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International Conference is the 10th international interdisciplinary peer reviewed conference which publishes works of the scientists as well as practitioners in the area where UBT is active in Education, Research and Development. The UBT aims to implement an integrated strategy to establish itself as an internationally competitive, research-intensive institution, committed to the transfer of knowledge and the provision of a world-class education to the most talented students from all backgrounds. It is delivering different courses in science, management and technology. This year we celebrate the 20th Years Anniversary. The main perspective of the conference is to connect scientists and practitioners from different disciplines in the same place and make them be aware of the recent advancements in different research fields, and provide them with a unique forum to share their experiences. It is also the place to support the new academic staff for doing research and publish their work in international standard level. This conference consists of sub conferences in different fields: - Management, Business and Economics - Humanities and Social Sciences (Law, Political Sciences, Media and Communications) - Computer Science and Information Systems - Mechatronics, Robotics, Energy and Systems Engineering - Architecture, Integrated Design, Spatial Planning, Civil Engineering and Infrastructure - Life Sciences and Technologies (Medicine, Nursing, Pharmaceutical Sciences, Phycology, Dentistry, and Food Science),- Art Disciplines (Integrated Design, Music, Fashion, and Art). This conference is the major scientific event of the UBT. It is organizing annually and always in cooperation with the partner universities from the region and Europe. In this case as partner universities are: University of Tirana – Faculty of Economics, University of Korca. As professional partners in this conference are: Kosova Association for Control, Automation and Systems Engineering (KA – CASE), Kosova Association for Modeling and Simulation (KA – SIM), Quality Kosova, Kosova Association for Management. This conference is sponsored by EUROSIM - The European Association of Simulation. We have to thank all Authors, partners, sponsors and also the conference organizing team making this event a real international scientific event. This year we have more application, participants and publication than last year.

Congratulation!

Edmond

Hajrizi, Rector of UBT and Chair of IC - BTI 2021

THE EFFECT OF NEW INTERNAL FERRULE DESIGN PREPARATION ON THE FRACTURE RESISTANCE OF ENDODONTICALLY TREATED CENTRAL INCISORS

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Abstract. Statement of problem. Many studies concerning that the amount of remaining coronal toothstructure may have a significant effect on fracture resistance of endodontically treated teeth.Purpose. This study investigated the fracture resistance of endodontically treated anterior central incisors prepared with internal ferrule preparation design.

Abstract. Material and methods. A total of 120 extracted human maxillary central incisor were endodontically treated and divided into 10 groups of 12. From Group A1 to E1 and A2 to E2 represented teeth were prepared without (0mm), 0.5mm, 1mm, 1.5mm, and 2mm internal ferrule preparation. As material for our experiments, we used Ø1.4 - 1.6mm Y-TZP ceramics posts with retention forms in the coronary part of the post, upgraded with IPS E-MAX, Ivoclar, Vivadent. The experimental samples were cemented (Multilink Automix, Ivoclar), embedded in acrylic resin blocks (ProBase Polymer/Monomer, Ivoclar) and loaded at an angle of 45° degrees in an Instron Testing Machine 4301 (Instron Corp., USA) at a crosshead speed of 1mm/min until fracture. Fracture loads (N) and modes (repairable or catastrophic) were recorded. Two-way analysis of variance was used for statistical analysis with the level ofsignificance seat $p<0.05$. Failure patterns were analyzed in the optical microscope Stereo Discovery V.8 (Carl Zeiss, Germany).

Results. The mean values (±SD) for fracture loads were measured (Newtons) for the first two groups without internal ferrule (0mm) = A1: 1.4mm - 405,04N (±100.04); and A2: 1.6 mm - 503,09N (±109.01); for next two groups with 0.5mm = B1: 1.4mm - 401.07N (±75.02) and B2: 1.6mm - 507.13N (±101.08), for next two groups with 1mm = C1: 1.4mm - 479.01N (±109.12) and C2: 1.6mm - 567.06N (±134.37), for next two grups with 1.5mm = D1: 1.4mm - 601.73N (±103.52) and D2: 1.6mm - 675.79N (±171.09), and for last two groups with 2mm = E1: 1.4mm - 719.99N (±220.02) and E2: 1.6mm - 861.06N (±237.15).

Failure patterns within those 1.4 – 1.6mm Y-TZP posts - E-MAX cores groups revealed non catastrophic failure in groups (0mm) A1-A2 = 100% - 100%, groups (0.5mm) B1-B2 = 100% - 100%; groups (1mm) C1-C2 = 91.7% - 91.7%, groups (1.5mm) D1-D2 = 91.7% - 75%; and for 2mm (internal ferrule preparation design) were 66.7% -58.3% in both of groups E1-E2.

Conclusion. With the limitations of this study, the teeth prepared without (0mm), with 0.5mm and 1mm internal ferrule preparation design demonstrated significantly lower failure loads then those with 1.5 and 2mm IF. The results showed that zirconium posts with retentive coronal part and 1.5mm - 2mm internal ferrule preparation which contribute to increasing the fracture resistance of the restored root-coronary dental complex, show significance higher fracture resistance. No-significant results were determined in all of experimental groups restored with different diameter (Ø 1.4 - 1.6mm) of zirconia posts.

Keywords: endodontically treated teeth, zirconia post, ferrule

Introduction

Many studies concerning that the amount of remaining coronal tooth structure may have an effect on the fracture resistance of endodontically treated teeth to provide ferrule effect.[1,2,3,4,5]

Several authors,[6,7,16,17,19,21] have suggested that it is very important to provide ferrule effect from the post, the core and the crown, but they extend their researches only on the effect of the dentin and crown ferrule. Only few studies investigate the effect of internal ferrule preparation on fracture resistance of endodontically treated teeth restored with different post and core. Jovanovski[8]

Faria at al[9] tested different designs of tooth preparation. They researched the influence of the remaining coronal tooth structure location on the fracture resistance and concluded that palatal walls were more resistant to fractures than labial.

In most of the studies[10,11,12,13,14,15,16,19,23] only external ferrule effect between external prepared dentin and crown was researched, not taking into account the influence of internal ferrule effect. Therefore, we decided to investigate the effect of post-core design and internal ferrule preparation design on the fracture resistance of endodontically treated teeth restored with zirconia posts. [8,17,18,20,21,24,25,26,27]

Material and methods

A total of 120 extracted human maxillary central incisors without fractures and with similar dimensions were stored in 0.1% thymol solution after extraction. The root canals were endodontically treated, prepared with K3™XF, Dentsply (Starter kit), obturated with AH plus®and gutta-percha points (Dentsply,DeTrey, Germany). The anatomic crowns of all teeth were sectioned horizontal to the long axis (2 mm incisal to the cement-enamel junction) with water cooled diamond-coated disc, IsoMet® 1000 Precision Saw BUEHLER.

All experimental teeth were divided into 10 groups of 12. Group A1 to E1 (A1 / B1 /C1 / D1 / E1) and E2 to E2 (A2 / B2 / C2 / D2 / E2) represented teeth prepared without (0mm), 0.5mm, 1mm, 1.5mm, and 2mm internal ferrule preparation. As material for our experiments, we used Ø 1.4 - 1.6mm Y-TZP ceramics posts (IJS-MF) Slovenia with retention forms in the coronary part of the post, upgraded with IPS E-MAX, Ivoclar, Vivadent.

Circumferential shoulder preparation of the cervical part of the root canal were prepared (excluding the first two groups) with an apical extended 0.5mm/1mm/1.5mm and 2mm long internal dentin ferrule preparation. 360° parallel internal dentin wall was extended coronal from the preparation shoulder of the root canal. The vertical length of the internal surface of the dentin wall was defined as the length of internal ferrule preparation. (Fig. 1.)

Post spaces were prepared in all groups with the special preparation drills (IJS-MF, Slovenia) leaving at least 4 mm gutta-percha apical seal.

Fig. 1. Internal Dentin Ferrule Preparation and
Y-TZP Post with retentive rings in the coronal part (IJS-MF), Slovenia

Groups A1 / B1 / C1 / D1 / E1, were restored with Ø 1.4mm, length 17.5/11mm, and groups A2 / B2 / C2 / D2 / E2 with Ø 1.6mm, length 15/8.5mm, Y-TZP Post (IJS-MF), Slovenia. The root part of the zirconia experimental post had a cylindric-conical line. The coronary design of the zirconia posts included retention forms with three retentive rings. The first (apical) retention element is a full ring, and upper two half-rings providing sufficient space for core build up material. The experimental posts were build-up with e-max core material (E-MAX, Ivoclar, Vivadent, Liechtenstein) and cemented with resin cement (Multilink Automix, Ivoclar). All simples with uniform core buildup were with dimensions 6 x 5 x 5 mm (base diameter x height x upper surface) and with 45° degrees on the palato-incisal surface made with indirect press method.

Fig 2. Instron Testing Machine 4301.

Root surfaces of the experimental teeth were marked at the CEJ and covered with Durapore adhesive tape. That cemented post/teeth experimental samples were embedded in acrylic resin blocks (ProBase Polymer/Monomer, Ivoclar) with fixator (Bego). (Fig. 1.)

In the next steps Durapore spacers were removed from the root surfaces and impression material (Xantopren plus, HeraeusKulzer, GmbHGermany) was injected into acrylic resin

modle. The experimental teeth were reinserted into acrylic cylinders with standardized silicone 0.1-0.2mm thin layers (simulated periodontal ligament).

Test specimens (unloaded) were then placed at an angle of 45° to the long axis into a special jig and retention tests were performed by Instron Testing Machine 4301 (Instron Corp., USA) with crosshead speed of 1mm/min until fracture. The load was applied in the middle of the lingual surface, 2 mm below the incisal margin. (Fig. 2)

Fracture loads (N) and modes (favorable/repair or catastrophic/non restorable) were recorded, thereby considering that reparable fractures are those that occur above the levelof the alveolar bone, and catastrophic are those that occur below the level of the alveolar bone. Two-way analysis of variance (ANOVA) was used for statistical analysis with the level ofsignificance seat $p<0.05$. Failure patterns were analyzed in the optical microscope (Fig. 3.).

Fig. 3. Optical microscope Stereo Discovery V.8 (Carl Zeiss, Germany).

Results

The mean and standard deviations for failure loads are shown in Table 6.1 and 6.2. The meanvalues for fracture loads measured in Newton's were for the following groups:

Table 1. 1 Fracture loads (N)

POST / CORE	**Y-TZP POSTS / E-MAX CORES**					
	INTERNAL FERRULE PREPARATION					
GROUP A(1-2) / B(1-2) / C(1-2)	**A(1-2) = 0 mm CONTROL GROUP**		**B(1-2) = O,5mm**		**C(1-2) = 1 mm**	
Ø (mm)	**1.4**	**1.6**	**1.4**	**1.6**	**1.4**	**1.6**
Mean (N)	**405.04**	**503.09**	**401.07**	**507.13**	**479.01**	**567.06**
Stand. Deviation	±100.04	±109.01	±75.02	±101.08	±109.12	±134.37

Table 1. 2 Fracture loads (N)

POST / CORE	Y-TZP POSTS / E-MAX CORES					
	INTERNAL FERRULE PREPARATION					
GROUP A(1-2) / D(1-2) / E(1-2)	A(1-2) = 0 mm CONTROL GROUP		D(1-2) = 1,5mm		E(1-2) = 2 mm	
Ø (mm)	1.4	1.6	1.4	1.6	1.4	1.6
Mean (N)	405.04	503.09	601.73	675.79	719.99	861.06
Stand. Deviation	±100.04	±109.61	±103.52	±171.08	±220.02	±237.15

For fracture resistance, two-way ANOVA revealed a significant difference ($p<0.05$) in groups with 1.5 mm and 2 mm, compared to groups without (0mm), with 0.5mm and 1 mm internal ferrule. No significant difference ($p>0.05$) was evaluated between the teeth in groups without (0mm), with 0.5mm and 1 mm and between the teeth with 1.5 and 2mm internal ferrule preparation.

Table 2. 1. No-Significant Difference ($p>0.05$)

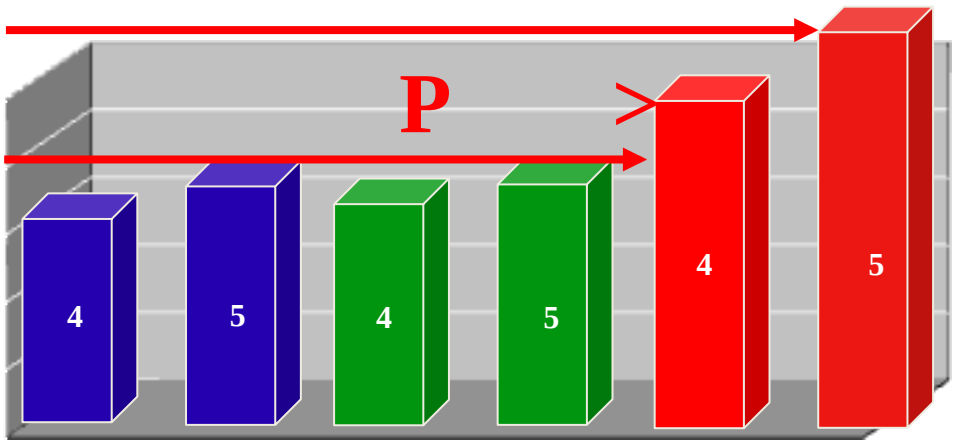
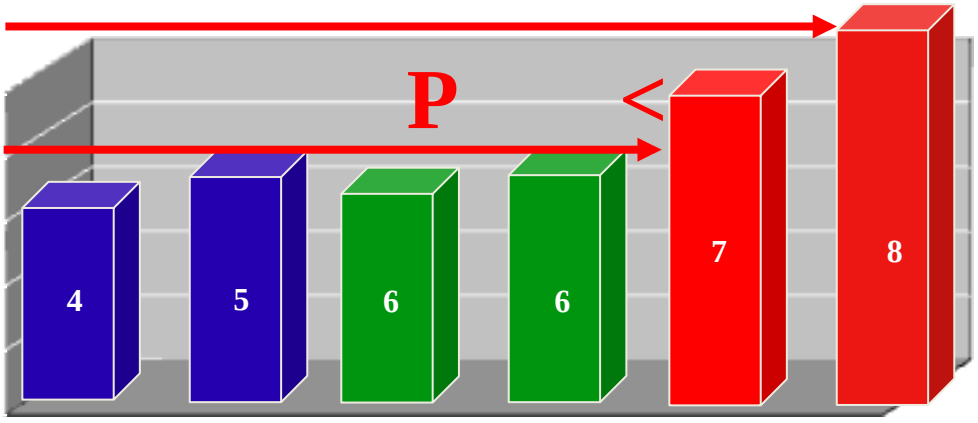


Table 2. 2. Significant Difference ($p<0.05$)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There were no significant differences among the groups with Ø 1.4 mm / 1.6 mm posts, regardless to the prepared internal ferrule (Table 2. 1/2).

Failure patterns within those groups revealed non-catastrophic failure in group A = 100% - 100% for 0mm; group B = 100% - 100% for 0.5mm; group C – 91.7% - 91.7% for 1mm; groupD = 91.7% - 75% for 1.5mm; and 66.7% -58.3% for 2mm (internal ferrule preparation design) in both of groups E (Table. 3. 1/2)

Table. 3.1. Types of Failure / Number / (%) of Teeth.
TABLE A: FRACTURES

% INTERNAL FERRUlE PREPARATION (IF) Y-TZP POST/ E-MAX CORE FRACTURES Ø		Con-trol A (0mm) %	B (0.5mm) %	C (1mm) %
REPARABLE	1.4	12 (100)	12 (100)	11 (91.7)
	1.6	12 (100)	12 (100)	11 (91.7)
NON-REPARABLE	1.4	0 (0,0)	0(0,0)	1 (8,3)
	1.6	0 (0,0)	0(0,0)	1 (8,3)

Table. 3.2. Types of Failure / Number / (%) of Teeth.
TABLE B: FRACTURES

% INTERNAL FERRUlE PREPARATION (IF) Y-TZP POST/ E-MAX CORE FRACTURES Ø		Control A (0mm) %	D (1.5mm) %	E (2mm) %
REPARABLE	1.4	12 (100)	11 (91.7)	8 (66.7)
	1.6	12 (100)	9 (75)	7 (58.3)
NON-REPARABLE	1.4	0 (0,0)	1 (8.3)	4 (33,3)
	1.6	0 (0,0)	3 (25,0)	5 (41,7)

Discussion

In this in vitro experimental study natural teeth were used for preparation and all roots received endodontic treatment and were subjected to a post and core build up. The autors[8] of the present study investigated and described the new design preparation. They concluded that different preparation length has different influence on the fracture resistance. However, adequately prepared dentin for zirconia posts with retentive rings inthe coronal part result in reparable fractures when subjected to compressive loads directly applied to the inclined surfaces of the cores. As in similar previous studies[28,29,30,31,32,33,34,35] in this study, the post and cores did not restore with crowns. We used fracture testing as a method for evaluation of the fracture resistance. The testing apparatus did not differentiate between the different modes of failure (Fig 3. Instron Testing Machine 4301).

The results showed that the fracture resistance of the post-core restorations with 0.5mm and1mm prepared internal part of the dentin was not significantly different from the fracture resistance of the restored teeth without (0mm). On the other hand, the teeth prepared with 1.5mm and 2mm prepared internal part of coronal dentin showed significantly increased fracture resistance. Therefore, it is not only important to use the remaining internal part of dentine in order to improve the fracture resistance of the tooth, but it is crucial to provide the sufficient length of internal preparation.

