Uvod: Zubni karijes je jedna od najučestalijih hroničnih bolesti djece i adolescenata. Cilj ovog rada je da se prikaže prevalenca karijesa mliječnih zuba kod djece predškolske dobi i trajnih zuba djece školske dobi na području općine Tešanj.

Materijali i metode: Istraživanje je obuhvatilo 537 djece, 175 predškolske i 362 školske dobi . Prevalenca karijesa prikazana je kod predškolske djece dobi 3 do 6 godina, te školske djece dobi 6 do 15 godina, posmatrajući parametre kao što su KEP (kep) indeks i indeks značajnosti karijesa (SiC).

Rezultati: Ukupna rasprostranjenost karijesa kod djece predškolske dobi iznosi 89,14%, a kod djece školske dobi 46,68%. Predškolska djeca imaju prosječnu vrijednost kep indeksa 5.9 i SiC indeksa 2.4. Vrijednosti kep i SiC indeksa mliječnih zuba kod trogodišnjaka iznose kep 4 / SiC 8.4, četverogodišnjaka 5.15/10.4, petogodišnjaka 6.25/12.2 i šestogodišnjaka 8.06/2.5. Školska djeca imaju prosječnu vrijednost KEP indeksa 2.06, a SIC indeksa 1.3. Vrijednosti KEP i SiC indeksa trajnih zuba kod šestogodišnjaka iznose KEP 0.04 / SiC 0.11, sedmogodišnjaka 0.74/2.23, osmogodišnjaka 1.66/3.76, devetogodišnjaka 1.98/3.66, desetogodišnjaka 2.3/4.54, jedanaestogodišnjaka 2.5/4.86, dvanaestogodišnjaka 2.33/4.53, trinaestogodišnjaka 2.61/5.66, četrnaestogodišnjaka 4.69/9.25 i petnaestogodišnjaka 1.75/3. Kod djece školske dobi mogli su se uočiti dominantno prisutni kariozni mliječni zubi što direktno utiče na veću incidencu nastanka karijesa na okolnim mladim trajnim zubima.

Zaključak: Dobijeni rezultati pokazali su visoku prevalencu karijesa, odnosno postojanje velikog broja karioznih i nesaniranih zuba mliječne i trajne denticije kod djece na području općine Tešanj što ukazuje na potrebu za efikasnijim mjerama prevencije i boljom organizacijom primarne stomatološke zaštite.

Ključne riječi: karijes, KEP indeks, SIC indeks, djeca, prevalence

FIELD OF DENTISTRY: PEDIATRIC DENTISTRY

DENTAL CARIES PREVALENCE IN PRESCHOOL AND SCHOOL CHILDREN IN TEŠANJ MUNICIPALITY

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ABSTRACT

Introduction: Dental caries is one of the most common chronic diseases of children and adolescents. The aim of this study was to determine the caries prevalence of primary teeth in preschool children and permanent teeth in school children in Tešanj municipality.

Materials and method: The research included 537 children, 175 preschool children and 362 school children. The prevalence of caries was shown in preschool children aged 3 to 6 years, and school children aged 6 to 15 years, observing parameters such as DMFT (dmft) index and caries significance index (SiC).

Results: The total prevalence of caries in preschool children is 89.14%, and in school children it is 46.68%. Preschool children have an average value dmft index of 5.9 and an average SiC index of 2.4. The values of the dmft index and SiC index of deciduous teeth in three-year-olds are dmft 4/ SiC 8.4, in four-year-olds 5.15/10.4, in five-year-olds 6.25/12.2 and in six-year-olds 8.06/2.5. School children have an average value DMFT index of 2.06 and SiC index of 1.3. The values of the DMFT and SiC of permanent teeth in six-year-olds are DMFT 0.04/ SiC 0.11, seven-year-olds 0.74/2.23, eight-year-olds 1.66/3.76, nine-year-olds 1.98/3.66, ten-year-olds 2.3/4.54, eleven-year-olds 2.5/4.86, twelve-year-olds 2.33/4.53, thirteen-year-olds 2.61/5.66, fourteen-year-olds 4.69/9.25 and fifteen-year-olds 1.75/3. It is observed that carious in primary teeth in school children is dominantly present, which directly affects the higher incidence of caries in the surrounding young permanent teeth.

Conclusion: The obtained results showed a high prevalence of caries, i.e. the existence of a large number of carious and untreated primary and permanent teeth in children in Tešanj municipality. Therefore, preventive measures and primary dental care must be better implemented and organized in primary dental care.

Key words: caries, DMFT index, SIC index, children, prevalence

FIELD OF DENTISTRY: ENDODONCIJA

DEEP SPLIT KORIJENSKOG KANALA MANDIBULARNOG PRVOG PREMOLARA

PRIKAZ SLUČAJA

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SAŽETAK

Uvod: Mandibularni prvi premolar obično ima jedan korijen i jedan kanal. Dvokanalne varijante čine 24% slučajeva, pri čemu se lingvalni kanal odvaja od glavnog pod oštrim uglom, najčešće u srednjoj trećini korijena, formirajući tzv. h-tip ili deep split. Cilj ovog rada je prikazati endodontsko liječenje mandibularnog prvog premolara sa deep split konfiguracijom korijenskog kanala.

Prikaz slučaja: Pedesetjednogodišnji pacijent se javio zbog boli u regiji zuba 44. Kliničkim pregledom utvrđen je kompozitni ispun II klase (OD), intraoralna fistula bukalno, perkutorna osjetljivost i blaga mobilnost zuba. Na RVG snimku je uočena apikalna radiolucenca dimenzija 7 mm, ali i račvanje glavnog korijenskog kanala po principu deep split-a. Prisustvo kompleksne morfologije zahtijevalo je modifikaciju standardnog protokola instrumentacije, s fokusom na značajno proširenje glavnog kanala do mjesta račvanja, kako bi se omogućila adekvatna obrada i opturacija oba kanala. Glavni korijenski kanal je instrumentiran mašinski do dimenzija 35/.06, dok je lingvalni kanal instrumentiran ručno do dimenzija 20/.02, uz obilnu irigaciju NaOCl. Apliciran je Ca(OH)2, a nakon 10 dana pristupilo se definitivnom punjenju odgovarajućim gutaperkama i silerom na bazi epoksi smola. Prije aplikacije, gutaperke su ohlađene primjenom EndoFrost-a, s ciljem lakšeg unošenja u korijenske kanale. Nakon opturacije glavnog kanala, gutaperka je presječena na mjestu račvanja, kako bi se omogućila jednostavnija aplikacija gutaperke u lingvalni kanal. Kontrolni snimak nakon mjesec dana pokazao je znakove cijeljenja periapikalnog tkiva.

Zaključak: Prepoznavanje, instrumentacija i opturacija mandibularnih prvih premolara sa deep split korijensko-kanalnom morfologijom predstavlja izazov u endodontskoj terapiji. Upotrebom operativnog mikroskopa, modificiranim pristupom instrumentaciji i opturaciji značajno se povećava šansa za uspješnost endodontskog tretmana.

Ključne riječi: mandibularni prvi premolar, deep split, morfologija korijenskog kanala, endodontski tretman

FIELD OF DENTISTRY: ENDODONTIC

DEEP SPLIT OF ROOT CANAL IN MANDIBULAR FIRST PREMOLAR

A CASE REPORT

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ABSTRACT

Introduction: Mandibular first premolar typically has one root and one canal. Two-canal variants occur in 24%, where the lingual canal diverges sharply from the main canal, usually at the midroot, which results in an h-type or deep split morphology. This case report aims to present the endodontic treatment of a mandibular first premolar with deep split configuration.

Case report: A 51-year-old patient presented with pain in the region of tooth 44. Clinical examination revealed a class II composite filling (OD), an intraoral fistula buccally, percussion sensitivity, and mild tooth mobility. An RVG image showed apical radiolucency measuring 7 mm, and a deep split bifurcation of the main root canal. Due to this complex morphology, the standard instrumentation protocol required modification. A significant enlargement of the main canal to the bifurcation level was necessary in order to adequately treat both canals. The main canal was rotary instrumented (35/.06), while the lingual canal was treated with hand files (20/.02) and abundant NaOCl irrigation. Ca(OH)2 was applied and after 10 days, obturation was performed with gutta-percha and an epoxy resin-based sealer. The gutta-percha was cooled with EndoFrost for easier adaptation. After obturation, it was cut at the bifurcation point to facilitate placement of the gutta-percha in the lingual canal. A follow-up RVG after one month indicated periapical healing.

Conclusion: Identification, instrumentation and obturation of mandibular first premolar with a deep split pose significant challenges in endodontic treatment. The use of an operating microscope, along with a modified approach to instrumentation and obturation, increases the likelihood of a successful endodontic treatment.

Keywords: mandibular first premolar, deep split, root canal morphology, endodontic treatment

FIELD OF DENTISTRY: ENDODONCIJA

GERONTOSTOMATOLOGIJA - IZAZOVI ENDODONTSKOG LIJEČENJA

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SAŽETAK

Uvod: Gerontostomatologija je grana dentalne medicine koja se bavi proučavanjem procesa starenja, preventivnim i terapijskim postupcima svih oboljenja dentofacijalne regije kod osoba starije životne dobi. Prema Svjetskoj zdravstvenoj organizaciji (SZO) osobe starije od 65.godina pripadaju populaciji starije životne dobi.