From many authors[21,23,24,25,26,27,36,37] it is generally accepted that for a restoration extending at least 2mm apical to the junction of the external core surface will protect the endodontically treated tooth. On the other hand, Nothdurft[22] stated noticeably lower values for the fracture resistance which were not significantly different for 1mm and for 2mm ferrule. Stankiewicz and Wilson (2008)[23], and numerous other authors[24,25,26,27,28,39], concludedthat a ferrule with 1mm of vertical height has been shown to double the resistance to fracture versus teeth restored without a ferrule preparation design. The results from our study confirm that not only the external ferrule, but also the internal ferrule should be at least 1.5 and 2mm long in order to provide the desired protective effect.[8]

In ours present study cylindric-conical posts with retentive coronal part were used for restaration of experimentally endodontically treated teeth. It is known that cylindrical posts exibit better retention than conical posts. However, the cylindrical shape does not correspond to root anatomy and excessive preparation in the appical portion of the tooth might weaken the root.[21]

Fracture strength values from others rewivers[23,25,26,27,28] is not comparable with the results of the present study because of differences in research design. Namely, in present study the ferrule lengths are presented from the internal part of dentin, unlike other studies which analyze only core-crown ferrule.[2,3,4,5,6,10,11,13,30,31,32,36,37,39.] The internal preparation partof dentin circumferentally provides a cylindrical space for the first retentive ring of the zirconia post in the coronal part of the root. Therefore, it provides fisiological stress distribution throw the dentin walls.

Other than that, in most of the studies on this matter, the composite core was build up on experimental posts that had no retention elements in their coronal part,[15,28,36] while in our study we used posts with retention elements and press core build up.

Ottl at al[33] in artificial root canals stated lower fracture strength of zirconia posts in respect to results from our study. Similarly, Asmussen at al [34] found lower fracture strength for Biopost and CeraPost. In both of these studies, zirconia posts without retention forms were used. With artificial roots lower fracture strength values were obtained because they reduced the effect of structural differences between natural teeth and the posts.[19,30.]

Oblak at al [19] used zirconia posts with retention elements, and stated values for load to fracture similar to ours (without internal ferrule), but their experiments were also conducted on posts mounted in artificial root canals, instead of natural teeth.

They concluded that load to fracture of zirconia posts depends primarily on post diameter but they had not taken into account the effect of dentin preparation. From our results, it is evident that the post diameter is less influential than the internal dentin preparation length for the improvement of the fracture resistance.

Akkayan and Guelmez[28] stated catastrophic fractures of zirconia posts. However, this study was performed with zirconia posts without retentive coronal forms. Similar to this study, Ozkurt at al[35] stated that the high rigidity of the zirconia posts is a predisposing factor for vertical root fractures. Dilmener[31] and Asmussen[34] assumed that the use of a zirconia postwith an elastic modulus closer to that of dentin would be mechanically more advantageous for the preservation of recipient roots. Many other studies[24,25,26.] have shown maximum beneficial effects from a ferrule with 1.5 to 2mm of vertical tooth structure. The fracture patterns were more favorable when a ferrule was present. The majority of the fractures inthe teeth without a ferrule were nonrestorable.[27,28] Hazaimeh and Gutteridge[36] concluded that the fracture patterns were more favorable when an external ferrule was present.

In our experimental study we excluded the external ferrule in order to research only the influence of the internal ferule preparation length on the fracture resistance of endodontically treated teeth. The results showed increased percentage of reparable fractures in all groups. In the present study, the teeth prepared with and without internal preparation dentin showed similar fracture modes, all in favor of the reparable fractures. However, we should not forget the fact that the same zirconia posts with retentive coronal elements were used for restoration of the teeth in all the groups. Therefore, it is evident that the retentive coronal form of the zirconia post contributes to the more favorable outcome of fractures.

The results from the all mentioned studies, compared with ours, confirm that preparation ferrule design and posts design with retentive coronal elements additionally increase the fracture resistance and produced more favorable modes of fracture.

Conclusion

Within the limitations of this in vitro study, the following conclusions were drawn:

The teeth without and with 0.5 and 1 mm internal ferrule preparation design were fractured at significantly lower loading then teeth restored with an apical extended 1.5 and 2mm long internal ferrule preparation.

The minimum internal ferrule length that provides increased fracture resistance is 1.5 to 2mm.

Load to fracture of the post-core restored endodontically treated teeth depends primarily on the length of the internal ferrule preparation, regardless to the post diameter.

The fracture patterns of the post-core restored teeth were restorable in 60 to 100% in allof the groups and significantly higher % of reparable fractures was determined in all of experimental groups.

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Differences in Maintaining Oral Hygiene of Children in The Municipality of Suhareka

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Abstract.. The issue of oral health has been quite challenging since ancient times for various reasons. This paper compares the level of awareness of oral hygiene in children of the same age, data obtained from 6-year-old students between a village school and a city school in the Municipality of Suhareka, differences in the practice of oral hygiene, the frequency of brushing and routine dental visits, the use of sweet foods such as food more enjoyable for children of this age. Oral hygiene means the practice of keeping the mouth clean with regular brushing of teeth. The purpose of this study is to assess the oral health of children and the recommendations of these children to keep the level of oral hygiene at the maximum level. Since oral hygiene is of particular importance because not only oral health depends on it but also health in general. It is key in preventing dental disease and bad breath, on the contrary that if we do not brush and brush our teeth every day then the bacteria cannot be kept under control and reach levels that can cause oral infections such as tooth decay and gum diseases. It also seems that fluoride found in toothpaste in students that keep brushing teeth, it's noticed that has a major role in remineralization of enamel.

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Keywords: tooth, children, oral hygiene, rural, urban.

1 Introduction

Oral health is one of the most important things that children, students should be taught, in order to promote the maintenance of dental hygiene throughout their lives, encouraging timely preventive measures [1]. It is important and priority to help children when they are young to develop healthy habits to take care of their teeth, because with these habits they create the basis for good oral health care, practices that follow during all their lives. This allows them to avoid many problems that stem from poor oral health, such as gum disease, cavities and tooth decay. They can avoid many of the problems that come from poor oral health, including gum disease, cavities, and tooth decay [2].

Children should have regular dental check-ups. Prevent tooth decay by brushing teeth twice a day and avoiding sugary foods and drinks especially now. Use low-fluoride toothpaste. Take your child to the dentist for check-ups every 6-12 months [3, 4]. Proper care of your child's teeth and gums includes brushing and rinsing daily. It also includes having routine dental exams, and getting necessary treatments such as fluoride, sealants, extractions, fillings, or braces and other orthodontics [5, 6]. One of the easiest ways to explain the concept of brushing, flossing, and cavities is with show-and-tell type activities [7, 8]. It is historically known that rural areas have made less progress in terms of oral care and hygiene. This is also confirmed through the numerous works and researches that have been done [9, 10]. In this context, we have a lot of work for awareness and emancipation, informing them of the dangers that await them as a result of neglecting oral care. This paper obtains real data that have been realized in a certain area, such as Suhareka.

2. Methodology and analysis

In the framework of our analysis, **40 students, aged 6 years**, were interviewed. Respondents were initially informed that the data would be confidential and would only be used for research. The interview questions were:

1. *Do you brush your teeth?*
2. *How many times a day do you brush them?*
3. *Do your parents brush their teeth?*
4. *Do you visit the dentist when you have no pain?*
5. *Do you use sweet foods?*

From data analysed we finally obtained that children in village school are less informed for oral hygiene practice!

Also, we seem the need for oral health promotion in schools.

3. Results

Now in accord with the questions posed above the diagrams are constructed according to the students' answers. Regarding do you brush your teeth question, the response of interviewed students was described in figure 1.

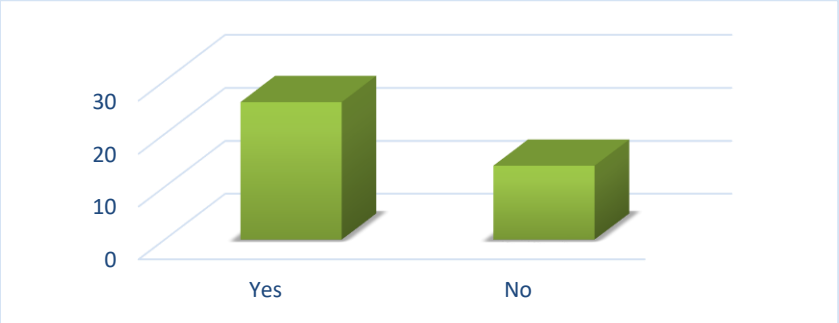

Fig. 1 Response of the question: “Do you brush your teeth?”

Regarding how many times do you brush your teeth question, the response of interviewed students was described in figure 2.

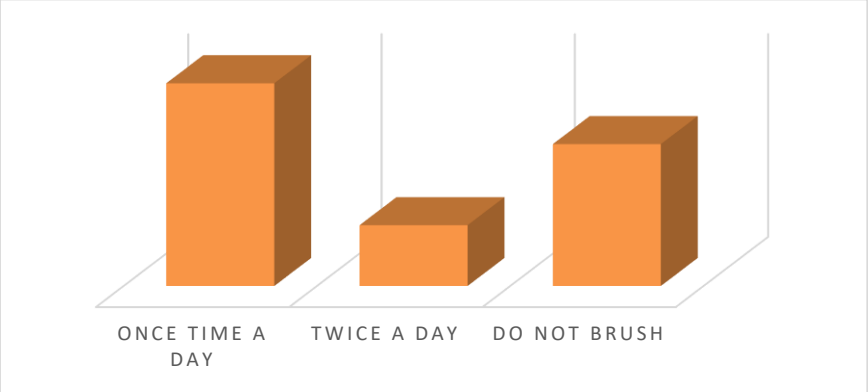

Fig. 2 Response of the question “How many times do you brush your teeth?”

Regarding visits to the dentist when no pain question, the response of interviewed students was described in figure 3.

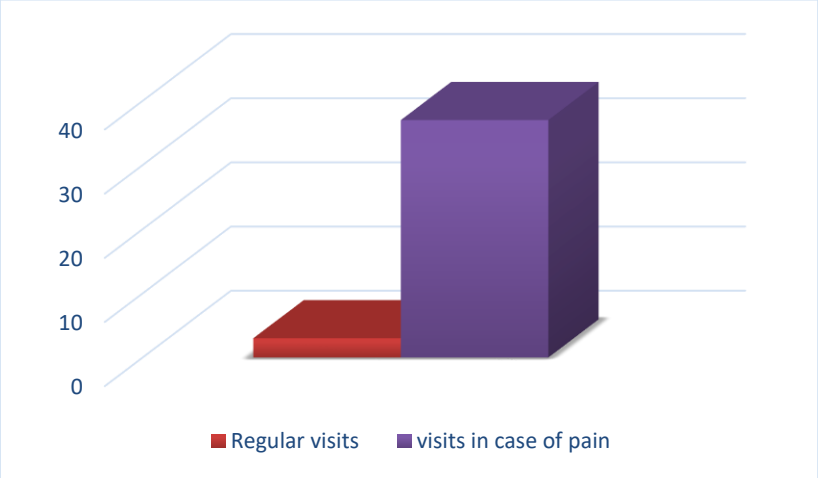

Fig. 3 Response of the question: “Do you visit the dentist when you have no pain?”

Regarding using sweet foods question, the response of interviewed students was described in figure 4.

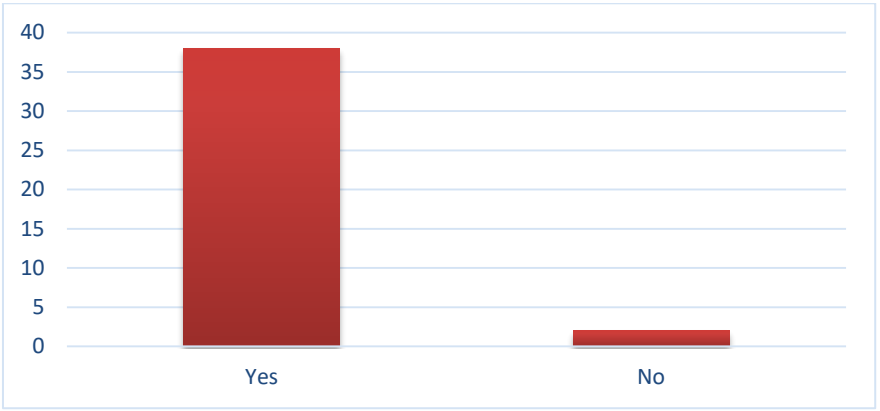

Fig. 4. Response of the question: “Do you use sweet foods?”

Regarding do your parents brush their teeth, the response of interviewed students was described in figure 5.

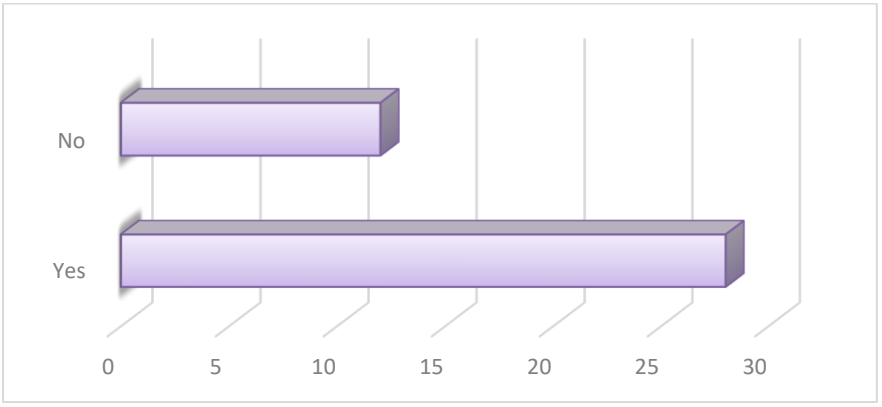

Fig. 5. Response of the question: “Do your parents brush their teeth?”

The people who were subject to the survey were a total of 40 children. The number of children attending new village schools have had obvious dental problems.

And in the question posed how many times a day brush your teeth. The response received was from a total of 40 children surveyed; 6 children have brushed their teeth twice a day, 20 brush their teeth once a day, while the rest, which means 14 of them, are not informed at all about maintaining oral hygiene. When asked how many times they make regular visits to the dentist, the number of those children who make regular visits to the dentist without pain or any other sensitivity has been quite low. Of these children we examined, 3 children make regular visits to

the dentist, while 37 other children visit the dentist only when they have pain. In the question "Do you use sweet foods?" the response was yes by 38 of them and no by 2 of them. In the other question "Do your parents brush their teeth?" 28 of them answered yes and 12 of them answered no.

From now on, the comparison between the data for cities and villages will be given.

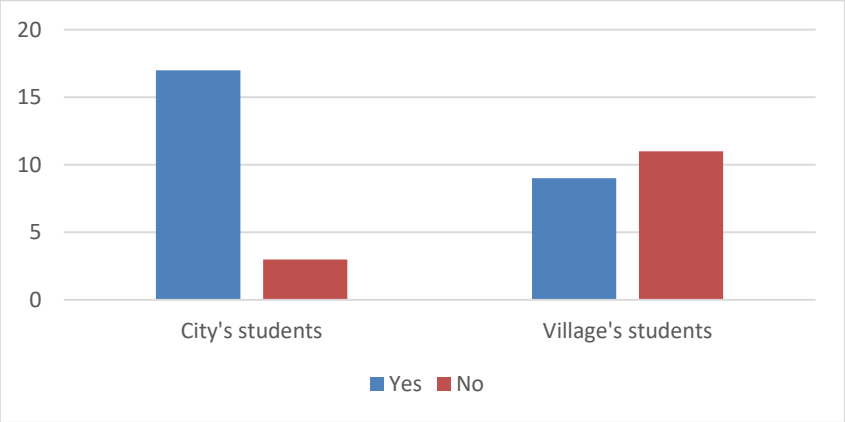

Fig. 6. Response of the question: "Do you brush your teeth?"

Regarding How often do your parents brush their teeth question, the response of interviewed students was described in figure 7.

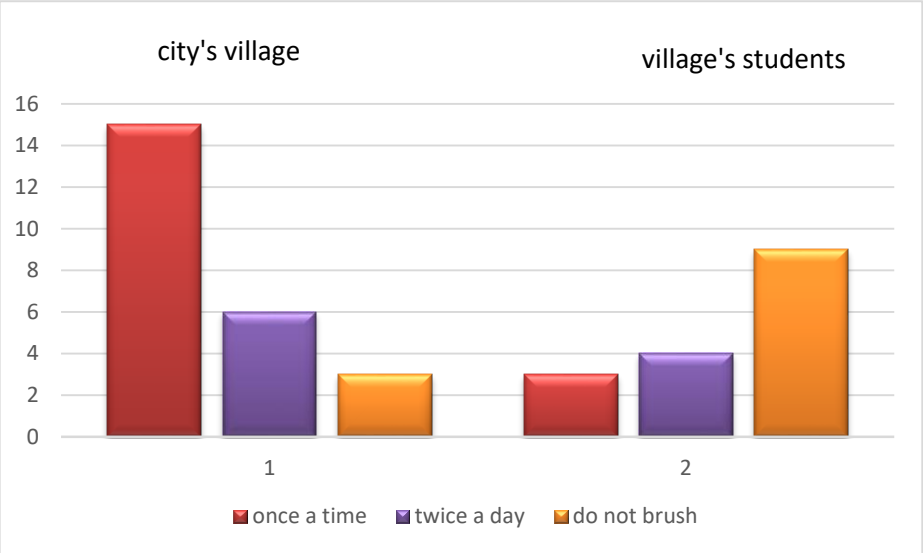

Fig. 7. Response of the question: "How often do your parents brush their teeth?"