Zubna pulpa starijih osoba razlikuje se od pulpe mlađih po broju vlakana i stanica. S godinama volumen pulpe se smanjuje, dolazi do procesa odlaganja dentina koji može biti ubrzan iritacijom pulpe karijesom, restauracijama i paradontalnom bolešću, što može onemogućiti uspješnost endodontskog tretmana.

Materijal i metode: Pacijenti starije životne dobi javili su se na Kliniku za Dentalnu patologiju i endodonciju zbog potrebe za saniranjem zubala. Nakon što je proveden kompletan klinički pregled i anamneza glavnih tegoba, te upotpunjena medicinskom anamnezom i rendgen dijagnostikom pacijenti su podvrgnuti dvoseansnom endodontskom tretmanu.

Rezultati: Kroz slučajeve iz kliničke prakse prikazat ćemo vam neke od endodontskih tretmana kod pacijenata starije životne dobi.

Zaključak: Bez obzira na sve promjene koje se dešavaju na zubima pacijenata starije životne dobi potrebno je sanirati akutni problem poput bola kao i nadoknaditi gubitak zuba u cilju poboljšanja oralnog zdravlja pacijenata. Svakom zubu treba pristupit individualno i odlučiti o daljem toku tretmana u korist pacijenta.

Ključne riječi: Gerontostomatologija, endodontski tretman, starosne promjene, OPG, RVG

FIELD OF DENTISTRY: ENDODONTIC

GERIATRIC DENTISTRY – ENDODONTIC TREATMENT CHALLENGES

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ABSTRACT

Introduction: Geriatric dentistry is a branch of dental medicine focuses on studying the aging process and implementing preventive and therapeutic procedures for all diseases affecting the dentofacial region in older individuals. According to the World Health Organization (WHO), individuals aged 65 and older are considered part of the elderly population.

There is a difference in the number of fibers and cells in the dental pulp between older and younger individuals. The pulp volume decreases with age, leading to increased dentin deposition, which can be accelerated by pulp irritation caused by caries, restorations, or periodontal disease, potentially resulting in unsuccessful endodontic treatment.

Material and methods: Older patients presented to the Clinic for Dental Pathology and Endodontics for dental restoration. After a comprehensive clinical examination, an evaluation of their primary complaints, a medical history review, and x-ray diagnostics, the patients underwent a two-session endodontic treatment.

Results: Through clinical case examples, we will demonstrate various endodontic treatments for older patients.

Conclusion: Despite the changes that occur in the teeth of older patients, it is essential to address acute issues such as pain and to compensate for tooth loss to improve their oral health. Each tooth should be treated individually, with the subsequent treatment plan tailored to the patient's best interests.

Keywords: Geriatric dentistry, endodontic treatment, age-related changes, OPG, RVG

FIELD OF DENTISTRY: ENDODONCIJA

VERTIKALNA FRAKTURA KORIJENA NAKON ENDODONTSKOG LIJEČENJA ZUBA

PRIKAZ SLUČAJA

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SAŽETAK

Uvod: Vertikalna fraktura korijena (VFK) predstavlja potpuni ili nepotpuni uzdužni prijelom korijena zuba, najčešće kod endodontski tretiranih postranih zuba koji nastaje kao posljedica jatrogenih faktora ili ekstenzivnih mastikatornih sila. Rana dijagnoza je važna jer se na taj način može izbjeći nepotreban tretman i prekomjerni gubitak kosti. Ekstrakcija zuba sa VFK obično je tretman izbora.

Cilj ovog rada je prikazati značaj kombinacije sveobuhvatnog kliničkog i radiografskog pregleda u pravovremenoj dijagnostici potpune VFK nastale dvije godine nakon endodontskog liječenja zuba 16.

Prikaz slučaja: Na Katedru za dentalnu patologiju s endodoncijom javila se 47-godišnja pacijentica upućena zbog zamjene ispuna II klase na zubu #16. Anamnestički pacijentica navodi da je bez bola, a zub je endodontski liječila prije dvije godine.

Kliničkim pregledom se primijeti blaga pomičnost zuba (stepen 1), bez otoka gingive, fistule i perkutorne osjetljivosti. Uradi se periapikalni snimak zuba i uoči se radiolucenca cijelom dužinom mezijalnog korijena zuba oblika slova „J“, te adekvatno endodontsko punjenje. Odluči se u potpunosti ukloniti ispun na zubu nakon čega se u furkaciji korjenova uoči frakturna linija u meziodistalnom pravcu cijelom dužinom dna pulpne komore. Fraktura se potvrdi pregledom operativnim mikroskopom (Carl Zeiss Meditec AG, Germany). Na osnovu kliničkog pregleda i analize snimka postavljena je dijagnoza potpune vertikalne frakture korijena zuba #16, te je zub indiciran za ekstrakciju.

Zaključak: Dijagnostika VFK predstavlja izazov jer klinički znakovi upućuju na neuspjeli endodontski tretman ili oboljenje parodoncijuma, a frakturna linija većinom nije uočljiva na radiogramu. Definitivna dijagnoza se može postaviti eksplorativnom endodontskom hirurgijom. Stomatolozi trebaju voditi računa o prevenciji VKF koristeći konzervativne endodontske i postendodontske restaurativne procedure.

Ključne riječi: vertikalna fraktura korijena, endodontsko liječenje, periapikalna lezija, operacioni endodontski mikroskop, ekstrakcija

FIELD OF DENTISTRY: ENDODONTIC

VERTICAL ROOT FRACTURE FOLLOWING ENDODONTIC TREATMENT OF A TOOTH

CASE REPORT

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ABSTRACT

Introduction: Vertical root fracture (VRF) is a longitudinally oriented complete or incomplete fracture of the root of a tooth, most commonly in endodontically treated posterior teeth, resulting from iatrogenic factors or extensive masticatory forces. Early diagnosis is crucial as it can prevent unnecessary treatment and excessive bone loss. The first choice of management for teeth with VRF is extraction.

This study aimed to highlight the importance of comprehensive clinical and radiographic examinations for the timely diagnosis of complete VRF two years after endodontic treatment of tooth #16.

Case report: A 47-year-old female patient was referred to the Department of Dental Pathology and Endodontics for replacement of a Class II restoration on tooth #16. The patient was asymptomatic and had received endodontic treatment two years prior. Clinical examination revealed slight mobility of the tooth (degree 1) with no gingival swelling, fistula, or percussion sensitivity. The periapical radiograph was taken, revealing a radiolucency along the entire length of the mesial root in the shape of letter „J,” with appropriate endodontic filling. It was decided to completely remove the restoration of the tooth, observing a fracture line in the furcation of the roots running mesiodistally throughout the entire length of the pulp chamber floor. Fracture was confirmed using an operating microscope (Carl Zeiss Meditec AG, Germany). On the basis of clinical examination and radiographic analysis, complete vertical root fracture of tooth 16 was diagnosed, and extraction was indicated.

Conclusion: The diagnosis of VRF is challenging for dentists because of the similarity of clinical signs with failed endodontic treatment or periodontal disease, and the fracture line is often difficult to identify on radiographs. A definitive diagnosis can be established through exploratory endodontic surgery. Dentists should be mindful of preventing VRF by employing conservative endodontic and post-endodontic restorative procedures.

Keywords: vertical root fracture, endodontic treatment, periapical lesion, operating endodontic microscope, extraction

OBLAST STOMATOLOGIJE: OPŠTA STOMATOLOŠKA PRAKSA

RAZVOJNA MORFOLOŠKA ANOMALIJA ZUBA - FUZIJA

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SAŽETAK

Uvod: Fuzija, odnosno stopljeni zub, predstavlja proces spajanja dva odvojena zubna zametka tokom embrionalnog razvoja, u fazi kada kruna još nije potpuno mineralizirana. Ova anomalija može biti potpuna ili djelomična. Potpuna fuzija podrazumijeva zajednički dentin krune i korijena, dok se djelomična fuzija dijeli na: fuziju korijena (sa podijeljenom caklinom, ali sa zajedničkim dentinskim korijenom) i fuziju krune (sa zajedničkom caklinom). Iako etiologija ove pojave nije u potpunosti razjašnjena, pretpostavlja se da je posljedica dejstva fizičkih sila tokom razvoja, što uzrokuje nekrozu epitelnog tkiva koje razdvaja zubne zametke.

Cilj rada: Cilj rada je prikazati karakterističan izgled ove strukturne anomalije, u cilju olakšavanja dijagnostičkog procesa u svakodnevnoj stomatološkoj praksi.

Materijali i metode: U ordinaciju za opštu stomatologiju JU Dom zdravlja KS (O.J. Ilidža) javila se na pregled osmogodišnja pacijentica B.D., 2016.god. u pratnji majke. Kliničkim pregledom uočen je slučaj fuzije zuba 82 i 83. Palpacijom je utvrđena mobilnost zuba, dok je zub 42 bio u fazi lingvalne erupcije. Na temelju heteroanamnestičkih podataka, nisu uočene kontraindikacije za ekstrakciju zuba. S obzirom na stanje u usnoj šupljini, odlučeno je da se izvrši ekstrakcija zuba kako bi se stvorio prostor za nesmetanu erupciju zuba 42. Pacijentici su date upute da pomoću jezika lagano pomiče zub 42 prema labijalnoj strani, kako bi se osigurao njegov pravilni položaj u zubnom nizu.

Zaključak: Razvojne morfološke anomalije zuba u mliječnoj denticiji se prema epidemiološkim studijama nalaze u 0,5-1% slučajeva. Nadamo se da će ovaj prikaz slučaja pomoći kolegama kliničarima prilikom postavljanja dijagnoze.

Ključne riječi: razvojna anomalija, fuzija, mliječna denticij

FIELD OF DENTISTRY: GENERAL DENTISTRY PRACTICE

RAZVOJNA MORFOLOŠKA ANOMALIJA ZUBA - FUZIJA

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ABSTRACT

Introduction: Fusion or fused tooth is defined as the merging of two separate tooth germs during embryonic development when the crown is not fully mineralized. Fusion can be either complete or partial. Complete fusion is characterized by a common dentin of both the crown and root, while partial fusion is subdivided into: root fusion (divided enamel with a shared dentinal root) and crown fusion (shared enamel). The etiology is not fully understood, but it is believed to result from the influence of physical forces during development, leading to necrosis of the epithelial tissue that separates the tooth germs.

Aim: The aim of this study is to present the characteristic appearance of this structural anomaly to facilitate easier diagnosis in clinical practice.

Materials and Methods: An eight-year-old patient, B.D., presented for examination at the general dentistry clinic of the Public Health Institution Health Center KS (O.J. Ilidža) in 2016, accompanied by her mother. Clinical examination revealed fusion of teeth 82 and 83. Upon palpation, the tooth was found to be mobile, and tooth 42 was erupting lingually. Heteroanamnestic information did not indicate any contraindications for tooth extraction. Given the oral condition, the extraction was performed to create space for the unhindered eruption of tooth 42. The patient was instructed to use her tongue to push tooth 42 labially to ensure its proper alignment in the dental arch.

Conclusion: Developmental morphological anomalies of teeth in the primary dentition are reported in 0.5-1% of cases, according to epidemiological studies. It is hoped that this case presentation will assist clinical colleagues in making an accurate diagnosis.

Keywords: developmental anomaly, fusion, primary dentition

OBLAST STOMATOLOGIJE: ORALNA HIRURGIJA

PRIPREMA PACIJENATA SA UROĐENIM KOAGULOPATIJAMA ZA ORALNOHIRURŠKI ZAHVAT

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SAŽETAK

Uvod: Poremećaji krvarenja – koagulopatije su vrste poremećaja sa zajedničkom karakteristikom produženog krvarenja. Urođeni poremećaji krvarenja mogu zahvatiti bilo koju fazu hemostaze, što uključuje malformacije krvnih sudova, abnormalnu strukturu i funkciju trombocita te nedostatak koagulacijskih i von Willebrandovog faktora. Cilj autora je da kroz slučaj iz vlastite kazuistike ukažu na praktične smjernice za sigurno izvođenje oralnohirurških zahvata kod pacijenata sa koagulopatijama, a što uključuje i obaveznu hematološku pripremu pacijenta te postoperativno praćenje.

Materijal i metode : U radu je prikazan i opisan oralnohirurški zahvat, ekstrakcija zuba 36, kod pacijentice sa dijagnozom von Wilebrandove bolesti. Indikacija za ekstrakciju zuba je postavljena na osnovu anamneze, kliničkog pregleda i analizom OPG snimka. Pacijentica je prethodno hospitalizirana i pripremljena za intervenciju na hematološkom odjelu KCUS. Nakon hirurške ekstrakcije zuba 36, primjenjene su hemostatske mjere, te je pacijentici ordinirana antibiotska terapija u trajanju od 7 dana.

Rezultati: Oralnohirurška intervencija izvedena je bez intraoperativnih i postoperativnih komplikacija. Rana je uredno zacijelila per primam, bez znakova produženog krvarenja ili potrebe za dodatnim hemostatskim mjerama.

Zaključak: Multidisciplinarna saradnja između doktora dentalne medicine, oralnog hirurga, hematologa od presudog je značaja u tretmanu pacijenata s poremećajem krvarenja. Osiguravanje sigurnog izvođenja oralnohirurških zahvata kod ovakvih pacijenata zahtijeva pažljivo planiranje, precizan terapijski plan i praćenje, čime se omogućava povoljan klinički ishod i minimiziraju potencijalne komplikacije.

Ključne riječi: koagulopatije, ekstrakcija zuba, von Willebrandova bolest, multidisciplinarna saradnja.

FIELD OF DENTISTRY: ORAL SURGERY

PREPARATION OF PATIENTS WITH CONGENITAL COAGULOPATHIES FOR ORAL SURGICAL PROCEDURES

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ABSTRACT

Introduction: Bleeding disorders, coagulopathies are conditions characterized by prolonged bleeding. Congenital bleeding disorders can involve any phase of hemostasis, including malformations of blood vessels, abnormal platelet structure and function, or deficiencies in coagulation factors such as von Willebrand factor. The aim of this study is to provide practical guidelines for safe performance of oral surgical procedures in patients with coagulopathies. This includes mandatory hematological preparation and postoperative monitoring.

Materials and methods: This paper presents an oral surgical procedure – the extraction of tooth 36 – in a patient with von Willebrand disease. The indication for extraction was chronic periapical infection, confirmed through radiographic and clinical findings. The patient was hospitalized preoperatively and managed at the Hematology Department of the Clinical Center University of Sarajevo. During preparation, antibiotics were administered over 7 days.

Results: The oral surgical procedure was performed without intraoperative or postoperative complications. The wound healed properly by primary intention without signs of prolonged bleeding or the need for additional hemostatic measures.

Conclusions: Multidisciplinary collaboration among dentists, oral surgeons, and hematologists is crucial in the treating patients with bleeding disorders. Proper planning, precise therapeutic management, and close monitoring ensure favorable clinical outcomes and minimize complications, enabling the safe execution of oral surgical procedures in this patient popuation.

Keywords: Coagulopathies, tooth extraction, von Willebrand disease, multidisciplinary collaboration.

OBLAST STOMATOLOGIJE: ORALNA HIRURGIJA

VELIKE CISTE VILIČNIH KOSTIJU - DIJAGNOSTIČKI I TERAPIJSKI PRISTUP

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SAŽETAK

Uvod: Velike ciste viličnih kostiju predstavljaju značajan klinički entitet u oralnoj i maksilofacijalnoj hirurgiji. Najčešće su odontogenog porijekla i karakterišu se prisustvom patološke šupljine ispunjene tečnim ili polutečnim sadržajem, obavijene epitelom. Pravovremena i precizna dijagnostika ključni su faktori u sprečavanju progresije lezije i očuvanju okolnih anatomskih struktura. Cilj ovog rada je da prikaže dijagnostičke metode i hirurške pristupe u tretmanu velikih cisti viličnih kostiju, uz analizu kliničkih slučajeva iz vlastite kazuistike.

Materijal i metode: U radu su prikazana tri slučaja pacijenata koji su upućeni na Kliniku za oralnu hirurgiju zbog simptoma povezanih sa prisustvom cističnih lezija u viličnim kostima. Klinička evaluacija obuhvatila je anamnezu, detaljan stomatološki pregled i radiološke pretrage. Dijagnostika je potvrđena histopatološkom analizom. Terapija je hirurška, koja je podrazumjevala enukleaciju cistične ovojnice i sanaciju zuba uzročnika gdje je to bilo indikovano.

Rezultati: Kod svih pacijenata, savremena radiološka dijagnostika je omogućila preciznu procjenu veličine, položaja i odnosa cistične formacije prema okolnim anatomskim strukturama. Postoperativni tok kod pacijenata bio je uredan, bez komplikacija i sa uspješnim ishodom cijeljenja. Patohistološka analiza je potvrdila dijagnozu odontogenih cisti.

Zaključak: Na osnovu prikazanih slučajeva može se zaključiti da pravovremena i precizna dijagnostika velikih cističnih lezija viličnih kostiju te adekvatan hirurški tretman ne samo da sprečavaju progresiju i destrukciju vilične kosti, nego predstavljaju i zlatni standard u terapiji ovih lezija, omogučavajući potpunu sanaciju pacijenta uz minimizaciju rizika od recidiva.

Ključne riječi: odontogene ciste, radiološka dijagnostika, hirurški tretman, velike koštane lezije.