Regarding Do you visit the dentist when you have no pain question, the response of interviewed students was described in figure 8.

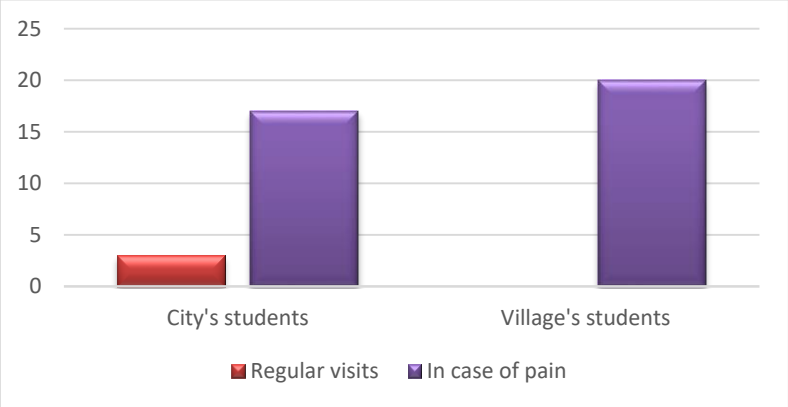

Fig. 8. Response of the question: Do you visit the dentist when you have no pain?"

Regarding do you use sweet foods question, the response of interviewed students was described in figure 9.

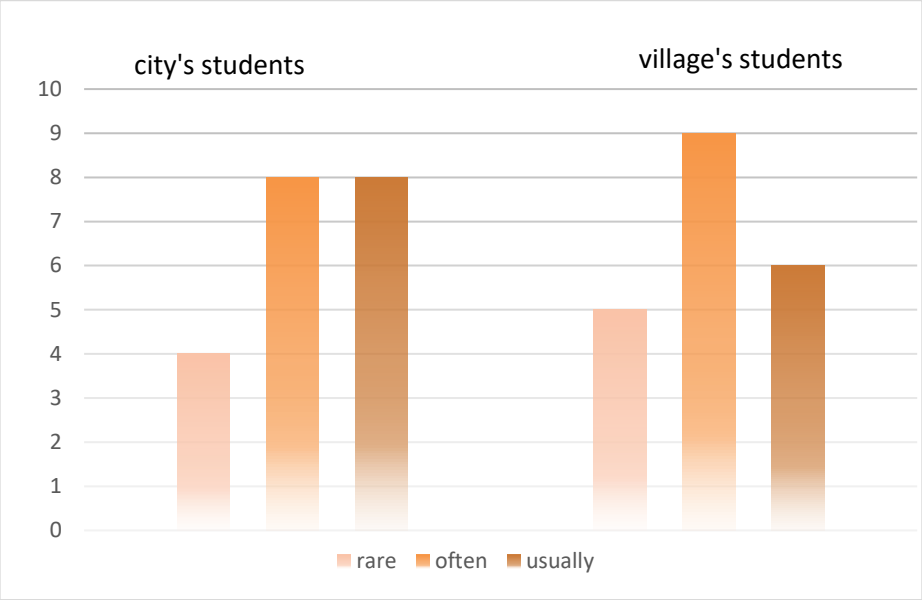

Fig. 9. Response of the question: “Do you use sweet foods?”

Regarding do your parents brush their teeth question, the response of interviewed students was described in figure 10.

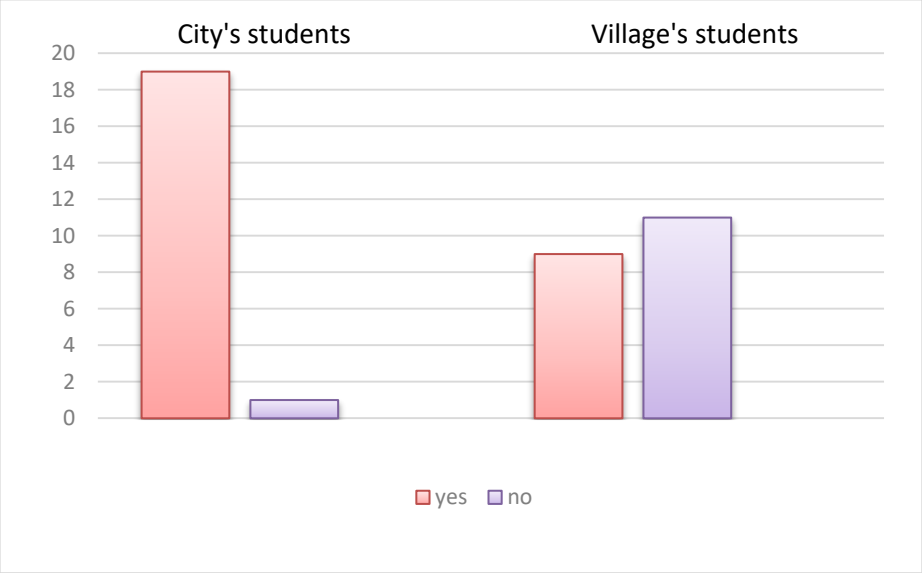

Fig. 10. Response of the question: “Do your parents brush their teeth?”

4. Limitations

This study is based in experience of 40 children, who are in first year of school and who have experience with tooth problem. From this study we cannot conclude anything accurate as we have included a limited number of respondents. In the future I plan to do a research of this nature but including a larger number of participants to see the status of the teeth of each student in particular. However, we need to mention that including oral hygiene programme in schools are the safest way to sow the culture of oral hygiene of children of this age.

5. Conclusions

In this paper, the phenomenon of oral health in children is treated. The analysis was performed in the municipality of Suhareka, where we managed to identify the current situation in oral hygiene. This analysis was done to make children aware from an early age about maintaining oral hygiene since we know that prevention is better than cure.

It has been observed that children whose parents have maintained hygiene have been more aware of the problem. At the end of the interview we given tips on how to keep their teeth clean. The analysis shows that we have a serious work in this direction and that there are still children who do not brush their teeth. Knowing the dangers that threaten you is worrying. We think that the school will play a role of awareness by incorporating the subject of Health and Hygiene in the curriculum, especially from grade 5 onwards. In the best case a dentist for routine check-ups, with special emphasis on rural areas would be the perfect solution. These dental examinations are the cornerstone of preventive care, they are superheroes in the fight against tooth decay, gum problems, and other possible oral health concerns. It has been observed that children, who live in the city are more informed about the role and importance of health, perhaps as a reason of the possibilities of the city in relation to the village, but this is also seen to be related to the education of parents. It has also been observed that children whose parents brush their teeth are more inclined to maintain oral hygiene, as they transmit messages to children and the child imitates the parents. The goal is to give every child a happy and healthy smile.

Recommendation

- Parent's awareness about keeping their children hygienic, not neglecting because they are not permanent teeth and will be replaced, as early removal of deciduous teeth leads to most deciduous tooth Orthodontic-anomalies
- Awareness about the fact that at the age of 6 (knowing by chronology) begins the eruption of the first permanent molar known as the occlusion key
- Brushing your teeth at least twice / day or after meals
- Use soft toothbrush, replace 1-2months
- Regularly use an alcohol free mouthwash
- Avoid constant snacking
- Fluoride treatments

- Apply protective dental sealants

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INFLUENCE OF THE POST SPACE PREPARATION ON THE REST FILLING IN ENDODONTICALLY TREATED TEETH

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Abstract: Endodontic treatment is usually indicated for teeth that are carious, severely damaged or fractured. In such teeth, making a post and a crown is indicated. Although the main purpose of the post is to strengthen the structure of the tooth and the possibility of extending the stump, it is equally important not to introduce reinfection into the canal during operation, but also to prevent the micropermeability of the remaining part of the canal filling. The post space preparation involves the removal of the gutta-percha and cementum from the coronary and middle thirds of the root canal, but it can often do damage to the filling in the apical part of the root canal, which can pull, loosen, or damage. During the tests related to the post space preparations, several parameters were examined in relation to the rest of the canal filling. They refer to: different methods for filling the root canals and materials in endodontic therapy, length of the remaining filling in the apical part, methods and instruments used in the preparation of the root canal, but also the most suitable time, ie the most favorable period for preparation after a definite obturation. Numerous tests have been performed in relation to the indicated parameters, but there are also numerous methods for testing whether the filling remaining in the channel meets the rules for hermetic closure. They can be clinical, laboratory, computer or X-ray. Yet while some rules and doctrines can be drawn, there are still many ambiguities and controversial results.

Keywords: apical sealing, apical microleakage, post space preparation

INTRODUCTION

The goal of endodontic therapy is to eliminate the infection from the root canal and to prevent any further contamination of the endodontic space. The improvement of materials and techniques for the treatment of root canals has led to the preservation of countless teeth that would otherwise have been lost. It is widely accepted and confirmed that the natural tooth is always the best choice in terms of any replacement (1).

Endodontic therapy consists of a series of procedures in which it takes place complete shaping and hermetic sealing of the root canal, which doesn'tallow permeability through the filling, either from the side of the periapical tissue, nor by the crown of the tooth. This micro-permeability is one of the main ones factors for failure of dentist therapy. Gaps in the apical part will lead to the formation of a new or persistent existing periapical lesion, while on the coronary side can cause a problem: caries that will occur in the next period, poorly placed restoration or poorly made crown, leaving the tooth too long with temporary restoration, inadequate thickness of the temporary filling or its gradual melting (2).

Therefore, the success of endodontically treated teeth depends not only the good treatment carried out, but also by the way they will be restored (3,4).

Endodontic treatment is most often indicated for teeth that are carious, severely damaged or fractured. It is very often indicated in such teethmaking a crown, which requires making a post that is placed in the root canal (5).

The purpose of post space preparation

The post space preparation of the root canal is just as important as well as the final restoration. It is imperative not to go beyond the boundaries of the anatomical space of the root canal, as well as to properly apply all stages on the preparation of the root canal for the placement of the post (6).

Although the main purpose of the post is to strengthen the structure of the tooth and the possibility of extending the stump, it is equally important not to introduce reinfection into the canal during operation, but also to prevent the micro-permeability of the remaining part of the canal filling (7-9).

The post space preparation involves the removal of the gutta-percha and cementum from the coronary and middle thirds of the root canal, but it can often do damage to the filling in the apical part of the root canal, which can pull, loosen, or damage.(10,11). Although micropermeability from the peg may occur as a result of peg loosening or tooth fracture, damage to the apical portion will undoubtedly lead to reinfection of the periapical space (12, 13).

When making a post, one should pay attention to(14):

1) the appropriate instrumentation,

2) correct orientation according to the position of the root
3) appropriate length of the preparation
4) shaping inside the canal

Post space processing techniques

The first step in preparing a tooth post is choosing which method to use to remove part of the filling. It can be done with mechanical-rotary instruments, physically heated instruments, chemical solvents or a combination of these methods, and this depends on the type of the formerfilling and canal condition.

The first tests on whether and how much the apical part of the filling is damaged after the post preparation were made much earlier. As early as 1965 Zeigler (15) uses pesorimers on forty-four teeth that have been filled with one of the three methods: with the technique of a single cone, lateral condensation or with silver posts. Its purpose was to evaluate the effect of rotation of the instrument at different filling modes. In a quarter of the samples received, severe damages of the fillings were seen, regardless of the type of thefilling, with the differences between the groups being insignificant.

Later, numerous texts and articles were presented, which refer to canal filling, to the various techniques for preparing the canal space, but stillthere are no studies that would indicate the effect of the work in the canal on the apical part of the filling and its value (16). Due to the many dilemmas and conflicting results, it is needed to answer the following questions:

1) How much of the root canal filling can be removed during preparation of the canal space, without endangering the apical sealing?

2) Which canal filling technique is most appropriate when planning the post installation?

3) Which methods for removing the canal filling give the least impact on the rest of the filling?

4) How long does it take to leave between the root canal filling and the post preparation, in order to reduce the damaging effect?

Numerous studies have been conducted and published over the past decades relating to this issue. But unfortunately, the results are pretty contradictory and no definite conclusions can be drawn from them, either specific suggestions, which would point to the advantage of a particular technique or method for removal of the canal filling, the necessary length for the remainder of the filling and the time when the preparation of the space for post installation should be done.

In several experimental studies (17, 18, 16, 13) examinations were done relating to the quality of the remainder of the filling after different types of materials and obturation methods, as well as about materials related to the post space preparation.Some studies show that the integrity of the remaining filling after removal of filling materials depend on a number of previous factors such as: endodontic filling techniques (19, 20), instruments or methods used for removal (21) or the length of remaining filling in the apical part(21,22). In most of the published papers or studies, the examiners follow several parameters. However, no concrete conclusion can be drawn, because they all force a certain way of preparation, which differs from other researchers.

There are still controversies over whether space preparation should be done immediately after canal obturation or after 3-7 days (22-26). There are many studies comparing the pros and cons of immediate and delayed post-space preparation and its effect on apical stability (10,16-18).

Some studies show that the integrity of the remaining filling after removal of filling materials depend on a number of previous factors such as: endodontic filling techniques (19, 20).

But despite numerous researches in almost a century, a mode of operation has not yet been defined which would be the gold standard.

Discussion

Insertions in the root canal can cause damage to a healthy apical periodontium, as evidenced by the work of Saunders (27), who shows significantly more periapical changes in teeth with canal posts than in endodontically treated teeth where there is no post. The reason for the failure of the teeth with posts is probably the disruption of the integrity of the canal filling during their construction.This is confirmed by the results of Matijević et al. (28), according to which in the teeth restored with intracanal post in 17.5% of the cases, no filling in the canal was noticed at all, which was probably completely extracted during the preparation. Teeth restored with intracanal post and composite restoration were extracted much more often than teeth where no post was installed, while such a risk did not exist if a crown was placed on the endodontically treated teeth (29).

During the tests related to the post space preparation, several parameters were examined in relation to the rest of the canal filling:

1) Endodontic filling technique

Adequate filling of the root canal system is a prerequisite for long-term success of endodontic therapy (30). Various materials and techniques have been innovated in the last 50 years. Gutta-percha is commonly used to fill root canals in combination with some of the many cements on the dental market (31). Apart from the technique of filling with a single gutta-percha post, other techniques are often used, such as: vertical condensation, continuous wave compaction, filling with thermoplastic gutta-percha carriers and many others. Of course there is also lateral condensation, which is the gold standard and with which all other techniques are compared (32).

The tests that determine the quality of the obturation are different, but most often refer to the percentage of filling of the root canal and examination of the micropermeability of the filling by various methods.

Examinations regarding the presence of empty spaces are different. Some of them are made in cross sections under different magnifications. Most authors consider the technique with a single gutta-percha to be the weakest, as it is insufficient to meet all the irregularities in the root canal (33). Eren et al. (21) conclude from the results obtained that the best results are obtained when filling with hot horizontal compaction. In contrast, Somma et al. (34) find no difference between hot vertical condensation and one-pin filling. Jarrett et al. (35) determining the percentage of gaps, they consider that the Thermafil and the continuous wave technique after Schilder give the best results (36).

The analysis of the micro-permeability of the channel charges occupies a huge part in the research in the last 20 years. It is tested in many ways: by immersion of the samples in color (37), by the fluid transport method by pressure (38), by bacterial penetration, by the electrometric method, by radioisotopes, spectrophotometry and by the glucose transport model.

Sometimes when two methods are tested, different, often conflicting results are obtained. Thus, according to the results of Gilhooly et al. (39), the radiographic quality of the filling was worse in the thermoplastic gutta-percha compared to the lateral condensation, but according to the test with color penetration, the result was quite the opposite.

In addition to cross-sectional analysis, canal filling is also examined by microcomputer tomography analysis. Such is the work of Iglecias (40), who examines the fullness of the canal after filling with condensation continuous wave and filling with a single gutta-percha pin and finds that the first method is definitely much more successful, but it is much more noticeable in the coronary and middle third.

Because in the post space preparation the filling in the apical third is not removed, and knowing that the shape of the canal in that part is always circular and without irregularities, then perhaps that is why the results relating to the fillings are so contradictory.

2) Length of the remaining filling in the apical part

In prosthetics, it is considered that if the length of the post is 1.5 times greater than the length of the crown, a stable product is obtained, and if that is not feasible, the smallest ratio in the height of the crown and the post should be 1:1. However, in the case of shorter roots, much of the filling in the coronary part should be removed and usually only 1-2 mm of filling remains in the apical part.

Dentists agree that the longer the rest of the filling in the root canal, the safer the sealing of the apical part and the lower the chance of reinfection. Examining the micro-permeability of the remaining canal filling after a 4, 5 or 6 mm post preparation Rahimi et al. (41) indicate that the best filling is obtained with a longer remaining portion, and that the difference between the groups was significant. According to De Cleen et al (23) the length of 3 mm remaining filling is the absolute minimum for safe apical filling, contrary to the findings of Abramovitz et al who consider the length of 3 mm to be unreliable, so the minimum would be 4-5 mm (42).

Metzger (43) believes that all the indicated lengths up to 7 mm are insufficient to make a good seal and that his results are more reliable than the others, because he uses a method by actively forcing the marker through the root canal. The marker passive method used by other researchers is considered insufficient to obtain accurate data (43).

Wu et al. performed a test with the fluid transport method for micropermeability and found that definitely after the post preparation the remaining 4 mm of the filling is not sufficient to prevent the micropermeability as opposed to the definite full filling before starting the post preparation. However, according to their results, cementing the post with any cement compensates the insufficiency of the quality of the remaining filling (44).