FIELD OF DENTISTRY: ORAL SURGERY

LARGE JAWBONE CYSTS - DIAGNOSTIC AND THERAPEUTIC APPROACH

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ABSTRACT

Introduction: Large jawbone cysts represent a significant clinical entity in oral and maxillofacial surgery. They are most often of odontogenic origin and are characterised by the presence of a pathological cavity filled with liquid or semi-liquid content, covered with epithelium. Timely and accurate diagnostics, are the key factors in preven-tinglesion progression and preserving surrounding anatomical structures. The aim of this paper is to present diagnostic methods and surgical approaches in the treatment of large jawbone cysts, with an analysis of clinical cases from our own casuistics.

Materials and methods: This paper presents three cases of patients who were referred to the Clinic for Oral Surgery due to symptoms associated with the presence of cystic lesions in the jawbone. Clinical evaluation included anamnesis, detailed dental examination and radiological examinations. The diagnosis was confirmed by histopathological analysis. The treatment was surgical, which included enucleation of the cystic envelope and restoration of the causative tooth where indicated.

Results: In all patients, modern radiological diagnostics enabled precise assessment of the size, position and relation of the cystic formation to the surrounding anatomical structures. The postoperative course in the patients was orderly, without complications and with a successful healing outcome. Pathohistological analysis confirmed the diagnosis of odontogenic cysts.

Conclusion: Based on the presented cases, it can be concluded that timely and precise diagnostics of large cystic lesions of the jawbones and adequate surgical treatment not only prevent the progression and destruction of the jawbone, but also represent the gold standard in the therapy of these lesions, enabling complete recovery of the patient while minimizing the risk of recurrence.

Keywords: odontogenic cysts, radiological diagnostics, surgical treatment, large bone lesions.

OBLAST STOMATOLOGIJE: ORALNA HIRURGIJA

ZNAČAJ STOMATOLOGA I CBCT DIJAGNOSTIKE U DIJAGNOSTICIRANJU MAKSILARNIH SINUSITISA: SLUČAJ USPJEŠNOG TRETMANA NAKON NEUSPJELE OTORINOLARINGOLOŠKE TERAPIJE

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SAŽETAK

Uvod: Maksilarni sinusitis (MS) je upala maksilarnog sinusa uzrokovana bakterijama, virusima, gljivicama, prisustvom alergijskih reakcija, neoplazmi, a može biti i zubnog porijekla kada se govori o odontogenom maksilarnom sinusitisu (OMS). Dijagnoza OMS-a uključuje detaljnu anamnezu, klinički pregled, radiološku dijagnostiku kao što je CBCT dijagnostika.

Cilj rada je pokazati važnost multidisciplinarnog pristupa i utjecaj stomatologa i CBCT dijagnostike u ključnoj dijagnozi MS i njenom ispravnom liječenju.

Studija slučaja pokazuje 47-godišnju pacijenticu koja je konstantno posjećivala doktora medicine i otorinolaringologa zbog jednostranog upornog bola u desnom maksilarnom sinusu, glavobolje, pritiska, otoka, iscjetka iz nosa i slanog sadržaja u grlu. Pacijentica je liječena visokim dozama antibiotika, ali bez rezultata. Po preporuci porodičnog doktora došla je na pregled na naš fakultet. Kliničkim pregledom i CBCT dijagnostikom ustanovljen je periapikalni proces iznad maksilarnih desnih molara koji je protrudirao u sinus i palatum i uočen je jednostrano zasjenjen desni maksilarni sinus. Postavljena je dijagnoza DMS i odlučeno je da se vade molari i istovremeno izvrši operacija sinusa. Postoperativni kontrolni pregledi su pokazali uspješnost tretmana.

Zaključak: MS zahtjeva multidisciplinarni pristup, a stomatolog treba da bude dio tima sa otorinolaringologom kako bi se postavila tačna dijagnoza. CBCT dijagnostika stomatologu pruža brojne mogućnosti i ključni je korak u identifikaciji dentalnog uzročnika i prevenciji neracionalne upotrebe antibiotika, jer bez uklanjanja uzročnika infekcije dolazi do neuspjele terapije MS.

Ispravna dijagnoza je ključ uspjeha!

Ključne riječi: maksilarni sinusitisi, CBCT dijagnostika, uticaj stomatologa, multidisciplinarni pristup

FIELD OF DENTISTRY: ORAL SURGERY

ROLE OF DENTIST AND CBCT DIAGNOSTICS IN THE DIAGNOSIS OF MAXILLARY SINUSITIS: SUCCESSFUL TREATMENT AFTER OTORINOLARYNGOLOGIST THERAPY FAILURE

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ABSTRACT

Introduction: Maxillary sinusitis (MS) is inflammation of the maxillary sinus caused by bacteria, viruses, fungi, presence of allergic reactions, neoplasms and can be by dental origin when talking about odontogenic maxillary sinusitis (OMS). Diagnosis of OMS includes a detailed history, clinical examination, radiological diagnostics such as CBCT diagnostics.

The objective of the paper is to show the importance of a multidisciplinary approach and the influence of the dentist and CBCT diagnostics in the key diagnosis of MS and its correct treatment

Case study shows a 47-year-old female patient who constantly visited a medical doctor and an otolaryngologist due to unilateral persistent pain in the right maxillary sinus, headache, facial pressure, swelling, nasal discharge and salty content in the throat. Patient was treated with hight doses of antibiotics but without results. On the recommendation of her family doctor, she came to our Faculty on examination. Clinical examination and CBCT diagnostic established a periapical process above the maxillary right molars that protruded into the sinus and palate and it was observed unilateral shaded right maxillary sinus. The diagnosis of DMS was made and it was decided to extract the molar and simultaneously perform sinus surgery. Postoperative control results demonstrated the effectiveness of the treatment.

Conclusion: MS requires a multidisciplinary approach and dentist should be part of the team with the otorhinolaryngologist in order to establish correct diagnosis. CBCT diagnostics provides dentists with numerous opportunities and are a key step in identifying the dental causative agent and preventing the irrational use of antibiotics, as MS therapy is ineffective without removing the causative agent of the infection.

Correct diagnosis is the key to success!

Key words: maxillary sinusitis, CBCT diagnostics, role of dentist, multidisciplinary approach.

OBLAST STOMATOLOGIJE: ORALNA HIRURGIJA

KERATOCISTE VILICA – ZNAČAJ PATOHISTOLOŠKE DIJAGNOSTIKE

PRIKAZ SLUČAJA IZ VLASTITE KAZUISTIKE

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SAŽETAK

Uvod: Keratociste su tvorevine koje se javljaju u rijetkim slučajevima, pretežno u mandibuli. Karakteriše ih to što su vrlo agresivne u destrukciji koštanog tkiva i sklone su recidivima i malignom alteriranju. U cilju sprječavanja recidiva nužno je u toku operativnog zahvata odstraniti cistu u cijelosti i ukloniti veći dio koštanog tkiva.

Cilj: Cilj ovog rada je pokazati značaj patohistološke verifikacije uzorka uklonjene lezije i značaj pravilnog hirurškog protokola.

Materijali i metode: U radu je predstavljen slučaj osamnaestogodišnje pacijentice, koja se javila na Kliniku zbog otoka u području angulusa mandibulae, te pojave „balona" distalno od drugog molara.

Urađeni su klinički pregled i 3D CBCT snimak, na kojem je uočljiva rtg svjetlina u području angulusa mandibulae koja odgovara cističnoj leziji. Unutar iste uočljiva je rtg tamnina koja odgovara impaktiranom trećem molaru.

U toku hirurškog tretmana urađena je ekstrakcija zuba 37, zatim enukleacija cistične lezije in toto, sa impaktiranim zubom.

Uklonjena patološka promjena poslana je na ph verifikaciju.

Rezultat: Ovaj slučaj je imao pozitivan ishod; postoperativni tok je uredan što se verifikuje i rtg dijagnostikom.

Zaključak: Ph dijagnostika značajna je u tretiranju patoloških stanja, naročito u slučaju dijagnoze keratociste, što ima značaj u praćenju postoperativnog toka i eventualnih komplikacija.

Ključne riječi: treći molari, ph dijagnostika, keratocista, hirurški protokol.

OBLAST STOMATOLOGIJE: ORALNA HIRURGIJA

KERATOCYST OF THE JAW – THE SIGNIFICANCE OF PATHOHISTOLOGICAL DIAGNOSIS

PRESENTATION OF A CASE FROM ONE'S CASUISTRY

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ABSTRACT

Introduction: Keratocysts are formations that occur in rare cases, mainly in the mandible. They are characterized by being very aggressive in the destruction of bone tissue and are prone to recurrence and malignant alteration. In order to prevent recurrence, it is necessary to remove the cyst completely and remove a large part of the bone tissue during surgery.

The aim of this paper is to demonstrate the importance of histopathological verification of the removed lesion sample and the importance of a proper surgical protocol.

Materials and methods: The paper presents the case of an eighteen-year-old patient, who came to the clinic because of swelling around the angulus of the mandible, and the appearance of a "balloon" distal to the second molar.

A clinical examination and a 3D CBCT scan were performed, which showed a radiolucent area in the mandibular angle corresponding to a cystic lesion. Within the lesion, a radiolucent area corresponding to an impacted third molar was observed.

During the surgical treatment, tooth 37 was extracted, followed by enucleation of the cystic lesion in toto, with the impacted tooth.

The removed pathological change was sent for ph verification.

Result: This case had a positive outcome; the postoperative course was uneventful, as verified by X-ray diagnostics.

Conclusion: Ph diagnostics are important in the treatment of pathological conditions, especially in the case of a keratocyst diagnosis, which is important in monitoring the postoperative course and possible complications.

Keywords: third molars, ph diagnostics, keratocyst, surgical protocol

OBLAST STOMATOLOGIJE: ORALNA MEDICINA

NOVI NEPRIJATELJ ORALNOM I OPĆEM ZDRAVLJU: SNUS I NIKOTINSKE VREĆICE

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SAŽETAK

Uvod: obzirom na sve češću upotrebu snusa, bezdimnog duhanskog proizvoda koji sadrži nikotin, te oralnih nikotinskih vrećica među srednjoškolcima, raste zabrinutost zbog njihovog uticaja na zdravlje. Iako se često predstavljaju kao sigurnija alternativa cigaretama, upotreba ovih proizvoda, uglavnom nekontrolisanog sadržaja, može negativno uticati na opće i oralno zdravlje, uzrokujući vrtoglavicu, mučninu, tahikardiju, te oralne promjene kao što su: gingivalne recesije, hiperkeratoza, diskoloracije i ulceracije. Njihova dostupnost u Bosni i Hercegovini je u stalnom porastu, dok zakonska regulativa i nadzor nisu adekvatno usklađeni. Cilj ovog istraživanja je analizirati prevalenciju upotrebe snusa i nikotinskih vrećica među srednjoškolcima, kao i njihovo znanje o negativnim efektima ovih proizvoda na oralno zdravlje.

Materijal i metode: Presječno epidemiološko istraživanje je provedeno među srednjoškolcima tokom marta 2025. godine, koristeći anonimni anketni upitnik izrađen putem Google Forms platforme.

Rezultati: Istraživanje je provedeno u srednjim školama Kantona Sarajevo na uzorku od 191 ispitanika. Redovnu upotrebu snusa ili nikotinskih vrećica prijavilo je 47 ispitanika (24,6%), dok ih je 74 (38,7%) barem jednom probalo navedene proizvode. Među redovnim korisnicima, 38 (80,9%) je primijetilo promjene u usnoj šupljini, a 33 ispitanika (70,2%) prijavilo je opće zdravstvene tegobe povezane s korištenjem ovih proizvoda. Pored toga, 46 ispitanika (62,2%) koji su ih barem jednom isprobali izjavilo je da bi ih preporučili prijateljima.

Zaključak: Rezultati ukazuju na potrebu za efikasnijim preventivnim mjerama, jačom regulativom i edukativnim programima s ciljem smanjenja dostupnosti i podizanja svijesti o potencijalnim zdravstvenim rizicima.

Ključne riječi: snus, oralne nikotinske vrećice, srednjoškolci, oralno zdravlje.

OBLAST STOMATOLOGIJE: ORALNA HIRURGIJA

THE NEW THREAT TO ORAL AND OVERALL HEALTH: SNUS AND NICOTINE POUCHES

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ABSTRACT

Introduction: The increasing use of snus, a smokeless tobacco product containing nicotine, and oral nicotine pouches among high school students has raised concerns about their impact on health. While marketed as safer alternatives to cigarettes, the use of these products, which mostly contain uncontrolled substances, can negatively affect both general and oral health, causing dizziness, nausea, tachycardia, and oral changes such as gingival recession, hyperkeratosis, discoloration, and ulcerations. The growing prevalence of these products in Bosnia and Herzegovina, alongside inadequate regulation, intensifies these concerns. This study aims to analyze the prevalence of these products among high school students and their awareness of potential negative effects on oral health.

Material and methods: A cross-sectional epidemiological study was conducted among high school students in March 2025 using an anonymous questionnaire created via Google Forms.

Results: The study was conducted in secondary schools in the Sarajevo Canton with a sample of 191 respondents. Regular use of snus or nicotine pouches was reported by 47 respondents (24.6%), while 74 respondents (38.7%) had tried them at least once. Among regular users, 38 (80.9%) noticed changes in their oral cavity, and 33 (70.2%) reported general health issues. Additionally, 46 (62.2%) of those who had tried them at least once stated they would recommend these products to friends.

Conclusion: The results emphasize the need for more effective preventive measures, stronger regulation, and educational programs to reduce availability and raise awareness of potential health risks.

Key words: snus, oral nicotine pouches, high school students, oral health.

FIELD OF DENTISTRY: ORTODONCIJA

EVALUACIJA PRECIZNOSTI DIGITALNOG I MANUELNOG MJERENJA ODNOSA VELIČINE ZUBA I DUŽINE ZUBNOG LUKA

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SAŽETAK

Cilj: Cilj ovog rada jeste prikazati utvrđivanje tačnosti mjerenja Nance prostorne analize dobijenih pomoću intraoralnog skenera u poređenju sa standradnim mjerenjima na gipsanom modelu.

Materijali i metode: Za realizaciju ovog istraživanja, definisan je uzorak. Uzorak na kojem se vršilo istraživanje činilo je 20 ispitanika. Svi ispitanici morali su ispunjavati sljedeće kriterije:

- Da nisu ortodontski tretirani
- Da imaju kompletiranu stalnu denticiju
- Da su zubi bez karijesa
- Da su zubi bez restauracija na aproksimalnim površinama

Svim ispitanicima sprovedeno je intraoralno skeniranje i digitalna analiza sa ciljem prikazivanja zubnih nizova gornje i donje vilice, meziodistalih promjera stalnih zuba i međuviličnih odnosa. Nakon toga sprovedeno je ručno mjerenje meziodistalnih promjera pomoću šublera na gibsanim modelima ispitanika, te mjerenje Nance prostorne analize. Na kraju je izvršeno poređenje rezultata dobijenih digitalnom analizom sa rezultatima manuelnog mjerenja na gibsanim modelima.

Zaključak: Primjena intraoralnog skenera u ortodonciji je jednostavnija i ugodnija za pacijente u odnosu na metodu uzimanja otisaka, posebno kod djece. Intraoralni sken zuba i okolnih struktura poboljšava i olakšava proces analize u svrhu dijagnostike i planiranja terapije. Za razliku od gipsanih modela koji zahtjevaju prostor za odlaganje, sa intraoralnim skenerom svi podaci su na jednom mjestu u digitalnoj formi.

Ključne riječi: intaoralni scan, Nance, meziodistalni promjer

FIELD OF DENTISTRY: ORTHODONTICS

ACCURACY EVALUATION OF DIGITAL AND MANUAL MEASUREMENTS BETWEEN TOOTH SIZE AND DENTAL ARCH LENGTH

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ABSTACT

The aim: The aim of this paper is to demonstrate accuracy of Nance spatial analysis measurements using an intraoral scanner in comparison with standard measurements on a plaster model.

Material and methods: To conduct this research, a sample was defined. The sample was consisted of 20 respondents. All respondents had to meet the following criteria:

- That they have not undergone orthodontics treatment
- That they have complete permanent dentition
- That the teeth are caries-free
- That the teeth are without restorations on the proximal surfaces

All subjects underwent intraoral scanning and digital analysis with the aim of showing the dental rows of the upper and lower jaws, mesiodistal diameters of permanent teeth, and maxillomandibular relationship. After that, manual measurement of mesiodistal diameters using calipers on plaster casts of the subjects was performed, as well as Nance spatial analysis measurements. Finally, the results obtained by digital analysis were compared with the results of manual measurement on plaster casts.

Conclusion: The use of intraoral scanning in orthodontics is simpler and more comfortable for patients compared to the impression method, especially in children. Intraoral scanning of teeth and surrounding structures improves and facilitates the analysis process for the purpose of diagnosis and treatment planning. Unlike plaster models that require storage space, with an intraoral scanner all data is in one place in digital form.

Key words: intraoral scan, Nance, mesiodistal diameter

FIELD OF DENTISTRY: ORTODONCIJA

EKSTRAKCIJE U SKLOPU ORTODONTSKOG TRETMANA

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SAŽETAK

Uvod: Iako već desetljićima kontroverzna tema, ekstrakcija stalnih zuba je u današnje vrijeme nerijetko neophodan dio sveobuhvatne ortodontske terapije s ciljem postizanja stabilne i funkcionalne okluzije i poboljšanja estetike. Definitivna odluka o sprovođenju ekstrakcione terapije donosi se na osnovu analize parametara kao što su: uzrast pacijenta, tip rasta pacijenta, izgled profila lica, inklinacija sjekutića, nedostatak prostora po zubnom luku, mogućnost ekspanzije zubnih lukova, tonusa muskulature usana i obraza, te pacijentovog stava prema ovom vidu terapije i mogućnosti saradnje.

Cilj istraživanja je procijeniti učestalost ekstrakcionog u odnosu na neekstrakcioni plan ortodontskog tretmana kod pacijenata koji su ortodontski obrađeni na Katedri za Ortodonciju Stomatološkog fakulteta sa stomatološkim kliničkim centrom u Sarajevu u zadatom vremenskom periodu.