3. Preparation time of the root canal for post installation

The time when the post preparation should be done is also a frequently examined parameter.

It is common to allow a few days for the cement to harden completely and for any transient irritation of the periapical tissue to subside during the endodontic treatment. Dalat and Spångberg (16) believe that if the cement is not hardened enough, the filling can be easily moved. Chen et al. (10) come to the same conclusion. Nagas et al. (17) conclude from their results that no matter which filling technique is used, it is significantly better to postpone the post preparation for seven days after the definitive obturation of the root canal. As cement they use AH plus cement. Bodrumlu uses Resilon in his test and also thinks that delayed preparation is better (45).

However, there are authors who prefer the preparation to be done immediately after filling, with the explanation that in this way it takes less time for the final rehabilitation of the tooth, there is no reopening of the tooth and the possibility of reinfection is less. In addition, at the time of obstruction, the dentist is most familiar with the individual specifics of the root canal system, which helps reduce perforation or other unwanted complications. Thus in the tests of Long (46), Aydemir (25) and Greeca (8), it does not matter whether it will be prepared immediately or delayed after a few days, as the stability of the filling remains the same.

According to Dos Reis-Prado (47) and Padmanabhan et al (48). on the contrary, delayed preparation gives worse results.

4. Methods for removing the canal filling

Many methods and ways of removing the filling are recommended to create space for the space placement: mechanical, chemical, thermal or a combination of these (49). The question is which of these methods will lead to the cleanest space and the best preservation of the remaining filling in the apical third.

The mechanical way to remove the filling is most commonly used and fastest method. It can be done with the many hand or machine tools available on the dental market (most commonly Gates Glidden burs or Peeso files are used), although whole series of machine tools for retreating canals are recommended.

Radeva et al. (50) examine the methods of the post preparation and the impact on the quality of the remaining filling and come to the conclusion that during the preparation the work with slower rotation reduces the risk of damage to the apical filling. Özkurt -Kayahan et al. (51) consider that when the removal is done with Gates Glidden burs if the tooth is filled with the single-cone technique there is damage to the remaining filling.

However, mechanically done preparation has its own risks. First of all, the whole filling can be easily extracted. Furthermore, damage to the cavity walls is possible during the rapid and careless instrumentation and transport of the canal. Zuli et al. (52) examined the canal walls after the post preparation and noticed defects in 39.6% of the cases. The transposition of the canals was examined by Mirceska (53) who came to conclussion that the use of machine tools intended for retreatment (ProTaper Retreatment files) are quite rigid and lead to transposition of the root canal, especially if the canal is curved. Working with Peeso expanders also rises the temperature, which can damage the organic tissue around the tooth root. A rise in temperature of 10ºC can damage the alveolar bone and periodontal ligament (54).

The thermal method of removing the filling is successful in fillings that contain a large amount of gutta-percha.

The chemical method of removing the filling is the least commonly used, due to problems with its toxicity and difficulty in handling. Studies show that xylene and orange oil soften gutta-percha better than other solvents, such as eucalyptol, halothane, or chloroform (55).

However, again from the data in the literature, no concrete conclusion can be drawn as to which method of removal is the best. Hiltner (56) compares two thermal methods: a heated flame retardant and an electronically heated lateral actuator and finds that there is no statistically significant difference between the two test groups when a 4 mm gutta-percha is left. Haddix et al. (57) compare the mechanical and thermal way of removing the filling from the canal and come to the conclusion that when working with heated instruments a significantly lower micro-permeability around the filling in the apical third is observed. Grecca (8) uses three methods of post preparation: mechanical (LA Axxess burs (SybronEndo) heated plager or diluent applied through a hand tool and concludes that there is no difference between the tested methods. In straight canals the material is best removed mechanically with Gates Glidden, but in curved canals definitely better results were obtained when mechanical instruments were used in combination with chloroform.

According to research by Anjo et al. (58) The Nd: YAG laser is effective in removing obturated material and is better than conventional methods.

Conclusion

All the results obtained from the realized studies show that the integrity of the filling in the apical third during the post preparation can be easily damaged, thus endangering the success of the endodontic and restorative therapy.

Many factors have been examined that are thought to contribute to more successful filling in the apical third, such as: different types of cements or techniques used to fill root canals, instruments and methods used to remove some of the filling in a post preparation, the length of the remaining filling, the time that is most convenient to do the removal and many other parameters. There are also numerous methods that examine whether the filling that remains in the canal meets the rules for hermetic closure of the apical part. They can be clinical, laboratory, computer or X-ray. Yet while some rules and doctrines can be drawn, there are still many ambiguities and controversial results.

The daily technological development of materials and techniques in modern endodontics can also be a stimulus for new research in the field of restoration of endodontically treated teeth.

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Dental management considerations for the patiens with diabtes mellitus In oral surgery and pediatric dentistry A review

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Abstract

The incidence of patients suffering from diabetes is increasing. Due to the increase in population, the pediatric dentist as well as the oral surgeon must effectively treat the patients based on the protocol as efficiently as possible.

Based on the review of various literature, the authors present relevant information about diabetes mellitus, its type, manner of occurrence, complications, medical and dental management of these patients.

There is a lot of medical and dental data which the pediatric dentist and the oral surgeon should take into consideration when treating patients with diabetes mellitus.

Keywords: diabetes mellitus, oral surgery, pediatric dentistry

Introduction

Diabetes mellitus is a metabolic disease of glucose, fat, and protein that results from either impaired insulin secretion, high insulin resistance, or both. This chronic disease is characterized by hyperglycemia and complications including microvascular changes of the kidneys, eyes, and nervous system (neuropathy). These complications are responsible for the high rate of mobility and mortality in the diabetic population. (1)

In addition to these changes, oral manifestations are also evident, which also affects oral care.

Diabetes mellitus is classified as:

• Type 1 diabetes - insulin dependent: absolute lack of insulin due to autoimmune destruction or accelerated destruction of pancreatic B cells, this is in fact inherited with a disorder of the genes on chromosome 6.

• Type 2 diabetes - not insulin dependent: absolute lack of insulin or insulin resistance (inability to produce insulin by the pancreas - resulting in lack of circulating insulin and consequently the appearance of Diabetes Mellitus - Subsequent hyperglycemia).

Gestational : which occur in 5-7% of all pregnancies and result in loss of fetus. In case of surviving fetuses,the usually overwiught .When pregnancy over,mother glycemic control return to normal but this women are at developoing diabtetes in the next 5-10 years ,

Epidemiology

According to data from 2006, 23.6 million people (about 7.8% of the population) in the USA have been diagnosed with diabetes, while now after this period of time, 34.2 million people have been diagnosed with diabetes mellitus, meaning 1 in 10 people have diabetes mellitus, whereas 1 in 3 are prediabetic. The increase in the number of young people 10-19 years diagnosed with diabetes mellitus is worrying. (2)

Nearly 6 million people are not aware they have diabetes, and they only realize this after a complication arises. The prevalence increases with age and about 245 million people are over the age of 60 years. An epidemic of type 2 diabetes is almost on the rise knowing that globally the number of patients with type 2 diabetes is increasing year by year. Based on 150 - 220 million cases in 2010, this number is expected to reach 300 million in 2025, which shows us that will cost a lot to treat DM, as well as this disease being a clinical problem.

In addition, DM is considered to be the leading cause of blindness and kidney damage (in adults between the ages of 20-74), gingivitis and periodontitis.

Also 1/3 of people with DM have severe periodontal disease, with loss of gingival connections to the teeth on average 5mm-or more.

High morbidity with this disease, puts this disease among the 7 leading causes of death certified in the USA in 2006. The risk of death in patients with DM is 2 times higher than in people without DM, of the same ages.

Pathophysiology

Understanding the pathophysiology of diabetes still remains based on basic knowledge about carbohydrate metabolism and insulin action. After consuming food, carbohydrates are broken down into glucose molecules in the gut. Glucose is absorbed into the bloodstream, raising its level in the blood. This increase in blood glucose stimulates the secretion of insulin by pancreatic β-cells. The insulin produced binds to specific cellular receptors and enables the introduction of glucose into the cells, which enables its use for energy as needed.

If the production and secretion of insulin changes, this is accompanied by a change in the dynamics of glucose in the blood. If insulin production decreases, glucose uptake into cells is inhibited, resulting in hyperglycemia. The same effect can be encountered if insulin is produced by the pancreas but not used properly by the target cells. If the secretion of insulin increases, more glucose is stored in the cells, as a result we have a small amount of glucose in the blood, which leads to hypoglycemia (3).

Cells store sufficient amounts of glucose. But if there is still a large amount of glucose in the blood, the excess amount is stored in the liver, in the form of glycogen, which serves as a constant reservoir in the future. When energy is needed, the glycogen stored in the liver by glycogenolysis is converted to glucose as an energy source. But if the amount of glucose in the blood remains small even after glycogenolysis, then the liver produces glucose from lipids (fatty acids) and proteins (amino acids), through the process of glycogenesis. Thus, glycogenolysis and glycogenesis are processes that regulate the amount of glucose in the blood. In this case the body must find an alternative way as an energy source, and in this case utilizes triglycerides in fatty acids, this process is also known as gluconeogenesis, where in addition to glucose production it also produces ketonic bodies that in a long period leads in diabetic ketoacidosis.

In addition, as a result of hyperglycemia, glucose is excreted through the kidneys and Polyuria (frequent urination) occurs as a result of osmotic diuresis. Excessive fluid loss in this case leads the patient to dehydration where the patient needs to drink as much fluid as possible (polydipsia). Also the lack of glucose in the cells results in the patient starving (polyphagia), and all these consequences in the inability to utilize glucose in the cells lead the patient to weight loss (depletion of fatty acid and protein reservoirs).

In addition to the hormone insulin which plays a key role in the regulation of carbohydrates in the blood, other hormones such as: glucagon, catecholamines, growth hormones, thyroid hormones and glucocorticoids. (4)

Etiology:

Diabetes mellitus can result in any of the following causes:

• genetic disorders - which attack both types of Diabetes, but mostly Type 2, because as a cause of Type 1 is mostly attributed to the role of viral infections and autoimmune reactions.

• primary disorders of pancreatic cells during inflammation, cancer, or surgery

• endocrine disorders such as hyperpituitarism or hyperthyroidism

• during other disorders in the body where the administration of high doses of steroids is required.

Complications of diabetes mellitus

Chronic increase in plasma glucose levels results in accumulation of glucose and extracellular metabolic products, and as a result then we also have complications which are:

Acute complications

- Ketoacidosis
- Non-ketotic hyperosmolar hyperglycemic syndrome
- Hypoglycemia

Chronic Complications

• microvascular changes in the eye (retinopathy- microaneurysm of the retina)

• kidney (nephropathy), and

• neuropathy.

Macrovascular changes

Ulcers on foot.

In the group of patients with poor diabetic controls, it is more important that in these cases the prolongation of wound healing after surgical-oral and pediatric interventions may appear and as a result it may increase the chances for postoperative infections.

Also special attention should be paid to the non-enzymatic process Glycation - (binding of glucose to proteins and fats) which results in the release of Piole products - Sorbitol or Mannitol which are metabolic products of glucose that also cause tissue damage. (6)

Diabetes and manifestations in the oral cavity

The manifestation of diabetes is also encountered in the oral cavity. Xerostomia as a symptom of diabetes in the mouth, leads to dry surfaces of the mouth and as a result burns off the oral mucosa, as well as creating a suitable environment for the development of candidiasis or bacterial infections.

In addition to the above, according to numerous studies, the reason that leads to a high incidence of infections either before or after certain surgical interventions is attributed to the fact that the defense mechanisms are severely impaired starting from deficient vascularization, reduction of production of growth factors, reduced immunity as well as psychological stress. All these then affect the prolongation of processes such as those of regenerative oral soft tissue or bone healing processes (7).

The effect of diabetes on the appearance of caries is still unclear, although some studies suggest that xerostomia and increased glucose in the gingival fluid, creates the possibility of the

appearance of caries. But, knowing that patients with diabetes have limited intake of fermented carbohydrates, the studies between patients with type II diabetes and the control group, show that there are no significant differences regarding the increased incidence of caries with 2 groups. Data in Sweden also shows that the percentage of the population affected by gingivitis and moderate periodontitis has decreased and the percentage of the population with healthy peridoncium has increased, all as a result of diabetes and oral health management. For example, this percentage of healthy periodontium was for 1983-23%, in 1993-22% and in 2003-44%.

Diabetes and periodontium

Diabetes and periodontal disease are the two most common chronic diseases in some parts of the world. Research shows that there is a two-way relationship between diabetes and periodontal disease, so that diabetes endangers periodontal health due to poor glucose control, which leads to periodontal disease, which also worsens diabetes. This shows how important it is not only for oral health professionals, but for all health professionals, to understand the role and importance of oral health management in patients with diabetes. We will focus on some key objectives, based on research done on diabetes and periodontal disease, such as:

1-The negative effect that diabetes has on periodontal health,

2-Negative effect of periodontal infection on glucose control in diabetes and

3-Periodontal infection and the development of complications in diabetes, but also the impact on the pathogenesis of diabetes itself (8).

The negative effect of diabetes on periodontal health

It is known that diabetes affects periodontal diseases, but that it also depends on the controls against diabetes. Patients who have good control over diabetes show the same degree of gingivitis compared to healthy people. Although numerous epidemiological studies suggest impairment of ligaments in the periodontium and bone resorption, almost 3 times more than in people without diabetes. Also patients with diabetes easily develop periodontal disease as a complication of diabetes, if they do not take care of oral hygiene, always knowing that dental plaque is the main cause of periodontal diseases. But in patients with well-managed diabetes and careful oral health care there are no significant differences with incidence of periodontal disease in healthy individuals.

Hyperglycemia encountered in the blood will be found increased in the gingival fluid and this leads to vascular changes in the gingiva, as well as other complications in the retina, kidneys, etc. Atherosclerotic changes lead to narrowing of blood vessels, resulting in increased periodontal tissue destruction and poor reparative potential. (10)

Diabetes also damages immune cells, such as polymorphonuclear leukocytes, monocytes, and macrophages, impairing polymorphonuclear adhesion, chemotaxis, and phagocytosis. This leads to increased inflammation in the periodontal epithelium and connective tissue, increasing the degradation of tissue connections and bone loss because bacterial agents act freely.

Collagen, as the primary structural protein in the periodontium, is also damaged. This is because it increases the production of collagenase, a collagen-destroying enzyme that continuously destroys the collagen produced. Thus, diabetes affects the normal synthesis of collagen, and consequently the difficult healing of wounds.

Tetracycline agents reduce collagen production and collagen degradation by antimicrobial action, therefore indicated for the treatment of periodontitis, arthritis, diabetes, osteoporosis, etc. (11)

The negative effect of periodontal infection on glucose control in diabetes

The data show that periodontal infection can affect glycemic control of diabetes, because periodontal infection increases the risk for minimal control against glycemia, especially in cases with complications of diabetes, such as nephropathy and macrovascular disease. In one study, 82% of patients with advanced diabetes and periodontitis had a cardiovascular, cerebrovascular, or peripheral vascular attack during the 1-11 years of the study, compared with only 21% of individuals with milder-grade diabetes. low or no periodontal disease. (12).

In patients with diabetes, periodontal treatment has an effect on glycemic control. Studies have confirmed this in patients with diabetes and periodontal tissue treatment with combination therapy with tetracycline (doxycycline), but not in patients treated with periodontitis but without antibiotics.

The mechanism by which antibiotics, together with periodontal treatment, have a positive effect on glycemic control is not yet known. Perhaps this is because subgingival pathogens are eliminated and collagen production is suppressed, which destroys collagen.

Oral manifestations that occur in diabetic patients are

Gingival and periodontal pathologies

Prevalence / assessment in the progression of oral changes, accurate instructions for oral hygiene, dietary instructions, frequent periodic examinations, and prophylaxis.

Salivary gland dysfunctions and xerostomia / caries, mucosa, absence of papillae.

Prevalence / mouthwash Rich in fluoride as well as saliva substitutes (xylitol-carboxymethylcellulose - or hydroxyl cellulose, stimulating muscle receptors. (13)

Medical treatment and dental treatment of patients who undergo surgeries in oral surgery and pedodontics.

The main purpose of treating patients with DM is to keep blood glucose levels as normal as possible, and this is achieved by controlling glucose which also prevents concomitant complications.

Normal blood glucose values;

Beetwen 4.0 -5.4 mmol / l (72-99mh.Dl), Up to 7.8 mmol / L (140 mg / Dl) 2 hours after meals

For diabetic patients, the target values should be:

Before meals: 4-7 mmol / type 1 and 2 After feeding: below 9 mmol / L for Type 1 and 8.5 mmol / L for Type 2.

According to the American Diabetes Association, it is recommended that people over the age of 45 have a diabetes test every 3 years.

As glucose circulates in the blood, it attaches to a portion of the hemoglobin molecule in the erythrocytes, and as blood glucose rises, so does the percentage of hemoglobin that binds to glucose. There are 2 tests that measure glucose hemoglobin:

1. Hemoglobin A1 (HbA1), normal value is less than 8% and

2. Hemoglobin A1c (HbA1c), normal value is 6.0-6.5%.

The other method for measuring blood glucose levels is the fructosamine test, where normal values range from 2.0-2.8mmol / L and measures glucose in the next 2-4 weeks.

Glucose monitoring is also performed by the patient himself, with the help of glucometers. Patients with type I diabetes measure their blood glucose level several times a day, compared to patients with type II diabetes. (14)

The target values to be achieved in diabetic patients are:

Target values: HbA1C	Pre-meal value of blood glucose mmol / L	2 h after meal mmol / L
≤7.0%	4.0-7.0	5.0-10.0

Drug management

The main goal of medical management in all diabetic patients is to keep blood glucose levels as normal as possible.

As a medication for the treatment of Diabetes is Insulin which is administered either subcutaneously or per os .

Insulin - which is used to treat patients with diabetes is found in several forms, based on the time of action:

Rapid - reacts within 15 min. with the highest point of activity in 45-90min

Short action - reacts within 30 min. With the highest point of activity in 2-5 h

Intermediate action (lens) - reacts within 1-2 h, with the highest point of activity 6-12h

Long action (Ultralente) - reacts within 4-6 h, with the highest point of activity 8-20 h. (15)

In cases of type 1 diabetes, due to the correlation between suboptimal glucose control and vascular complications, intensive management is the main way recommended to all patients. This is actually achieved even through more frequent insulin administration (up to 4 times a day) or the use of different types of insulin as well as the monitoring of blood glucose.

Insulin administration should be done individually, adapting to each patient separately, age and lifestyle.

For example, adults and adolescents are given intermediate-acting insulin at bedtime, school-age children are given short-acting insulin, and give a glass of tea in the afternoon instead of lunch to prevent hyperglycemia, while preschool children may be given manage a dose of intermediate-acting insulin in the morning and small doses of fast-acting insulin analogues to prevent hyperglycemia later.

In order to minimize the risk of any intraoperative emergency, clinicians need to correctly apply management protocols based on a few points:

Medical history

Have a clear glucose value before each treatment, as well as previous glucose values or any previous hypoglycemic condition.

We should also be informed about antidiabetic medications, the dose and time at which they are administered. In addition, we should be informed about medications that may interfere with blood glucose levels either in the role of insulin or in carbohydrate metabolism.

Drugs that have hypoglycemic action - salicylates, dicumerol, b-adrenergic blockers, sulfanamides or even angiotensin inhibitory converting enzymes. (16)

While drugs with hyperglycemic action are: corticosteroids, epinephrine, oral contraceptives or calcium channel blocker drugs.

Scheduling an appointment for a medical visit

Generally, morning visits are recommended because the level of endogenous cortisol in this daily period is high (the role of cortisol - increases the level of glucose in the blood), also patients should definitely take the daily dose of insulin since in the morning its peak of action is low and thus prevents the occurrence of any eventual state of Hypoglycemia. (17)

Diet:

It is much more important for clinicians to make sure that the patient has eaten breakfast and has received the necessary therapy (insulin). On the contrary if the patient has not eaten breakfast but has taken a certain dose of insulin then he is at risk for a hypoglycemic crisis.

In cases when it is necessary to make major interventions under sedation or anesthesia, food should be avoided before this procedure, the insulin dose should be modified in consultation with the specialist doctor who is checking the patient (18).

Blood glucose monitoring:

Depending on the medical history, therapy or even the procedures that need to be performed, dentists need to measure the level of glucose in the blood.

If the blood glucose level is less than 70 mg / Dl, then we should prescribe sugars before the intervention in order to minimize the hypoglycemic crisis. While in patients when the blood glucose level is too high, then in we refer the patient to make a consultation with the specialist doctor before treatment. (19)

Management during treatment

The critical condition that may occur during the treatment of patients with Diabetes Mellitus is the hypoglycemic crisis. This is when insulin levels exceed physiological needs, and usually occur when the effect of insulin is maximal.

The initial clinical signs during a hypoglycemic episode are:

Mood swings, weakness, and then accompanied by sweating, tachycardia, and if we do not react immediately the patient may experience consciousness, hypotension, hypothermia, fever, coma and eventually death. (20)

How to manage: To stop the intervention, then to administer 15 g of glucose or any glucose tablet, chocolate, but in cases when the patient has already lost consciousness then administer intravenously25 -30 mL of 50% dextrose solution or 1mg of glucagon (it can also be administered subcutaneously or intravenously) (21)

If the long period of hyperglycemia persists, then ketoacidosis appears when the patient clinically results in theft, loss of concentration, abdominal pain and bad acetone odor. In these cases, insulin administration is required.(22)

Intraoperative management of hypoglycemic emergency

Signs and Symptoms Managing emergencies

Mild • hunger • fatigue • sweating • nausea • abdominal pain • headache • tachycardia • irritability Moderate • incoherence • uncooperative • belligerence • resistive behaviour Severe • unconscious • seizure	• Terminate dental treatment immediately Awake/alert patient • Administer 15 g oral carbohydrate (i.e., glucose tablet, 180 mL orange juice, 15–25 mL sugar) • Monitor blood glucose and repeat carbohydrate dosing as necessary Uncooperative patient • Seek emergency medical assistance • Administer glucagon 1 mg via subcutaneous or intramuscular injection followed by oral glucose supplement or • Administer 20–50 mL of 50% dextrose solution intravenously Unconscious patient • Seek emergency medical assistance • Administer 20–50 mL of 50% dextrose solution

After treatment

Clinicians should also consider possible postoperative changes in this group of patients.

In the case of the group of patients with poor control of Diabetes Mellitus are more at risk of developing infection and wound healing, therefore if we are dealing with major surgical interventions then we must take certain doses of antibiotics for preventive.

Also patients who use drugs such as salicylates increase insulin secretion and as a result may lead to hypoglycemia. Therefore, aspirin should be avoided in the postoperative period.

As a conclusion in the context of dental management we need to take the following steps:

- Consultation with a specialist doctor regarding diabetes
- To receive an accurate medical history including medications which are under the prescription of the patient
- To be confirmed by the patient who has eaten food and taken medication before treatment
- The pedodontist or oral surgeon should be aware of the emergency symptoms of diabetes and how to manage that emergency condition
- Prevention, treatment and elimination of infections in advance
- Do not use aspirin
- Achieve deep local anesthesia (to reduce stress)
- Ensure good oral hygiene
- Provide a regular diet and medication
- Provide a glucometer when we have conservative treatment or oral surgery. (23)

Conclusion

Based on the fact that now with about 318 million people worldwide suffer from Diabetes, it is clear that Oral Surgeons or Pediatric Dentist during their professional careers with treat such patients suffering from this chronic disease, add here the number of oral manifestations and the risk of intraoperative emergencies, it is necessary for us to have the knowledge about the underlying disease, the consequences that appear from this disease which result in the oral cavity and to have accurate knowledge about how to treat these manifestations, and as a professional doctor to cooperate together so as to effectively inform the patient about exemplary oral health care.

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PHARMACOLOGIC THERAPY IN TEMPOROMANDIBULAR DISORDERS: A MINIREVIEW

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Abstract The temporomandibular disorders (TMD) etiology is multifactorial and it affects the most important functions, such as eating, speaking, and facial expressions, and are usually accompanied by pain which results in distress for the patient. Despite the extensive studies in the management of TMD, which is commonly a multidisciplinary approach and the most commonly used steroidal or nonsteroidal anti-inflammatory, myorelaxant, tricyclic antidepressants, anticonvulsants and anxiolytics have been proven to be successful for related inflammatory, disc interference disorders only and neuropathic pain, but are still not an appropriate solution for definitive treatments and still carries risk due to their side effect profiles. Taking this into consideration there is still an emerging need to investigate the main pharmacological approaches for the appropriate management of the resulting acute and chronic pain. In this regard, many studies have been conducted so far to provide the role of pharmacotherapy on TMD. Therefore, in this review, we have summarized the current scientific evidence which supports the most common available safe, and effective drug treatments in the TMD.

Keywords: TMD, pharmacotherapy.

Introduction

The temporomandibular disorders (TMD) etiology is multifactorial and it affects the most important functions, such as eating, speaking, and facial expressions, and are usually accompanied by pain which results in distress for the patient (1). TMDs induces pain, joint sounds, mandibular movement problems or jaw function, malocclusion (2). TMD classification is shown in Table 1Patient with TMD experiences also headaches and sleep related problems, with a higher incidence in women's (3). Most common population, like 33% experience at least one TMD symptom, however 3.6-7.0 % have a need for management (4). However, despite the extensive studies in the management of TMD, it is usually considered as a multidisciplinary approach including non-pharmacologic and pharmacologic management. The most commonly used pharmacological agents for the management of TMD symptoms, especially inflammation and pain are, non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroids, muscle relaxants, opioids and other central nervous agents such as anticonvulsants, antidepressant and anxiolytics (5). These agents have been proven to be successful for related inflammatory, disc interference disorders only and neuropathic pain, but are still not an appropriate solution for definitive treatments and still carries risk due to their side effect profiles and reduced or unknown efficacy. Therefore in this mini review, we have summarized their pharmacological actions and most common available treatments, their safety and efficacy in management of TMD.

Table 1. TMD classification based on the diagnostic criteria (Modified from Peck CC et al., 2014)[6]

1 Masticatory Muscle Disorders	1 Protective co-contraction 2 Local muscle soreness 3 Myofascial pain 4 Myospasm 5 Centrally mediated myalgia
2A Temporomandibular Joint	1 *Derangement of the condyle-disc complex* 2. Disc displacements

Disorders	3 Disc dislocation with reduction Disc dislocation without reduction
2B Structural incompatibility of the articular surfaces	1 Deviation in form 2 Disc 3 Condyle 4. Fossa 5 Adhesions 6 Disc to condyle 7 Disc to fossa 8 Subluxation (hypermobility) 9 Spontaneous dislocation
2C Inflamatory Disorders of the TMJ	1 Synovitis/Capsulitis 1 Retrodiscitis 2 Arthritides 3 Osteoarthritis 4. Osteoarthrosis 5 Polyarthritides 6 Inflammatory disorders of associated structures 7 Temporalis tendonitis 8 Stylomandibular ligament inflammation
3. Chronic Mandibular hypomobility	1. *Ankylosis* 2. Fibrous 3 Bony 4 *Muscle contracture* 5 Myostatic 6 Myofibrotic 7 *Coronoid impedance*
4. Growth Disorders	1 *Congenital and developmental bone disorders* 2 Agenesis 3 Hypoplasia 4 Hyperplasia 5 Neoplasia 6 *Congenital and developmental muscle disorders* Hypotrophy 7 Hypertrophy 8 Hypertrophy 9. Neoplasia

2. Pharmacological Treatment of Temporomandibular Disorders

Pharmacologic therapy is needed for controlling inflammation, pain (acute or chronic), and muscle spasm as main symptoms of TMD. The most common pharmacological treatment is usu-

ally empirical and is divided into four different groups, including, anti-inflammatory drugs including nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroids, and systemic nervous system action drugs such as muscle relaxants, opioids, anticonvulsants, antidepressants, anxiolytics, and other target actions including hyaluronic acid and glucosamine and bioactive and traditional plants (7).

2.1 NSAIDs

Based on their anti-inflammatory and analgesic pharmacological properties, NSAIDs are the first-line medication for the treatment of pain and inflammation in TMD, with a focus on disc displacement, synovitis, arthritis, and capsulitis (8). These agents can be used also in the management of pain from masticatory myalgia and myofascial pain (9). The most common NSAIDs used are diclofenac, naproxen sodium, ibuprofen, celecoxib, piroxicam etc (10), and the period of use for such indication consists of a minimal 2 week period, suggesting long-term treatment to obtain the clinical effects (11). Despite their beneficial actions they possess gastrointestinal, renal, and cardiovascular side effects (12). The most common gastrointestinal and cardiovascular side effect is bleeding, ulceration, and risk for atherothrombosis, which alerts close monitoring during the period of their use (13). Even though the gastrointestinal effects are diminished with selective cyclooxygenase-2 inhibitors (COXIBs) they pave the road more for cardiovascular-related side effects, which faded their clinical use perspective due to safety concerns (14). They interfere with other drugs in increasing toxicity, including methotrexate, lithium, and reduction of antihypertensive drug effects (diuretics and ACE inhibitors) and increase anticoagulation effects (15). In addition to this NSAIDs are combined with derivates of p-aminophenol, such as acetaminophen or paracetamol to provide synergic effects in controlling acute TMD pain (16).

2.2 Corticosteroids

Corticosteroids are potent anti-inflammatory drugs in the management of moderate to severe TMD and are mainly administered as locally injected in the joints with intra-articular injections, topically or orally (17). Their use needs to be limited for no more than a sustained two-week period due to an increase of susceptibility for infections due to their immunosuppressive actions, hyperglycemia, osteoporosis, suppression of hypothalamic-pituitary-adrenal axis, etc (18). In order to minimize their side effects, they must be limited to a short period of use with a local intra-articular injection (19). Therefore, methylprednisolone, triamcinolone acetonide, betamethasone, dexamethasone alone or in combination with lidocaine, hyaluronic acid, and NSAIDs have been proven to improve symptoms of TMD (20). However, due to their poor side effect profile, with a focus on degenerative changes in joints, their use needs to be limited for every 3 to 4 months (21, 22).

2.3 Muscle Relaxants

Muscle relaxants reduce the skeletal muscle tone associated with higher masticatory and cervical muscle contraction and are used in a patient with TMD related to chronic orofacial pain or muscle-related symptoms (23). This includes central muscle relaxants cyclobenzaprine (similar structure to tricyclic antidepressants), carisoprodol, carisoprodolmetaxalone, methocarbamol, tizanidine, diazepam, and peripheral such as baclofen, botulinum toxin A, dantrolene (24). Central muscle relaxant use needs to be limited during the driving period and due to their sedative properties are in preferred in the lowest dosage before sleeping, and also their anticholinergic side effect profile need to be monitored (25). Their general use consists of a continuous 30 day period of use, followed by 2 weeks as a washout period, and return for additional 2-3 months if necessary (9). However, despite their meaningful clinical data, their long-term clinical use and efficacy are still not clear (16). For example, botulinum toxin alone or combined use is not supported by the currently available evidence in subacute and chronic pain (26).

2.4 Opioids

Opioids or narcotic analgesics are characterized and used for controlling more moderate to severe pain from TMD, where the other drugs are found ineffective (27). These agents are recommended to be limited to short-term and acute pain control, due to knowing the risk due to their side effect profile such as respiratory depression, sedation, constipation, and the most common pharmacological concerns regarding the tolerance and physical dependence caused by this agent (28). Despite that these agents are not considered as first-line therapy for managing TMD-associated pain, the most commonly prescribed opioids in TMD are oral use of hydrocodone, oxycodone, and codeine (4). However, fentanyl patches or intra-articular morphine injection can be also be considered when the oral route is not a reasonable option (29). The prescription of this agent should be carefully considered and limited due to special concerns of patients with substance use disorders, with a major focus in the chronic course of therapy since there are no final conclusions of long-term therapeutically benefits and due to tolerance and abusing tendency (30).

2.5 Central Nervous System Drug Agents

The central nervous drug agents used in TMD are anticonvulsants, antidepressants, and anxiolytics these agents are used to control pain, gabapentin, pregabalin as an anticonvulsant are used to treat pain and tenderness in masticatory muscles, with a focus in mainly neuropathic pain (31, 32). In addition, antidepressant drugs as alone or in combination with anticonvulsants, including mainly tricyclic antidepressants and serotonin-noradrenalin re-uptake inhibitors, serotonin selective re-uptake inhibitors are used to manage TMD-related bruxism, muscle pain-related sleep disorders, fibromyalgia, chronic pain in the orofacial region which might have depression or sleep as a comorbid disease. The common use of antidepressant drugs in TMD are amitriptyline, nortriptyline, desipramine, fluoxetine, paroxetine (33). These drugs need to be used with caution in a patient with cardiovascular diseases and concomitant use with monoamine oxidase Inhibitors

(34). In the end, the anxiolytics include mainly benzodiazepines specifically: diazepam and clonazepam. Drugs in the central nervous system need to be prescribed with caution from the dental community and need to be in consultation with physicians to ensure their diagnosis, medical stability, and management of the side effects (35).

3. Other Complementary Alternatives

Despite the current presence of approved pharmacological treatments in the management of TMD, there are some complementary alternatives that are mainly empirical treatments without strong evidence to support their effectiveness and that are being used nowadays, including hyaluronic acid, glucosamine, and traditional agents (7, 36, 37). Hyaluronic acid is commonly used in combination with glucocorticoids via intra-articular injection for the treatment of TMD.This controls the myofascial pain within the masseter muscle, restores the viscoelasticity of synovial fluid in the inflamed joins, and creates lubrification (38). In addition to this, glucosamine has been considered an additional alternative due to its inhibition properties in cartilage decomposition and promotion of proteoglycan synthesis. This has been considered to be a safe option in higher dosage or in combination with hyaluronic acid (39). The most common plants which are being demonstrated efficacious in the different preclinical and clinical study investigations are Tephrosia toxic area, Euphorbia bicolor Latex Extract, Moringa oleifera, Grape Seed Extract, Purple Corn Extract, Resveratrol, Curcumin, Cocoa, Lectins, Terpenes, etc (7).

Conclusion

In this review, we summarized the knowledge regarding the pharmacological treatments of TMD, starting from the priority of treatment up to the recent developments and complementary alternatives. There are different pharmacological groups of treatments that are used alone or in combination with other modalities such as physical therapy or oral appliances. The current pharmacological agents help to control inflammation, pain and provide improvement of the symptoms but not a definitive cure. Despite the long history of their use, there are still difficult to prioritize them and specify their main indications. However, anti-inflammatory drugs, NSAIDs, and corticosteroids are frequently used followed by opioids, muscle relaxants, anticonvulsants, antidepressants, and anxiolytics. Careful consideration should be in their dosage and length of treatments, drug interactions due to their side effect profile of anti-inflammatory drugs, physical dependence, and tolerance in opioids, physician monitoring with other central nervous action drugs with other comorbidities.