Materijali i metodi: Studijom retrospektivnog karaktera uključen je 301 pacijent koji je liječen na Katedri za Ortodonciju Stomatološkog fakulteta u Sarajevu u periodu od oktobra 2023. do februara 2025. godine. Za potrebe ovog istraživanja analizirani su digitalni ortopantomogramski snimci, laterolateralni kefalogrami, studijski modeli, te fotografije pacijenata.

Rezultati pokazuju da je od ukupno 301 pacijenta u gore navedenom periodu ekstrakciona terapija jednog ili više zuba bila planirana kod 55 pacijenata od čega su 20 bili dječaci, a 35 djevojčice starosne dobi 11 do 20 godina.

Zaključak: Ovim istraživanjem zaključujemo da je 18,27% ispitanika imalo potrebu za ekstrakcijom jednog ili više stalnih zuba u sklopu ortodontske terapije. Ekstrakcije su bile učestalije kod pripadnika ženskog spola uzrasta 15-16 godina.

Zubne ekstrakcije su neophodne u tretmanu brojnih malokluzija. Ipak, one zahtijevaju temeljito razumijevanje fiziologije erupcije, okluzije i estetike lica, kao i dugotrajnu stabilnost rezultata.

Ključne riječi: ekstrakcija, ortodontska terapija, okluzija, estetika

FIELD OF DENTISTRY: ORThODONTICS

TOOTH EXTRACTION IN ORTHODONTICS

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ABSTRACT

Introduction: Although a controversial topic for decades, the extraction of permanent teeth is increasingly an essential part of comprehensive orthodontic treatment aimed at achieving a stable and functional occlusion and improving aesthetics. The final decision regarding the implementation of extraction therapy is made based on the analysis of parameters such as the patient's age, growth pattern, facial profile appearance, incisor inclination, lack of space in the dental arch, potential for arch expansion, lip and cheek muscle tone, and the patient's attitude towards this type of therapy and their ability to cooperate.

Objective: The aim of the stufdy is to assess the frequency of extraction-based versus nonextraction orthodontic treatment plans in patients treted at the Department of Orthodontics, Faculty of Dentistry with Dental Clinical Center in Sarajevo, during a specified time period.

Materials and methods: This retrospective study included 301 patients treated at the Department of Orthodontics, Faculty of Dentistry, Sarajevo, from October 2023 to February 2025. For the purposes of this research, digital orthopantomograms, lagteral cephalograms, study models, and patient photographs were analyzed.

Results: The results show that out of the total 301 patients during the aforementioned period, extraction therapy for one or more teeth was planned for 55 patients, of which 20 were boys and 35 were girls, aged 11 to 20 years.

Conclusion: This study concludes that 18,27% of the participants required extraxtion of one or more permanent teeth as part of their orthodontic treatment. Extractions were more frequent in female patients aged 15-16 years. Tooth extractions are necessary in the treatment of various malocclusions. However, they require a thorough understanding of eruption physiology, occlusion, facial aesthetics, and long-term stability of the results.

Keywords: extraction, orthodontic treatment, occlusion, aesthetics

FIELD OF DENTISTRY: ORTODONCIJA

ATIPIČNI OBLICI HIPODONCIJE

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SAŽETAK

Uvod: Hipodoncija je urođeni nedostatak jednog do šest zuba. Uzrok hipodoncije je obično nejasan, ali uglavnom se povezuje s genetskim poremećajima i s uticajem određenih faktora okoline koji djeluju tokom razvoja. Hipodoncija se kao anomalija može pojaviti kod zdravih ljudi, ali se javlja i kod sindroma, kao i kod rascjepa nepca. Hipodoncija pojedinih zuba trajne denticije je 1,37 puta češća kod žena nego kod muškaraca. Na Stomatološkom fakultetu u Sarajevu 2019. godine je provedeno istraživanje o učestalosti hipodoncije, kojim je utvrđena prevalenca hipodoncije od 3,42%. Postoje određene teorije koje objašnjavaju nesindromsku hipodonciju, kao što je Duhlberg-ova. Prema ovoj teoriji zubni niz se sastoji od genetski stabilnih i labilnih zuba. Mezijalni zubi u svakoj grupi su stabilni, a distalniji zub iste grupe je labilan i najčešće zahvaćen hipodoncijom. Najčešće nedostaju umnjaci, gornji lateralni sjekutići i drugi premolari.

Hipodoncija donjih umnjaka je toliko česta, da se danas smatra normalnom pojavom.

Cilj ove prezentacije je bio prikazati slučajeve atipične hipodoncije, odnosno nedostatak genetski stabilnih zuba.

Materijali i metode koji su korišteni u svrhu ovog istraživanja su ortopantomografski snimci snimljeni na Stomatološkom fakultetu sa stomatološkim kliničkim centrom u Sarajevu.

Rezultati: Od 382 pregledana OPG snimka, na njih 7 je pronađena atipična hipodoncija. Od toga, kod četiri pacijenta nedostaju stalni drugi molari. Očnjaci i prvi premolari nedostaju kod ukupno tri pacijenta, te gornji centralni sjekutić kod jednog.

Zaključak: Pacijentima sa hipodoncijom mogu se javiti poteškoće pri žvakanju i govoru te narušena estetika. Liječenje zahtjeva multidisciplinarni pristup koji je individualno prilagođen svakom pacijentu.

Ključne riječi: hipodoncija, atipični nedostatak zuba, ortodoncija

FIELD OF DENTISTRY: ORTHODONTICS

ATYPICAL FORMS OF HYPODONTIA

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ABSTRACT

Introduction: Hypodontia is a congenital deficiency of one to six teeth. The cause of hypodontia is usually unclear, but it's commonly connected to genetic malformations and the influence of environmental factors due to their influence during growth and development. Hypodontia can occur alongside healthy individuals and conditions such as syndromes and cleft palate. Hypodontia in permanent dentition is 1.37 times more common in women than in men. In 2019, at the Faculty of Dentistry of Sarajevo, research was conducted to evaluate the prevalence of hypodontia, and the results estimated a prevalence of 3.42%. Some theories, such as Duhlberg's, explain non-syndromic hypodontia. According to this theory, a dental arch consists of genetically stable and unstable teeth, where the tooth located more mesially is genetically stable, and the tooth located more distally in the dental arch is genetically labile and is more frequently affected by hypodontia. The most commonly missing teeth are third molars, maxillary lateral incisors, and maxillary second premolars. Hypodontia of mandibular third molars is so common that it's a normal phenomenon.

The aim of this paper was to present atypical hypodontia, the absence of genetically stable teeth.

Materials and methods: This research was conducted at the Faculty of Dentistry, University of Sarajevo, using radiographs of patients referred for the orthodontic examination.

Results: Out of 382 reviewed OPG images, atypical hypodontia was found in 7 of them. Four of them have missing permanent second molars. Canines and first premolars are missing in a total of three, and upper central incisor in one patient.

Conclusions: Patients with hypodontia may face mastication difficulties and aesthetic problems. Treatment of hypodontia includes a multidisciplinary approach that is individually adapted for each patient.

Keywords: hypodontia, atypical hypodontia, orthodontics

FIELD OF DENTISTRY: ORTODONCIJA

EKSTRAKCIJA ZUBA U ORTODONCIJI - NAJČEŠĆI RAZLOZI ZA EKSTRAKCIJU I VRSTA ZUBA

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SAŽETAK

Uvod: Ekstrakcija u okviru ortodontske terapije je relativno česta intervencija. Više je razloga zbog kojih se pristupa ekstrakciji iz ortodontskih razloga - nedostatak prostora za smještaj zuba, kamuflažni tretman skeletnih diskrepanci, strukturne i razvojne anomalije zuba.

Cilj: Utvrditi broj ekstrakcionih slučajeva u odnosu na neekstrakcione slučajeve, kao i razloge ekstrakcije i vrstu ekstrahiranih zuba.

Materijali i metode: Za potrebe ovog istraživanja analizirani su dijagnostički protokoli pacijenata na Klinici za ortodonciju Stomatološkog fakulteta sa stomatološkim kliničkim centrum Univerziteta u Sarajevu. Studijom retrospektivnog karaktera uključeno je 364 pacijenta Klinike za ortodonciju Stomatološkog fakulteta sa stomatološkim kliničkim centrum Univerziteta u Sarajevu kod kojih je planirana ortodontska terapija u periodu od septembra 2023. do februara 2025. godine.

Rezultati: Rezultati analize su pokazali da od 364 pacijenata kod kojih je planirana ortodontska terapija, kod 35 pacijenata je planirana ekstrakcija jednog ili više zuba.

Među 35 ekstrakcionih slučajeva najčešći razlozi za ekstrakciju zuba u okviru ortodontskog tretmana su bili: zbijenost zuba (nedostatak prostora), bimaksilarna protruzija, kamuflažni tretman, asimetrije, karijes, impakcije zuba (nepovoljan položaj), dentalne anomalije (prekobrojni zubi, atipični zubi). U odnosu na vrstu zuba, najčešće je bila zastupljena ekstrakcija: prvi premolari – 25 pacijenata, drugi premolari – 3 pacijenta, lateralni sjekutić – 3 pacijenta, očnjak – 4 pacijenta.