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Determination of mercury from dental amalgam fillings in hard tissue of the teeth in vitro condition

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Abstract The purpose of this study was to determinate mercury in hard tissue from dental amalgam fillings in vitro conditions.

Material and method: 30 human teeth were tested. They were extracted for different reasons. Depend of preparation of cavity teeth were divided in three experimental groups with 10 teeth. Group 1-10 teeth were prepared in occlusal surface, group 2-10 teeth were prepared in approximate-occlusal surface and group 3-10 teeth were prepared in MOD surface. All of them were filled with amalgam and after 24 hours, five teeth of each group were polished. After 9 months the examples were tested. Before chemical analysis tooth were irrigated four times for 10 minutes in ultrasonic bath. Tooth were grind in size less than in grinder with sphere (Retch, Germany). From each tooth was taken 250 mg dust and wamineralized with royal water (HCl+HNO3 in ration 1:3) in microwave oven (Bergenhof, Germany). After mineralization examples were filtered and were analyzed in ICP-OES (Perkin Elmer, USA, Optima 2100 DW).

Results: There were significant difference in the amount average of mercury in both group polished (One Way Anova, $F=110.54$, $p<0.001$), and unpolished group (One Way Anova, $F=69.54$, $p<0.001$).

Conclusion: It may be concluded that mercury was released more in unpolished amalgam filling than polished amalgam fillings.

Key words: amalgam, mercury, polished, unpolished.

Introduction

The use of mercury in dentistry has been controversy since at least the middle of the 19th century. This controversy has intensified lately because of techniques showing mercury to be continual released from dental amalgam fillings. (1)

Mercury is naturally occurring element and exists in three forms: organic, inorganic and elemental. Fish and marine mammals are the dominant sources contributions up to 70-90% of the totally mercury (organic, methylmercury). (2)

Dental filling with mercury amalgam can be source of human exposure to elemental mercury vapors for many population. Amalgam surface release mercury vapor into the mouth and lung,

depending upon the number of amalgam fillings and other factors, the estimated average daily absorption of mercury vapor from dental fillings varies between 3 and 17 μg mercury. (3)

Mercury can also be released by electrochemical corrosion from amalgam fillings during chewing. (4)

Also, materials used for tooth bleaching can cause the release of the mercury from amalgam fillings. According to Bahar et al. the free amount of the mercury from the amalgam fillings depends on the contents of silver in the alloys. The greater the percentage of silver (69%), so little less the release of the mercury from the amalgam, and vice versa the smaller the percentage of silver (45%), so greater release of the mercury from the amalgam. (5)

Although bleaching gels are commonly applied to anterior teeth excess bleaching materials might inadvertently come into contact with amalgam restoration on premolars and molars, and may increase the susceptibility of amalgam to corrosion and degradation. Bleaching agents, including carbamyde peroxide break into free radicals which can theoretically corrode metallic alloys such as amalgam in the proximity or on teeth undergoing bleaching procedures to release mercury. (6)

On the other hand, mercury is one of the radioactive elements that can be quite toxic even in the smallest dose. (7,8)

Various analytical techniques has been used previously for the determination of mercury environmental and biological samples such as Cold Vapor Atomic Absorption Spectrometry (CVAAS), Cold Vapor Fluroscence Spectrometry (CVAFS), Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES), electrothermal atomic absorption spectrometry, Anodic Stripping Volta metry, Cold Vapor Inductively Coupled Plasma Mass Spectrometry (CV-ICP-MS) (9) and Optical Emission Microspectroscopy. (10)

The free amount of the mercury from amalgam fillings can also be determined by the nuclear tracking technique. (11)

The release of the mercury from amalgam fillings can also be studied with Spectroscopy-Induced Laser Femtosecond. (12)

The corrosion of amalgam can also be determined by Florescent Energy of Spectroscopy. (13)

Also studied is the influence of pH on the release of Hg from amalgam fillings.

It is stated that in variable pH values, mercury more dissolves in more thirds amalgam fillings that contain tin at all stages of amalgamation, compared to amalgam fillings that do not contain tin. (14)

Researches agree that amalgam restorations leach mercury into the mouth, but consistent findings are not available to report whether it has any significant health risk. (15)

Mercury does not collect irreversibly in human teeth. The average half of mercury is 55 days for transport through the body to the point of excretion. Thus mercury that came into the body years ago may no longer be present in the body. 13

Other investigations have recently reported that Hg concentrations in autopsied human brain and kidney are significantly higher in those subjects with no amalgam. (16)

The use of mercury in tooth fillings represents some 10% of the total global mercury consumption; thus, it is the largest consumer of mercury in the world -UNEP. (17)

Aim

The purpose of this study was to determinate mercury in hard tissue from dental amalgam fillings in vitro conditions.

Materials and Methods

The research was carried out at the Faculty of Medicine - Branch of Dentistry in Prishtina, Kosovo. This research includes 30 human teeth (premolars) of mandibulars that have been exctracted for various clinical causes. Teeth are stored in physiological solution until they are used. The research was conducted under in vitro conditions. Depending on the preparation of cavity, the teeth are divided into three experimental groups with 10 teeth and these groups depending on the filling polish are divided into two other subgroups.

Group 1. (n=10) cavity is prepared in the occlusal surface (kl I according to Black) and depending on the polishing of the filling these teeth are divided into two subgroups:

Under Group 1.1. (n=5) teeth with amalgam fillings have not been polished.

Under Group 1.2. (n=5) teeth with amalgam fillings have been polished.

Group 2. (n=10) cavity is prepared in the occlusal and approximate surface (kl II according to Black) and depending on the polishing of the filling these teeth are divided into two subgroups:

Under Group 2.1. (n=5) teeth with amalgam fillings have not been polished.

Under Group 2.2. (n=5) teeth with amalgam fillers have been polished.

Group 3. (n=10) cavity is prepared in the occlusal, mesial and distal surface (kl MOD according to Black) and depending on the polishing of the filling these teeth are divided into two subgroups:

Under Group 3.1. (n=5) teeth with amalgam fillings have not been polished.

Under Group 3.2. (n=5) teeth with amalgam fillers have been polished.

Then these teeth are filled with amalgam (Dispersalloy, Johnson and Johnson Inc. Montreal, Canada) and after 24 hours it has become the polishing of these fillings.

Mercuy release from dental amalgam fillings was determinated after 9 months of filling teeth.

Before chemical analysis these teeth were irrigated from four times in the duration of 10 minutes in the ultrasonic bath. Then the teeth are grinded into grinders mills in sizes less than 75 microns (Retsch, Grindomix GM 200, Germany). After grinding the teeth, powder was drying in the thermostat at a temperature of 105C° in the duration of 3 hours. Then there was the measurement of powder on the scales in 4 decimals (Kern, Germany).

From each tooth is taken 250 mg of powder and mineralization has been made with royal water (HCl+HNO3 in relation to 1:3) in the microwave oven (Bergenhof, Germany), at temperature 37C° and duration of 54 minutes.

After mineralization, filtration and reading was done with ICP-OES (Perkin Elmer, USA, Optima, 2100 DW).

Results

Table 1. Mean value of Hg at different classes

Class	N	Mean ± SD	Rank	T- test P- value
Cl I	10	6.53 ± 0.85	5.36 - 8.02	T=2.329 P=0.032
Cl I, P	10	5.80 ± 0.51	5.12 - 6.53	
Cl II	10	10.02 ± 1.81	6.72 - 12.22	T=1.816 P=0.086
Cl II, P	10	8.76 ± 1.24	7.74 - 11.4	
MOD	10	13.18 ± 0.88	11.61 - 14.56	T=1.405 P=0.177
MOD, P	10	12.54 ± 1.14	10.53 - 14.07	
Total	60	9.47 ± 3.00	5.12 - 14.56	

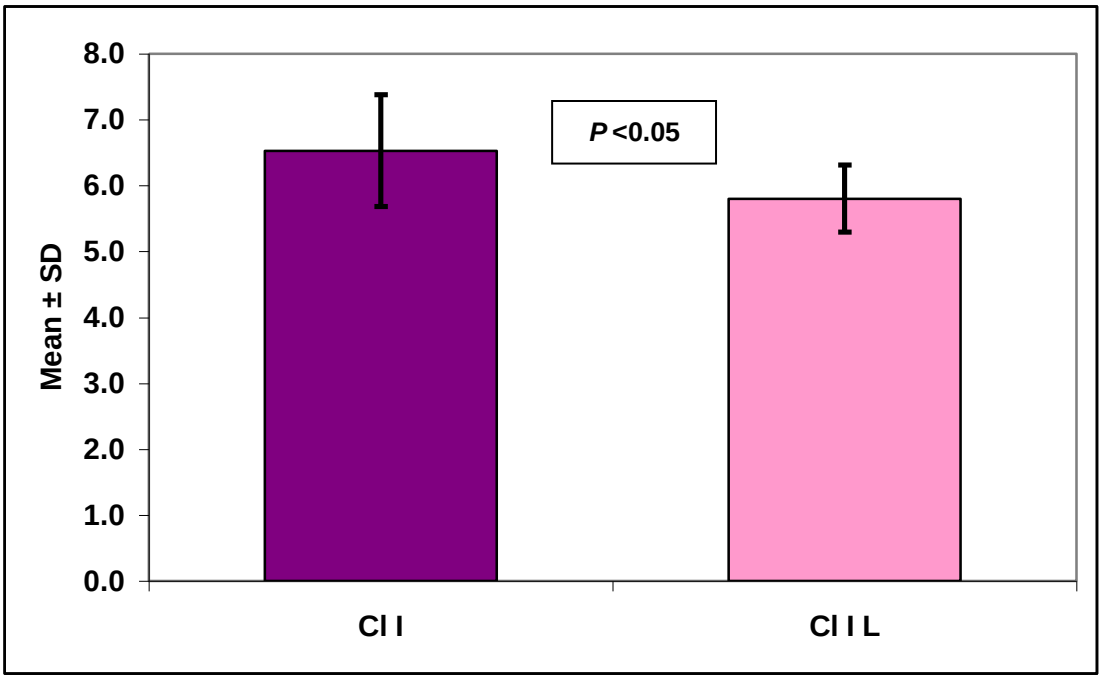
The average value of mercury in teeth in which the cavity on the occlusal surface (Cl I according to Black) is preparation before polishing the amalgam filling (5 teeth, 10 measurements of each teeth from 2 times, n=10) is 6.53, the standard deviation 0.85 mean minimum value 5.36 and maximum 8.02. The average value of Hg in the teeth in which cavity on the occlusal surface (Cl I according to Black) is preparation after the amalgam filling polish is 5.80, the standard deviation 0.51 while the minimum value 5.12 and the maximum 6.53.

Mercury average value after polishing the amalgam filling was smaller and difference significant (P<0.05), (Tab. 1 and Graf. 1).

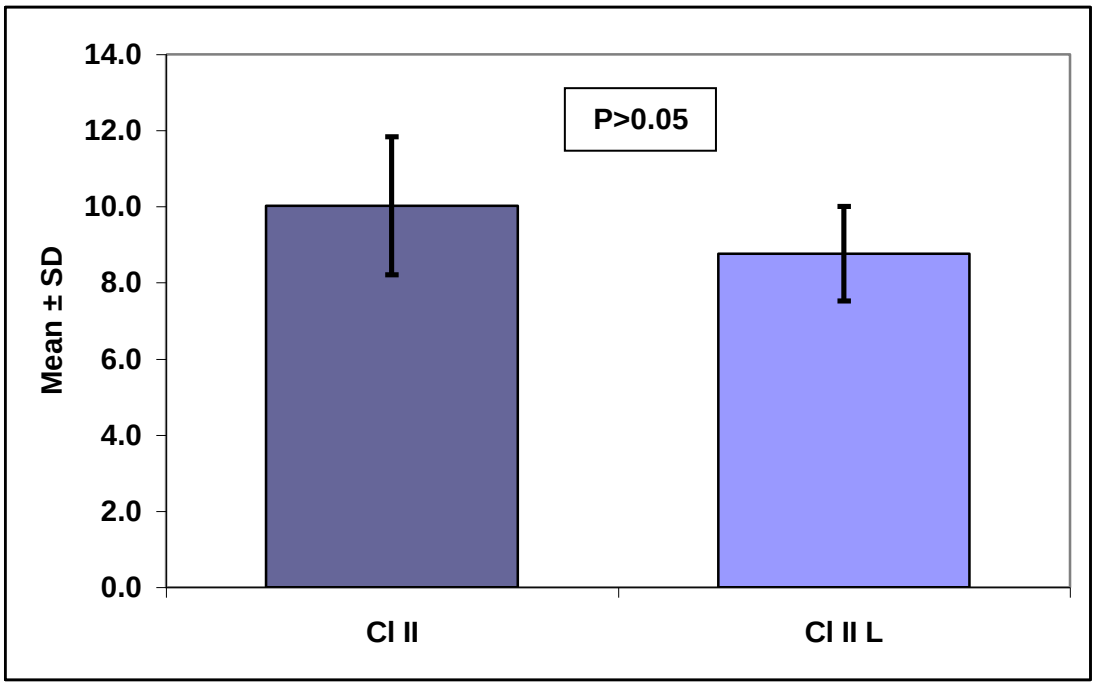
The average value of mercury in teeth in which cavity is prepared on the occlusal and aproximal surface (Cl II according to Black) before amalgam filling polish is 10.02, standard deviation 1.81 while the minimum value is 6.72 and maximum is 12.22. The average value of mercury in teeth in which the cavity on the occlusal and aproximate surface surface (Cl II according to Black) is preparing after polishing of the amalgam filling is 8.76, the standard deviation 1.24 while the minimum value is 7.74 and the maximum is 11.4.

Mecury value after polishing the amalgam filling was smaller without significant difference (P>0.05), (Tab. 1 and Graf. 2).

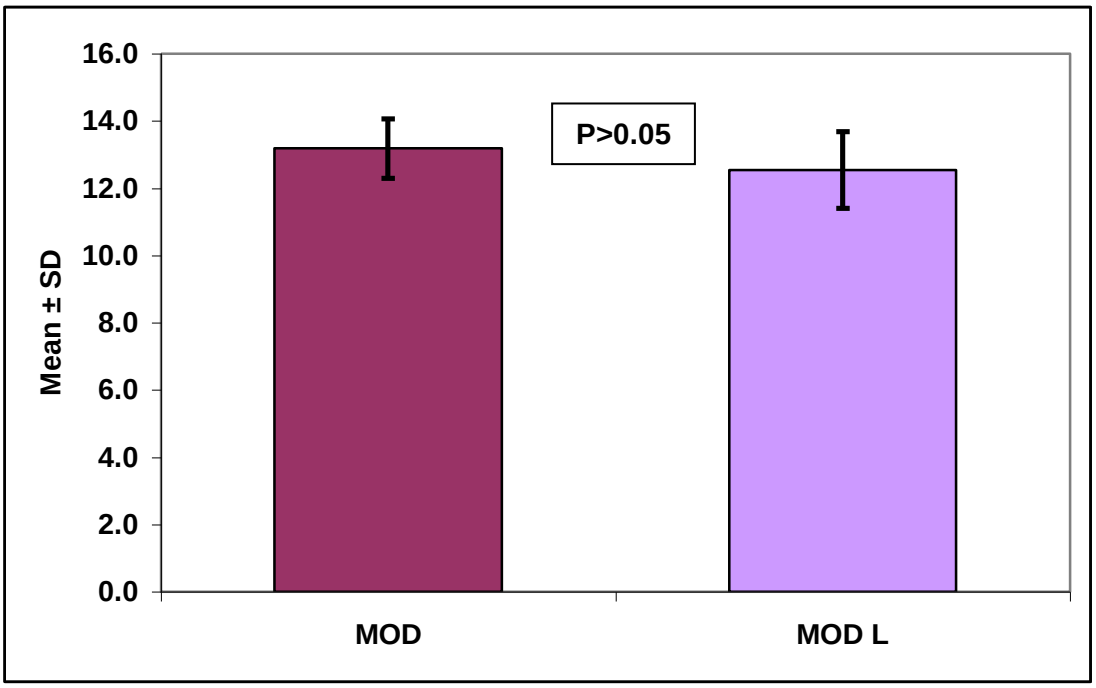
Mercury average value before the MOD amalgam filling polish is 13.18, the standard deviation is 0.88 while the minimum value is 11.61 and the maximum is 14.56. The average value after the MOD amalgam filling after polishing was 12.54, the standard deviation is 1.14 while the minimum value is 10.53 and the maximum is 14.07. Mercury value after polishing was smaller without significant difference (P>0.05), (Tab. 1 and Graf. 3).