Zaključak: Najčešći razlozi za ekstrakciju su bili: zbijenost zuba i asimetrija. A najčešće je bila zastupljena ekstrakcija gornjih prvih premolara.

Primjena ekstrakcije zahtijeva veliki oprez, poznavanje rasta i razvoja kraniofacijalnong kompleksa, razumijevanje denticije i okluzije, i pažljivo planiranje ortodontske terapije.

Ključne riječi: Ortodoncija, ortodontska terapija, ekstrakcija zuba.

FIELD OF DENTISTRY: ORThODONTICS

TOOTH EXTRACTION IN ORTHODONTICS – MOST COMMON REASONS FOR EXTRACTION AND TYPE OF TOOTH

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ABSTRACT

Introduction: Tooth extraction in orthodontic treatment is relatively frequent intervention. There are many reasons for tooth extraction in orthodontic treatment, the lack of space for placing the teeth, camouflage treatment of skeletal discrepancies, structural and developmental anomalies of teeth.

Aim: Determine the number of extraction cases in relation to non-extraction cases, reasons for extraction and what teeth have been extracted.

Materials and methods: For the purpose of this research, the diagnostic protocols of patients that have been treated in Clinic for Orthodontics of Faculty of Dentistry with Dental Clinical Center have been analyzed. In this study of retrospective character 364 patient who were treated in Clinic for Orthodontics of Faculty of Dentistry with Dental Clinic Center during the period of September 2023. till February 2025. have been included.

Results: Out of 364 patients, extraction treatment of one or more teeth has been carried out for 35 patients. Most common reasons for tooth extraction in orthodontic treatment are: crowding, bimaxillary protrusion, camouflage, dental asymmetry, caries complications, impaction, dental anomalies. Most frequently extracted teeth are: first premolars (25), second premolars (3), canines (4), lateral incisors (3).

Conclusion: The most common reasons for extraction were: tooth crowding and asymmetry.

The most common extracted teeth were upper first premolars.

Extraction as a part of orthodontic treatment requires caution, knowledge of the growth and development of the craniofacial complex, understanding dentition and occlusion and careful planning of orthodontic therapy.

Key words: Orthodontics, orthodontic therapy, tooth extraction.

FIELD OF DENTISTRY: PARODONTOLOGIJA

PROCJENA ORALNE HIGIJENE U PREVENCIJI GINGIVITISA KOD STUDENTSKE POPULACIJE STOMATOLOŠKOG I DRUGIH FAKULTETA UNIVERZITETA SARAJEVO

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SAŽETAK

Uvod: Gingivitisi izazvani lošom oralnom higijenom uz karijes zuba su najčešća oboljenja među školskom i studentskom populacijom. Edukacija studenata o njihovom oralnom zdravlju podiže svijest o oralnoj higijeni kao najbitnijoj mjeri prevencije pojave gingivitisa.

Cilj: Cilj istraživanja je analizirati navike održavanja oralne higijene i pravilnost primjene oralnih higijenskih metoda među studentima Stomatološkog fakulteta i studenata sa drugih fakulteta Univerziteta u Sarajevu, s posebnim naglaskom na procjenu važnosti održavanja oralne higijene u prevenciji gingivitisa.

Materijali i metode: U istraživanje je uključeno 30 studenata Stomatološkog fakulteta i 30 studenata sa drugih fakulteta Univerziteta u Sarajevu. Dob ispitanika je u rasponu od 21 do 26 godina. Svi ispitanici su prije pregleda potpisati informirani pristanak za dobrovoljno učestvovanje. Podaci koji su se uzimali prilikom pregleda unešeni su u posebno osmišljene radne kartone, za ovo istraživanje.

Istraživanje je provedeno na studentskim vježbama tokom ljetnog semestra 2023/2024. godine. Inkluzioni kriterji su bili da su studenti sistemski zdravi, da ne uzimaju neku terapiju. Ekskluzioni kriteriji da studenti imaju neko sistemsko oboljenje, i da su pod terapijom.

Po tipu istraživanja radi se o presječnom istraživanju (cross-sectional study).

Svim ispitanicima su postavljena pitanja o štetnim navikama, o načinima sprovođenja oralne higijene i redovnim posjetama stomatologu, te im je urađen klinčki pregled gingive, određivanje parodontalnih indeksa i testova koji se koriste u dijagnostičke svrhe.

Rezultati: Rezultati će biti statistički analizirani i obrađeni u programu SPSS Statistics 21.0. i prodiskutovani sa rezultatima drugih autora, publikovanih u reevantnim bazama podataka.

Zaključak: U zaključku bit će navedene bitne činjenice proizašle iz rezultata i diskusije.

Ključne riječi: student, oralna higijena, loše navike.

FIELD OF DENTISTRY: PERIODONTOLOGY

ASSESSMENT OF ORAL HYGIENE IN THE PREVENTION OF GINGIVITIS AMONG STUDENTS OF THE FACULTY OF DENTISTRY AND OTHER FACULTIES AT THE UNIVERSITY OF SARAJEVO

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ABSTRACT

Introduction: Gingivitis caused by poor oral hygiene, along with dental caries, is one of the most common diseases among school and university students. Educating students about their oral health raises awareness of oral hygiene as the most important preventive measure against gingivitis.

Objective: The aim of this study is to analyze oral hygiene habits and the proper application of oral hygiene methods among students of the Faculty of Dentistry and students from other faculties of the University of Sarajevo, with a special emphasis on assessing the importance of oral hygiene in the prevention of gingivitis.

Materials and Methods: The study included 30 students from the Faculty of Dentistry and 30 students from other faculties of the University of Sarajevo, aged between 21 and 26 years. Before the examination, all participants signed an informed consent form for voluntary participation. The collected data were recorded in specially designed work charts for this research.

The study was conducted during student practical exercises in the summer semester of the 2023/2024 academic year. Inclusion criteria required that students be systemically healthy and not undergoing any therapy. Exclusion criteria included students with systemic diseases or those receiving therapy.

This study is a cross-sectional study. All participants were asked questions about harmful habits, oral hygiene practices, and regular dental visits. A clinical examination of the gingiva was performed, along with periodontal index assessments and diagnostic tests.

Results: The results will be statistically analyzed using SPSS Statistics 21.0 and compared with findings from other studies published in relevant databases.

Conclusion: The conclusion will highlight key findings derived from the results and discussion.

Keywords: student, oral hygiene, bad habits.

FIELD OF DENTISTRY: PREVENTIVNA STOMATOLOGIJA

SOFTVERSKA RJEŠENJA U PREVENCIJI DENTALNIH OBOLJENJA: ULOGA APLIKACIJE "NUTRI" U KONTROLI ORALNE HIGIJENE I ISHRANE DJECE

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SAŽETAK

Uvod: Istraživanje analizira utjecaj digitalnih rješenja u prevenciji dentalnih oboljenja kod djece, s fokusom na aplikaciju za praćenje prehrane i oralne higijene razvijene u Bosni i Hercegovini.

Cilj. Procijeniti efikasnost "Nutri" aplikacije u poboljšanju pH pljuvačke, smanjenju plaka i redukciji unosa šećera.

Materijali. Korištena je mobilna aplikacija "Nutri", vaga InBody 720 za analizu tjelesnog sastava, test trakice za pH pljuvačke, ultra soft dentalne četkice kao i paste za zube (1400 ppm) za sve ispitanike. Podaci su prikupljeni na početku i kraju istaživanja.

Metode. U osmosedmičnom istraživanju učestvovalo je 40 djece (12-17 godina), podijeljenih u dvije grupe. Eksperimentalna grupa (n=20) koristila je aplikaciju za digitalno praćenje, dok je kontrolna grupa (n=20) imala štampani plan ishrane i higijene. Za određivanje dentalnog plaka korištena je O'Leary metoda plak kontrolnog indeksa (PCI). Stomatolog je na početku istraživanja svim ispitaicima dao upute za pravilno pranje zuba.

Rezultati. Prosječna pH vrijednost pljuvačke povećala se za 12% u eksperimentalnoj grupi, dok je u kontrolnoj porasla za 5% (p=0.03). PCI se smanjio za 50% u eksperimentalnoj, dok je u kontrolnoj grupi smanjenje iznosilo 27.5% (p=0.02). Plak je smanjen kod 90% ispitanika u eksperimentalnoj grupi i 60% u kontrolnoj (p=0.01). Dosljednost pridržavanju preporuka bila je veća kod djece koja su koristila aplikaciju (p<0.01).

Zaključak. Istraživanje potvrđuje da digitalni alati ovog tipa mogu poboljšati prehrambene kao i navike redovnog održavanja oralne higijene. Omogućeno je preciznije praćenje ishrane, oralne higijene, brža komunikacija i kontrola ključnih parametara.

Ključne riječi: digitalno zdravlje, oralna higijena, prehrana, prevencija

FIELD OF DENTISTRY: PREVENTIVE DENTISTRY

SOFTWARE SOLUTIONS IN THE PREVENTION OF DENTAL DISEASES: THE ROLE OF THE "NUTRI" APPLICATION IN MONITORING ORAL HYGIENE AND NUTRITION IN CHILDREN

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ABSTRACT

Introduction. This study analyzes the impact of digital solutions in preventing dental diseases in children, focusing on an application for monitoring diet and oral hygiene developed in Bosnia and Herzegovina.

Objective. To assess the effectiveness of the "Nutri" application in improving saliva pH, reducing plaque, and decreasing sugar intake.

Materials. The study utilized the "Nutri" mobile application, InBody 720 scale for body composition analysis, saliva pH test strips, ultra-soft toothbrushes, and fluoride toothpaste (1400 ppm) for all participants. Data were collected at the beginning and end of the study.

Methods. The eight-week study included 40 children aged 12–17, divided into two groups. The experimental group (n=20) used the application for digital tracking, while the control group (n=20) followed a printed dietary and oral hygiene plan. The O'Leary Plaque Control Index (PCI) method was used for plaque assessment. At start of the study, the dentist provided all participants with instructions on proper toothbrushing techniques.

Results. The average saliva pH increased by 12% in the experimental group compared to 5% in the control group (p=0.03). PCI decreased by 50% in the experimental group and by 27.5% in the control group (p=0.02). Plaque reduction was observed in 90% of participants in the experimental group and 60% in the control group (p=0.01). Adherence to dietary and hygiene recommendations was significantly higher among children using the application (p<0.01).

Conclusion. This study confirms that digital tools of this type can improve dietary habits and regular oral hygiene practices. They enable more precise monitoring.

Keywords: digital health, oral hygiene, diet, prevention

FIELD OF DENTISTRY: PREVENTIVNA STOMATOLOGIJA

STAVOVI I ZNANJA STUDENATA STOMATOLOŠKOG FAKULTETA SA STOMATOLOŠKIM KLINIČKIM CENTROM O INTERDENTALNIM ČETKICAMA

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SAŽETAK

Uvod: Zubni plak predstavlja zajednicu mikroorganizama smještenu na zubnim površinama i ujedno je glavni etiološki uzročnik u nastanka karijesa i parodontopatija. Ne postoji sredstvo koje dovodi do potpunog uklanjanja zubnog plaka, ali kumulativnim djelovanjem većeg broja sredstava njegova patogenost se može značajno smanjiti. Mehanička kontrola plaka podrazumijeva korištenje manuelne četkice za zube, zubnog konca i interdentalnih četkica. Četkica za zube nije u mogućnosti ukloniti plak u interdentalnim prostorima, zbog toga je potrebno koristiti i dodatna sredstva za njegovo uklanjanje.

Cilj: Utvrditi stavove studenata Stomatološkog fakulteta sa stomatološkim kliničkim centrom u Sarajevu vezane za upotrebu interdentalnih četkica, kao i povezanost navedenih stavova sa godinom studija koju studenti pohađaju.

Ispitanici i metode: Istraživanje je uključivalo studente integriranog studija Stomatološkog fakulteta sa stomatološkim kliničkim centrom u Sarajevu, čiji su stavovi vezani za interdentalne četkice ispitivani putem anketnog upitnika.

Rezultati: U rezultatima će biti prikazana distribucija odgovora studenata i studentica u odnosu na godinu integriranog studija, koju trenutno pohađaju. Distribuirani odgovori ukazati će na stepen studentskog znanja i korelaciju sa godinom studija.

Zaključak: Sticanjem znanja studenti raspolažu informacijama, koje će kasnije kroz praksu prenositi pacijentima u cilju očuvanja optimuma oralnog zdravlja i sprečavanja nastanka oralnih oboljenja. Tokom studija stiču znanja i o sredstvima, koja se koriste za redukciju prisustva plaka u usnoj šupljini.

Ključne riječi: interdentalne četkice, znanje, stavovi, studenti

FIELD OF DENTISTRY: PREVENTIVE DENTISTRY

ATTITUDES AND KNOWLEDGE OF STUDENTS AT THE FACULTY OF DENTAL MEDICINE WITH THE DENTAL CLINICAL CENTER ON INTERDENTAL BRUSHES

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ABSTRACT

Introduction: Dental plaque represents a community of microorganisms located on dental surfaces and is also the main etiological cause of caries and periodontitis. There is no agent that leads to the complete removal of dental plaque, but with the cumulative action of a large number of agents, its pathogenicity can be significantly reduced. Mechanical plaque control involves the use of a toothbrush, dental floss and interdental brushes. A toothbrush is not able to remove plaque in interdental spaces, so it is necessary to use additional means to remove it.

Aim: To determine the attitudes of students at the Faculty of Dental Medicine with the Dental Clinical Center in Sarajevo related to the use of interdental brushes, as well as the connection of these attitudes with the year of study they attend.

Participants and methods: The research included students of the Faculty of Dental Medicine with the Dental Clinical Center, whose attitudes related to interdental brushes were examined through a questionnaire.

Results: The results will show the distribution of students' responses in relation to the year of study they are currently attending. The distributed responses will indicate the level of student knowledge and its correlation with the year of study.

Conclusion: Students are getting knowledge, which they will transfer to the patients with the aim of preserving oral health and prevention of oral diseases. Besides that, they also acquire knowledge about means used to i dental plaque reduction in oral cavity.

Keywords: interdental brushes, knowledge, attitudes, students

FIELD OF DENTISTRY: : RESTAURATIVNA I ADHEZIVNA STOMATOLOGIJA

UTICAJ IZLOŽENOSTI PLAVOJ SVJETLOSTI IZ POLIMERIZACIJSKIH LAMPI NA ZDRAVLJE OKA: PRAKSA MEĐU STOMATOLOZIMA

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SAŽETAK

Izlaganje oka visokom intenzitetu plave svjetlosti polimerizacijskih lampi kroz duži vremenski period može dovesti do oštećenja retine. Oštećenja oka mogu nastati kao rezultat direktne, akcidentalne ekspozicije plavoj svjetlosti ili kao kumulativni efekat rasutih svjetlosnih talasa usljed nekorištenja adekvatne zaštite.

Cilj ovog rada je ispitati praksu stomatologa o upotrebi zaštitnih barijera tokom polimerizacije te prikazati moguće štetne efekte plave svjetlosti na zdravlje.

Istraživanje je sprovedeno anonimnim anketiranjem stomatologa na području Kantona Sarajevo, u državnim ustanovama i privatnim ordinacijama. Od ukupno 120 anketa, 108 stomatologa (90%) je dostavilo popunjen upitnik.

Istraživanje je pokazalo da četvrtina ispitanih stomatologa ni na koji način ne štiti oči od polimerizacijske svjetlosti, dok najveći procenat (67%) smatra da će oči zaštititi time što ne gleda u svjetlost. Svega 8% ispitanika koristi adekvatnu zaštitu tokom polimerizacije i to u vidu zaštitnih naočala. Analiza sprovedene ankete je izvršena i u odnosu na godine radnog iskustva pri čemu je utvrđeno da stomatolozi sa preko 20 godina radnog iskustva ne koriste nikakvu zaštitu pri polimerizaciji.

Rezultati ankete su pokazali nedostatke u svakodnevnoj praksi lične zaštite anketiranih stomatologa. U okviru edukacijskih programa stomatolozima je potrebno skrenuti pažnju na potencijalne štetne efekte polimerizacijskih lampi, kao i na zdravstvene posljedice koje mogu nastati usljed nezaštićenog izlaganja plavoj svjetlosti.

Ključne riječi: polimerizacijske lampe, plava svjetlost, zaštitne naočale, retina, anke

FIELD OF DENTISTRY: RESTORATIVE AND ADHESIVE DENTISTRY

THE IMPACT OF LIGHT-CURING UNITS BLUE LIGHT EXPOSURE ON EYE HEALTH: PRACTICE AMONG DENTISTS

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ABSTRACT

Prolonged exposure of the eye to high-intensity blue light from light-curing units (LCUs), can lead to retinal damage. Eye damage may result from direct accidental exposure to blue light or from the cumulative effect of scattered light waves due to inadequate or no eye protection.

The aim of this study was to assess the practices of dentists regarding the use of protective barriers during polymerization and to determine the potential adverse effects of LCUs blue light.

An anonymous survey examined dentists in Canton Sarajevo who work in state institutions and private practices. A total of 120 surveys were distributed, and 108 dentists (90%) completed and returned the questionnaires.

The findings indicated that a quarter of the surveyed dentists did not use any form of eye protection against polymerization light. The majority (67%) of the participants believed that avoiding direct exposure to light provided sufficient eye protection. Only 8% of respondents ensured adequate eye protection with protective glasses during polymerization. The survey analysis also included years of work experience and showed that dentists with over 20 years of work experience did not use eye protection during polymerization.

The analysis of the survey revealed certain shortcomings in the daily personal protection practices of the surveyed dentists. We find it essential for educational programs to highlight the potential harmful effects of LCUs, particularly the health consequences of unprotected exposure to blue light.

Keywords: Light-curing units, blue light, protective glasses, retina, questionnaire.

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