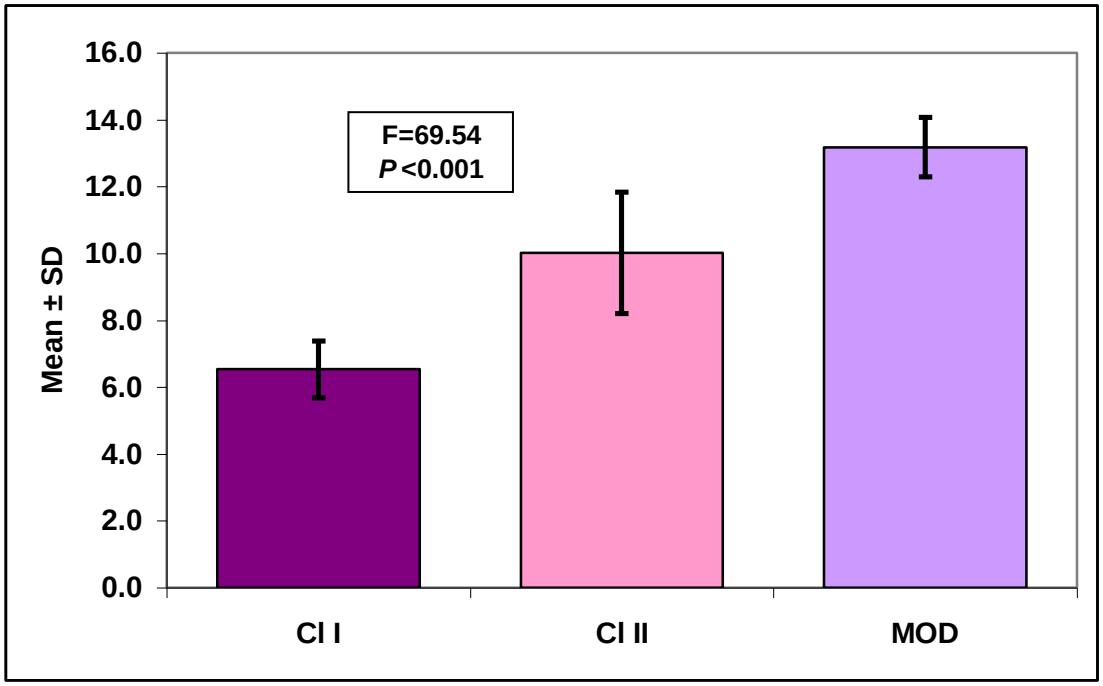
Graf. 1. Mean value of Hg at Cl I and Cl I L



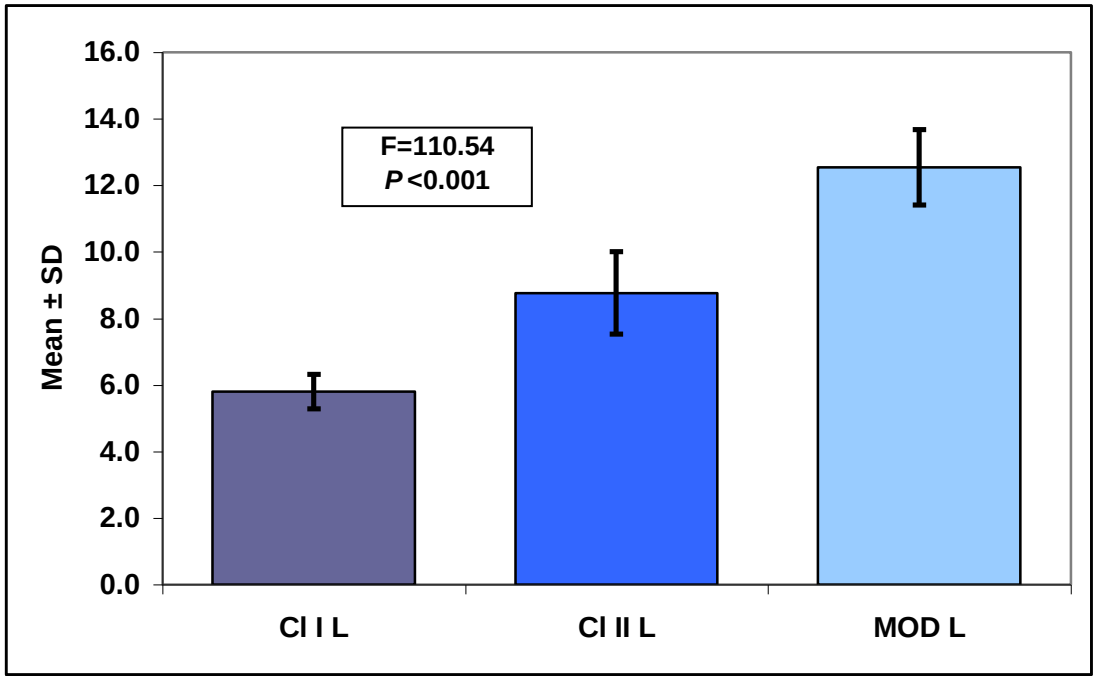
Graf. 2. Mean value of Hg at Cl II and Cl II L



Graf. 3. Mean value of Hg at Cl II and Cl II L



Graf. 4. Mean value of Hg at Cl I, Cl II and MOd



Graf. 5. Mean value of Hg at Cl I L, Cl II L and MOD L

Between the average values of Hg according to Black classes we have high statistical signification as in groups without amalgam filling polishing (One Way ANOVA F= 69.54, P<0.001) and amalgam filling polishing groups (One Way ANOVA F=110.54, P<0.001), (Graf. 4 and Graf. 5).

Diskutimi

Exposure to mercury from dental amalgams, with possible negative health effects, has generally been considered to occur via either erosion or evaporation directly from the surface of fillings, followed by ingestion. (18)

Numerous epidemiological studies have assessed the impact of mercury exposure from oral dental amalgam. In a recent study, males with high mercury levels in hair (1 > ppm) had a 50% higher probability of having periodontitis than females with normal mercury levels (1<ppm). The results suggest that mercury exposure, irrespective of gender, is associated to periodontitis. (19)

In 1994, it was shown that the amount of tin in the ɣ1-phase is related to the emission of mercury vapor. Based on this paper, it is possible to identify the brands tested: conventional amalgams, amalgams with reduced amount of ɣ2- and non-ɣ2-amalgams. The result is clear; non-

ɣ2-amalgams emit substantially more mercury vapor than the old, conventional amalgam. Using the highest emitter of the low copper amalgams as a baseline, the high copper amalgams emitts 3–4 times as much mercury vapor depending on brand. (20)

In an investigation measuring differences in mercury vapor emission in corroded and un corroded samples, only one non-ɣ2-amalgam and one low copper amalgam was used. The pattern is once again confirmed with the non-ɣ2-amalgam emitting substantially more mercury vapor than the conventional one corroded samples emitted more mercury vapor than not corroded ones (21). In another investigation, using the same brands of amalgam as Mahler et al. (1994),(20)

Marek studied the average values of mercury solubility in phase ɣ1 (Ag-Hg) and phase ɣ2 (Ag-Hg-Sn) with AAS. Its results have shown that the solubility is better in phase γ_1 (Ag-Hg) compared to phase γ_2 (Ag-Hg-Sn). 23 He noted that the release of the mercury from amalgam is smaller in phase γ_2 (Ag-Hg-Sn) compared to phase γ_1 (Ag-Hg). (22)

The release of Hg from amalgam fillings depends on the type of amalgam filling and the duration of the filling. (23)

Harris et al in their research have determined the migration of Hg, Ca, Zn and Cu in teeth to amalgam fillings more than 20 years ago established. They have concluded that the release of mercury more than 10 mg (g-1) and zinc 10 mg (g-1), > 100mg (g-1), has been detectable in the teeth several milimetres away from amalgam filling. (24)

During the elimination of the amalgam from the cavity also comes to the release of the mercury. The free amount of the amalgam fillings depends on the way it leaves whether with water or absorption. It is stated that the free amount of the mercury is greater (34.0–796 μ́m3) if water or vacuum cleaner is not used during its elimination, compared to the use of water carp (4.09-19.0 796μ́m3) and the use of vacuum cleaners worth 14.0-19.0 μ́m3. (25)

According to the author Derand it is reported that there is a large difference between the polished fillings saved in the room environment and the corroded fillings stored in the saliva. 27 Also, the simple composition of the filling frees up more noise compared to fabricated fillings. (26)

Also in our in vitro research the teeth were stored in saliva and it was found that the average values of mercury released according to Black classes (kl I, II and MOD) filled with amalgam have given a statistically significant difference as in the groups without polishing (One Way ANOVA F = 69.54, P <0.001) as well as polishing groups (One Way ANOVA F = 110.54, P <0.001).

Bolsoni e al have investigated the corrosion of amalgam fillings which have beeen polished and unpolished at various time intervals. Determination of corrosion products was done with

Optical Emission Micropectrocopy. They have come to the conclusion that the greatest concentration of mercury in the first 24 hours of research. According to them this corrosion of the amalgam probably comes due to the degradation of gamma phase 2 during amalgamation. (10)

Our research unlike Bolson has shown that mercury release is greater after 9 months of amalgam application and this determination of mercury release was made by ICP-OES.

Bjorkman & Lind have studied influence of factors on the evaporation of Hg from amalgam fillings. They found that rinsing the mouth with warm water for a period of one minute affects the increase of Hg vapors to a factor of 1.7 when the water temperature rises from 35C ° to 45C °. (27)

The corrosion behavior and dissolution of such a structure depends on the characteristics of each individual phase and on the electrochemical interaction between these phases in a special environmental such as the oral cavity during mouth guard bleaching. (28)

Fredin B in his research has studied various aspects of mercury release from amalgam fillings under in vivo and in vitro conditions using Light Microscopy Hg globules. He concluded that amalgam fillings should be considered as inappropriate fillings given the long exposure time of mercury vapors which have toxic action on the human body. (29)

Mercury vapors can also cause various diseases in the human body. Anaerobic bacteria from periodontal diseases produce hydrogen sulfide (H_2S) and methyl mercaptan (CH_3SH) are responsible for gingivitis. (30)

These sulfur compounds react with the mercury amalgam to produce a black gum tissue called “amalgam tattoos”, consisting of mercuric sulfide (HgS) is extremely toxic causing oral and systemic diseases. (31)

According to Pakmahadit et al, patients who have amalgam fillings and are exposed to Wi-Fi wave emissions release more mercury from these fillings, compared to patients who have amalgam fillings but are not subject Wi-Fi wave emission. (32)

Leszek et al. have reported the deposition of mercury in various parts of the body within 29 days. This research was conducted in sheep by mixing radioactive mercury 203 with mercury and silver from amalgam fillings. They have concluded that the high concentrations of mercury from amalgam fillings are found more in the kidney and liver. (33)

Conclusion: It may be concluded that mercury was released more in unpolished amalgam filling than polished amalgam fillings.

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SECONDARY CARIES SUSCEPTIBILITY IN PROSTHODONTICS CORRELATED TO MARGINAL GAP

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Introduction: Secondary caries of abutment teeth is an unwanted complication during prosthodontics treatment and the main reason for the replacement of FPD restorations. Marginal gap space in fixed restorations is responsible for micro-leakage and cement decomposition with caries appearance due to specific demineralization process by bacteria colonization. The aim of the study was to evaluate caries lesions in correlation to the crown marginal gap.

Material and methods: Marginal gap between the abutment tooth and the crown was measured using a light-body silicone for evaluating of absolute discrepancy with replica technique (RT). Twenty porcelain fused to metal crowns were fabricated on ten premolars casts. Light body polyvinylsiloxane addition silicone impression material was used to fill the discrepancies between crown and tooth. After setting, impression material was removed from the die, and the thickness of the layer was measured and evaluated by electron microscopy.

Results: The measurements of marginal fit were with mean marginal discrepancies in a range between 61.5 and 75.0 microns, mean marginal gaps in a range from 40.9 - 45.3 microns, mean vertical discrepancies in a range from 22.9 - 46.0 micron, and mean horizontal discrepancies in the range of 42.0 to 58.8 micron. Statistical data analysis was performed using a non-parametric test of Kruskal-Wallis and Mann-Whitney.

Conclusion: Based on the selection of 100 microns as a limit of clinical acceptability, restoration margins were presented with increased risk for caries occurrence, even when the prostheses have an acceptable fit. However, in patients with proper oral hygiene and maintenance with regular follow-ups crown margin gap was not critical.

Keywords: Secondary caries, abutment, marginal gap

Introduction

The main goal of every prosthodontist is to create dental restorations with both esthetical and functional clinical performance. The restorations must fit both internally and marginally, and withstand masticatory forces for a long time. Accurate and precise layering between the abutment teeth and dental prostheses is highly required in the manufacturing process of dental prosthesis[1].

Imperfect marginal adaptation can lead to unpleasant and unwanted side effects such as plaque accumulation, marginal discoloration, microleakage, carious and endodontic lesions, and periodontal disease[2]. The marginal fit of the restorations is considerably affected by the materials and techniques used when making dental crowns. If the fit of the restoration and the thickness of the cement is well designed, the cement is not dissolved and the abutment tooth is prevented from secondary caries[3].

Caries formation requires host substrate, presence of biofilm, fermentable carbohydrates, and time. For caries to be initiated, dental plaque usually has a high proportion of Streptococcus mutans present[4]. The patient's behavioral and dietary modification also play a key role in reducing carries risks.

Prosthesis failure may be defined as any condition that leads to their replacement. A systematic review on ceramic-based FDPs reported that more than 15% were removed or were in need of replacement at 10 years. Complications are technical or biological, and dental caries was most common[5].

Secondary caries of the abutment teeth is an unwanted complication during prosthodontics treatment and the main reason for the replacement of FPD restorations. With single crowns, one of the 3 most common complications was a need for endodontic treatment in 3%, while in fixed partial denture (dental bridges) studies reported complications like caries in 18% of abutments[6]. Carious lesions at an early stage cause pathological reactions of the pulpal tissues, and further development of deep lesions leads to the destruction of hard tissues of the abutment tooth causing pain and loosening of the restoration[7].

The most important element for the long-term success of a cast restoration is probably the fit of the crown margin and the so-called "marginal gap". Today we still do not have a common agreement on a clinically accepted value on marginal fit, but some expert studies accepted 32 µm to 230 µm gap in the gingival margin region[8]. Some differences in rating the gap value are correlated to the vertical position of the gap, supragingival or infragingival location. Margins should ideally be placed supra-gingival, but this is not always clinically feasible.[9]

The silicone replica technique (SRT) has been frequently used for evaluating the marginal and internal fitting because of its ability to measure the condition of a dental prosthesis

without causing any damage. However, due to morphological variations such as rounded margins, it is sometimes necessary to predetermine the location and number of the measurement points.

The aim of the in-vitro study was to evaluate the development of the secondary caries lesions on the abutment teeth in correlation to crown marginal gap.

Material and methods

The marginal gap between the abutment tooth and the crown was measured using a light-body silicone for evaluating of absolute discrepancy with the silicone replica technique (SRT). The replica technique is one of the common methods used to evaluate the width of the marginal gap between the dental crown and the abutment[10]. It evaluates the impression material thickness, which is a result of the cementation of the crowns over copings[11].

Ten anatomical premolar abutments (dies) with dimensions 6.5 mm of height, axial walls 6º tapered and chamfer finish line was made of type IV dental stone as master models (Figure 1). Die spacing was not used. The models were then sent to the dental laboratory. Twenty porcelain fused to metal crowns (Co-Cr alloy) were fabricated on the premolars casts. They were fabricated conventionally with wax technique, invested and cast. The investment was removed from the framework and cleaned by 110 μm aluminum oxide sandblasting. Finally, the veneering porcelain was manually layered on the frameworks and sintered according to the manufacturer's recommendations.

Fig.1 Premolar abutment as a master model

Afterward, the light body polyvinylsiloxane addition silicone impression material (base and catalizator) was mixed with activator according to manufacturer's recommendations and used to fill the discrepancies or the space between the crowns and abutment teeth (Figure 2).

Fig. 2 Light body addition silicone immersion material

The film from the silicone impression material was used to simulate the position and thickness of the cement layer for evaluation of the width of the existing "marginal gap" (Figure 3).

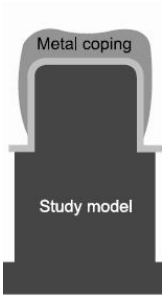

Fig. 3 SRT – Porcelain fused to metal crowns on the stone abutment over light body silicone

After setting the impression material, it was removed (Figure 4.) from the die and the thickness of the layer was measured and then evaluated by electron microscopy. The fitting of the marginal surface was measured as the distance between the finish surface angle of the prepared tooth and the cervical margin of the 20 crowns. Internal adaptation or the film thickness was measured as the distance between the inner surface of the crown and the outer surface of the prepared tooth at three location points (marginal, occlusal, and axial).

Fig.4 Silicone impression film after setting and removing from the coping

Results

Statistical analysis was performed using SPSS 11.0 software for Windows. Kruskal-Wallis one-way analysis of variance (H-test) and Mann-Whitney U-test were used to compare the differences between measured values. The results from the measurements of the marginal fit

in the marginal point in 10 crowns showed mean marginal discrepancies in a range between 61.5 and 75.0 μm. The results from the measurements in the occlusal points showed mean marginal gaps in a range from 40.9 - 45.3 μm. The results from the measurements in the axial points mean vertical discrepancies in a range from 22.9 - 46.0 μm. The measurements in the occlusal points showed mean horizontal discrepancies in the range of 42.0 to 58.8 μm.

Discussion

The gap space is a determining factor for the long-term integration of a restoration. The gap space can be detected clinically at the margin of a crown. Usually, it is the result of multiple errors encountered throughout the crown fabrication step. The impression method (conventional or digital) and fabrication techniques affect the accuracy of fit of complete-coverage fixed restorations[12].

Cementation technique and cement thickness play a major role in the creation of the final clinical gap space. Studies aimed at decreasing gap space have been done. In some instances authors tried to measure the gap space without the presence of any cement, thus, eliminating the possible error that can result from the cementation procedure. Others measured the space after cementation and sectioning of samples.

Cementation and marginal integrity play important roles in the long-term prognosis of the treatment. The focus of prosthodontics restorations is to obtain the smallest or acceptable marginal gap value from 25 to 120 μm. According to some authors, the maximal opening should not exceed 100 μm. The quantitative evaluation of the marginal adaptation is not yet standardized and can be misleading. According to Guess et al., 100 μm is the clinically acceptable marginal gap for ceramics, while McLean and von Frauenhofer reported a gap of fewer than 120 μm.44 Another previous study reported that 100 - 200 μm is the clinically acceptable range for long-term preserved dental prostheses.

Conclusion

Within the limitations of this study, it can be concluded that the porcelain fused to metal crowns demonstrated a comparable and acceptable marginal, axial, and occlusal fit all being within the range of clinically accepted values.

Within the limitations of this study it can be concluded that the SRT is an accurate and reliable technique that can simulate crown gap space after the cementation. The RT is reliable for evaluating cement thickness at the marginal and internal gaps.

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TYPES OF SUTURING MATERIALS IN ORAL SURGERY

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Abstract **Aim:** In everyday surgical practice, different types of suturing materials are available. They play an important role in tissue healing, facilitate the process of hemostasis, enable the reconstruction and reunification of tissue whose integrity has been compromised during surgery or trauma. The aim of this study is to examine the reaction of the tissue to different suturing materials, as well as to determine the speed of wound healing and the incidence of complications after their use, in order to prove which of them is most suitable for oral surgery procedure.

Material and methods: These researches were done based on analyzes presented on "MEDLINE" and "PubMed" databases, from 1970 to 2018, using the following keywords: oral surgery, suture materials, flap, periodontium, polyglucapron, polytetrafluoroethylene, polyglycolic acid, polylactic acid, silk.

Results: Tissue reactions to suturing materials vary depending on the surface properties and the adhesion properties of the bacteria to the material. Silk is the most commonly used suturing material in oral surgery. The application of silk sutures increases the risk of infections, because they react with the connective tissue, allowing the accumulation of dental plaque and bacterial adhesion around them. Studies about tissue response to suturing material confirm the

presence of inflammation when using silk and cotton threads, and minimal reaction in others (nylon, polyester, polytetrafluoroethylene (ePTFE), polyglycolic acid (PGA).

Conclusion: In addition to the observance of surgical suturing techniques, and the proper maintenance of oral hygiene in the postoperative period, the choice of suturing material has a significant impact on tissue healing. This underscores the need for careful selection of suturing material during oral surgery.

Key words: oral-surgical interventions, suturing material, resorbable and non-resorbable sutures.

Introduction

In recent years the attention of surgeons has been increasingly focused on selection of "ideal suturing material". Suture is a stich or series of stiches made to secure apposition of the edges of a surgical or traumatic wound. Moreover, suture material is an artificial fiber used to keep wound together until they hold themselves by natural which is synthesized & oven into a stronger scar. [1]

The main cause with the suturing is to achieve: wound edge, apposition, provide adequate tension, maintain hemostasis, aid in wound healing, - avoid wound infection, produce aesthetically pleasing scar by approximating skin edges.

The healing process itself depends on the amount of suturing material used, the type of stitches, sewing technique and the density set suture. However, the healing of oral wounds is accompanied by certain peculiarities. First, the oral cavity is colonized by bacteria, which in combination with detritus from food form a biofilm and facilitate the possibility of wound infection. Secondly, oral wounds cannot be immobilized due to the continuous movements that occur in masticator apparatus. The surgical wound is in constant contact with various tissues (enamel, cement) and materials (metal, ceramics) that do not have adequate active metabolic exchange, which compromises the healing process.

Nowadays, there is a wide range of choice of suturing materials. And according to several criteria, they are classified into three major groups. According to the physical structure of the material, there are monofilament and multifilament. While, according to biological characteristics their division is into resorbable and non-resorbable materials. And, in terms of origin are divided into natural and synthetic suturing materials. [2]

Monofilament suturing materials are in fact a homogeneous structure, consists of single strand of suture material. As representatives of this group and resorbable materials, include: Monocryl (poliglecaprone), Fast absorbing gut, Chromic gut, PDS II (polydioxanone) and others. Non-resorbable monofilament representatives, Nylon, Polyamide, Polypropylene and Polyester

as examples. Unlike monofilament, multifilament suturing materials consists of several filaments twisted or braided together. As representatives of this group, but resorptive materials are: Polyglycolic Acid, Polyglactin, as well as Polyglactin - rapid. And the group of multifilament and non-resorptive materials include: Surgical silk, Surgical Lenin, Cotton, Polyamide braided and Polyester braided. [3]

The aim of our research was to examine the reaction of the tissue to different suturing materials, as well as to determine the speed of wound healing and the incidence of complications after their use, in order to prove which of them is most suitable for oral surgery procedure. We conducted the research based on already confirmed analyzes of individual authors and their collaborators, presented on "MEDLINE", "PubMed" and "CYBERLENINKA" databases, in the period from 2003 to 2018.

Materials and methods

All the 11 studies (table 1) included in present literature review were carries out at universities or at healthcare centers. Seven studies were clinical and four studies had an experimental researchable approach. The experimental studies were performed on humans, Wistar rats, Rhesus monkeys and Beagle dogs.

Table 1.

Authors/year	Examination material	Type of intervention	Suturing material	
Leknes KN et al./ 2005 [4]	Human	Periodontal surgery	**Silk** (multifilament) an **PTFE** (monofilament, non-resorbable)	A stronger inflammatory reaction of the tissue was observed in silk sutures compared to PTFE sutures.
Kakoei S et al./2010 [5]	Animal model	Oral mucosal surgery (buccal mucosa)	**Plain gut** (monofilament) and **silk**	In the first two postoperative days - the silk sutures showed a significantly greater inflamma-tory response to the surround-ing tissue than the catgut sutures. However, in the next four days, a larger amount of fibrous tissue was observed around the catgut sutures compared to the silk sutures.
Дрыга А.В. et al./ 2005 [6]	Human	Oral surgery	**Silk**, **nylon** (monofilament, non-resorbable), **polyester** (monofilament, non-resorbable), Polyglecaprone 25	Cotton, linen, silk as multifilament sutures induce infection and subsequent inflammation much more often than monofilament sutures. Therefore, it is recommended to avoid their use in wounds that have

				the possibility of bacterial contamination. Silk has been shown to have a particularly inhibitory effect on macrophages, affecting mainly the adhesion of these cells.
Banche G. ***et al./2007*** [7]	Human	Dentoalveolar surgery	**Silk**, **nylon** (monofilament, resorbable), **polyester** () **Polyglecaprone 25** (sintetic, monofilament, resorbable)	Bigger number of adherent bacteria was observed around non-resorbable sutures than on resorptive ones. Resorbable silk and poly-glucapron 25 showed the lowest number of adherent bacteria.
Yilmaz N et al./2010 [8]	Animal model	Oral mucosal surgery (buccal mucosa)	**Silk** (natural,multifilament, non-resorbable), **catgut** (natural, monofilament, resorbable) and **Polyglecaprone 25** (sintetic, monofilament, resorbable)	Reactions to silk and catgut are similar in animals with diabetes and in healthy individuals. More positive effects on tissue healing with polyglucapron 25 compared to others.
Pons-Vicente O. et al./2011 [9]	Human	Implantology	**Silk**, **polyester suture**, **teflon**	The results showed that there is a larger accumulation of plaque on the silk threads. The intraoperative manipulation with the silk sutures was more uncomfortable, and the patient's comfort was worse compared to the polyester sutures coated with Teflon.
Sortino et al. /2008 [10]	Human	Oral-surgical intervention	Silk and polyglycolic acid - PGA (synthetic, resorbable)	Silk sutures showed greater reliability compared to PGA sutures.
Vastardis S and Yukna R/ 2003 [11]	Human	periodontal surgery	Polyglactin 910 (synthetic, resorbable)	The reaction of the periodontal tissue to the sutures is a possible cause of gingival abscesses.
Kim J-S et al. /2011 [3]	Animal (Dog- beagle)	Surgical intervention on oral mucosa (buccal mucosa and gingiva)	Nylon	On the buccal mucosa it was observed that the number of macrophages increased in the first days around the suture material, while in the connective tissue the infiltration was low. On the gingiva (keratinized tissue) showed that the number of polymorphonuclear leuko-cytes, lymphocytes and macrophages decrease from the surrounding tissue to the submucosal tissue.

Volodko V. A. / 2018 [12]	Human	Oral-surgical intervention extraction of retained lower third molars	Vicryl (as a traditional suture material) and Vicryl plus (synthetic, resorbable material with antibacterial coating)	In patients in whom suture material Vicryl was used, by applying cytological analyzes on 3 and 7 days in the smear, microorganisms Staphylo-coccus aureus and Staphylo-coccus epidemidis, macrophages and leukocytes were detected in large numbers. - While in patients who were administered Vicryl plus, on days 3 and 7 Staphylococcus aureus and Staphylococcus epidemidis were also observed, macrophages and leukocytes in significantly smaller numbers. -This is due to the minimal development of reactive inflammation in the wound area. Mild edem and hyperemia of the mucous membrane have also been reported in these patients. Patients with Vicryl on the third day showed larger edem and hyperemia of the mucous membrane.
Дрыга А.В. at al. / 2005 [6]	Animal (dog)	Surgical intervention on oral mucosa	Polyglycolides -Polysorb, Maxon, Vicryl (resorptive)	Polysorb sutures have the highest tear strength (14.7 kg), Maxon sutures have slightly lower tear strength (14.2 kg), while Vicryl sutures have the lowest tear strength (11.2 kg). As for the ability to stretch, Maxon sutures under constant load are stretched over time, which reduces the possibility of tissue incision in the event of edem. While this ability hasn't been observed in Polysorb and Vicryl sutures. The formation of a scar when suturing the tissue with Maxon sutures takes place in conditions of minimal inflammatory reaction, but the biodegeneration of the suture material is slowed down.

In seventh studies, involving periodontal surgical interventions, surgical procedures on the buccal mucosae, and dental implant surgery - tissue reactions were performed between silk and other suturing materials, including polytetrafluoroethylene (PTFE), nylon, poliglecaprone 25, polyglycolic acid, and catgut sutures.

Three studies, including the studies by Leknes et al. [4], Kakoei S et al. [5] presented that the silk as multifilament suturing material causes intense inflammatory tissue reaction, compared to monofilament polytetrafluoroethylene (PTFE) and Cat gut sutures. In addition, silk has a particularly inhibitory effect on macrophages, mainly affecting their adhesion. It is therefore recommended to avoid its use in wounds that have the possibility of bacterial contamination.

Also, three studies (Banche G et al. [7], Yilmaz N et al. [8], Pons-Vicente O et al. [9]) and their collaborators, reported that poliglecaprone 25 has more positive effects on wound healing and exposes fewer adherent bacteria compared to silk.

Regarding the durability of suturing materials, as one of the important features they should possess, Sortino F et al. [10] in his research reported that – the silk sutures as natural and non-resorbable material have shown greater reliability, compared to PGA threads which are synthetic and resorptive.

In a study by Vastardis S and Yukna RA [11], cases were presented where the occurrence of stitch abscesses was associated with Polyglactin 910 sutures.

In an experimental study, Kim J-S et al. reported that nylon as a suturing material, on the buccal mucosa, increases the number of macrophages around the suturing material in the early days after applying. While the same material applied on gingiva – as keratinized tissue, the number of macrophages, polymorphonuclear leukocytes and lymphocytes was significantly reduced.

In the clinical study by Володько В. А. [12], using Vicryl and Vicryl plus as antibacterial impregnated surgical material, points us to the fact that on cytological analysis where was used Vicryl as suturing material were detected microorganisms as Staphylococcus aureus and Staphylococcus epidermidis, macrophages and leukocytes in higher numbers. While in the regions where Vicryl plus was used, their number was significantly lower.

Дрыга А.В. et al. [6] in their experimental study analyzed Polysorb, Maxon and Vicryl in terms of their ability to stretch, tear strength and scar formation conditions. They confirmed that according to the tear strength, on the first place - as the strongest material was Polysorb (14,7kg), on the second place was Maxon (14,2kg) and as the weakest material was Vicryl with a strength of 11.2 kg.

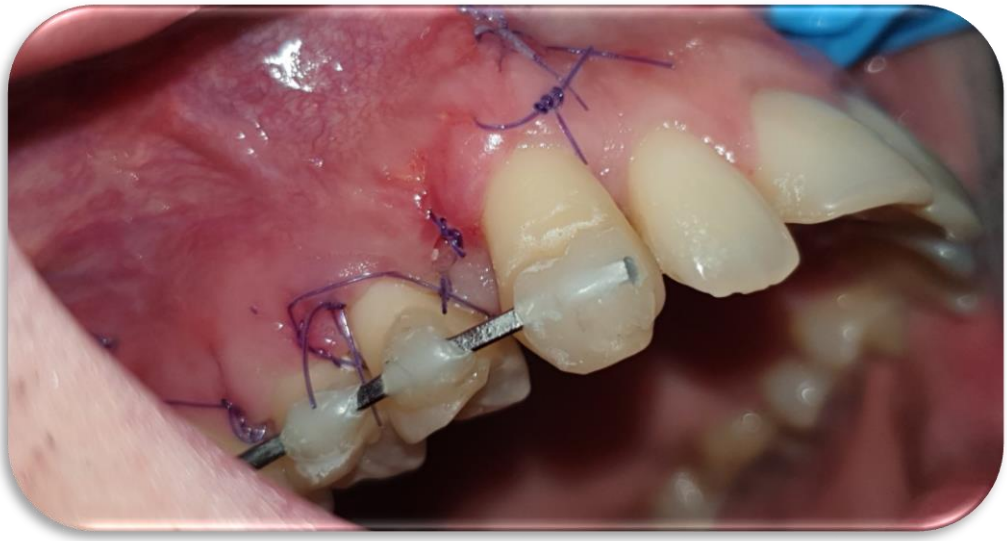
As for the ability to stretch, Maxon sutures under constant load are stretched over time, which reduces the likelihood of tissue rupture in the event of swelling**.** But, at the other sutures that ability was not noticed.

The scar formation, during suturing the tissue with Maxon - took place under conditions of minimal inflammatory reaction, but the biodegradation of the suture material was slowed down.

In addition of doing an analysis of world-renowned current papers on this topic, we have done two clinical cases using two different suturing materials. From what we have done, we can conclude the same as the studies we have developed.

Namely, in the both cases were made GBR (Guided Bone Regeneration). Why we selected these 2 cases? Because of the reason that the Guided bone regeneration needs a longer wound healing period, and the suturing material (thread) of the surgical wound remains for a longer period of time, so in the resorbable thread 3 weeks, and in the non-resorbable 10 days. So, in that period we can consider the possibility of dental plaque accumulation and bacterial adherence on the suturing material. Also, we can notice the tissue inflammation reactions that were clinically visible, or there was an absence of inflammation.

In the first case, bone augmentation was performed with PRF and PRF membrane, because there was a loss of bone tissue on the canine and premolar. We used resorbable suturing material.



While, in the second case, the radix was primarily extracted, and the further bone augmentation was also performed with PRF and PRF membrane. In order to make our comparison between resorbable and non-resorbable material the wound was sutured with silk.

We found out that our results really matched with the results of the studies we have developed. We came to the same conclusion that silk - as a traditional and commonly used suturing material, (although it is cheap and easy to handle), compared to other materials, it should not be the "material of choice" in oral surgery, due to the fact that inflammatory tissue reactions are most violent when using this material.

We have clinically determined that there are signs of inflammation (color, rubor, dolor, tumor, function lease), the wound edges do not heal and there is no creation of new granulation tissue.

The performed analyzes confirmed that the bacterial adherence and the present dental plaque on the suturing material, lead to inflammation of the surgical wound. It is generally known that systemic disorders such as poorly controlled diabetes mellitus and cardiovascular disease can cause an oral inflammatory reaction. Therefore, an inflammatory tissue reaction that is primarily provoked by suturing materials may falsely suggest that it is caused by a systemic disease. (Yilmaz N, Inal S, Muğlali M, Güvenç T, Baş B. Effects of polyglecaprone 25, silk and catgut suture materials on oral mucosa wound healing in diabetic rats: an evaluation of nitric oxide dynamics. Med Oral Patol Oral Cir Bucal. 2010 May 1; 15(3):e526-30.; Banche G, Roana J, Mandras N, et al. Microbial adherence on various intraoral suture materials in patients undergoing dental surgery. Journal of Oral and Maxillofacial Surgery. 2007;65(8):1503–1507)

Other provoking factors that can contribute to the occurrence of oral inflammation are smoking and the use of other tobacco products. However, there is still a lack of clinical studies that could reliably support this hypothesis. (Javed F, Klingspor L, Sundin U, Altamash M, Klinge

B, Engström PE. Periodontal conditions, oral Candida albicans and salivary proteins in type 2 diabetic subjects with emphasis on gender. *BMC Oral Health.* 2009;9(1, article 12).; Javed F, Chotai M, Mehmood A, Almas K. Oral mucosal disorders associated with habitual gutka usage: a review. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology*. 2010;109(6):857–864.)

However, it is evident that different suturing materials used in oral surgery cause a wide variety of tissue reaction, depending on several factors, including the surface characteristics of the material and the degree (amount) of bacterial adherence. This research emphasizes the need for careful selection of suturing material during oral surgery.

Nowadays there is no ideal suturing material, but it should have the following characteristics: high tensile strength to hold the wound margins appropriately till healing is complete, should not be allergic or cause any tissue inflammation, have least capillarity so that the material does not soak up much of the inflamed tissue fluid surrounding the wound and further exaggerate infection, should have good knotting properties, easy to sterilize, to be visible in the surgical field, have an affordable price.

Conflict of interests

The authors declare that they have no conflict of interests.

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