Volume XXIV, Nr. 4, 2018

ISSN 2065-376X

MEDICINE IN EVOLUTION

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REDUCE ŞI AJUTĂ LA PREVENIREA PROBLEMELOR GINGIVALE ÎN 4 SĂPTĂMÂNI PENTRU A ÎNTRERUPE CICLUL GINGIVITEI

IULIE 2010 IANUARIE 2011 IULIE 2011

IANUARIE 2012 IULIE 2012 IANUARIE 2013

blend-a-med Oral-B CLINIC LINE GUM PROTECTION SYSTEM

Recomandați Sistemul blend-a-med Oral-B Clinic Line Gum Protection
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blend-a-med RESEARCH CENTERS Oral-B

Volume XXIV, Nr. 4, 2018, Timişoara, Romania
ISSN 2065-376X

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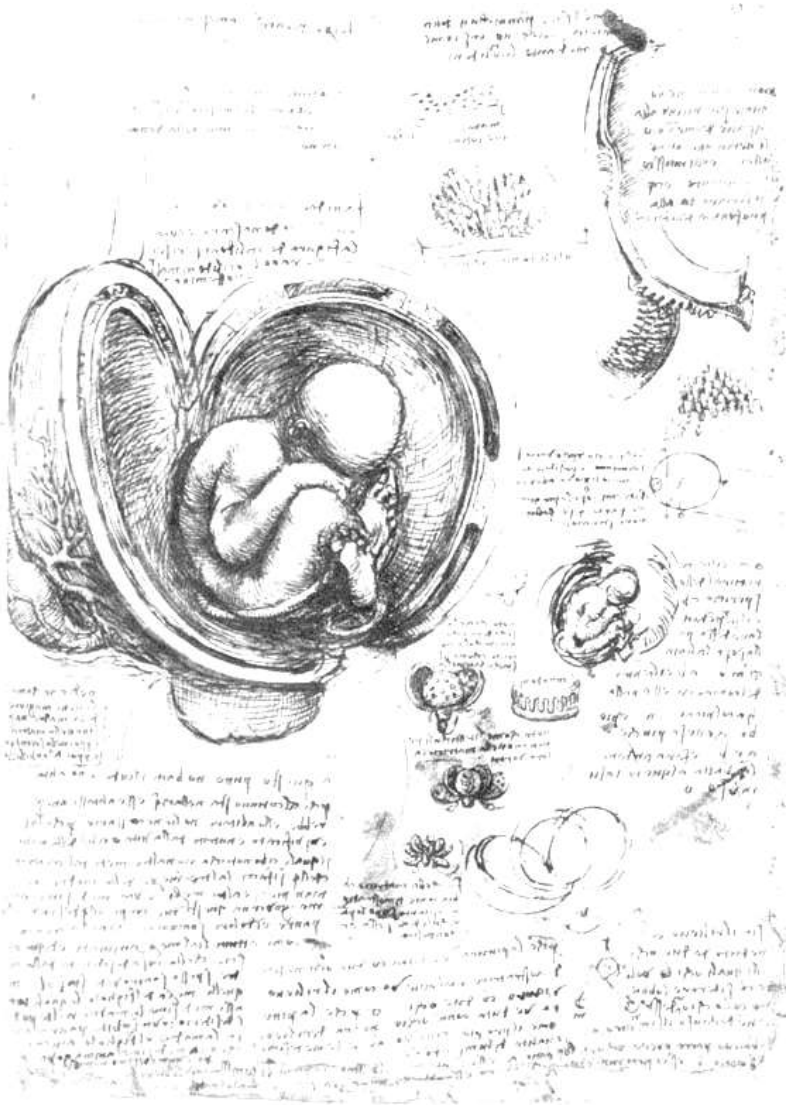

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Journal edited with the support of

Printed at: WALDPRESS, Timisoara,
17 Brandusei Street,
Phone/Fax: 0040256422247

Edited at: EUROSTAMPA, Timisoara
26, Revolutiei 1989 Street,
Phone: 0040256204816

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Dental Hygienist

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Finish: 2018/08/31
Programme: ERASMUS+
Sub-Programme: Key Action – Strategic Partnership
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Oral health is a determinant factor for quality of life, essential for well-being, and an integral part of general health.

Our mission is to promote oral health and the cost effective prevention of oral diseases in Europe. In the EU, the socio-economic burden of oral diseases is considerable: they affect the majority of school-aged children and adults and account for 5% of public health spending". The European Platform for Better Oral Health.

The dental hygienist is the key provider of preventive oral care in order to promote and improve the oral health of individuals, families and groups in society. The European inequality in access to oral health care can be tackled by harmonisation of dental hygienist education on ground level and increasing access to continuing education.

The goals of EuHyDens are:

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- ✔ Harmonization of dental hygienists qualifications in Europe.
- ✔ Recognition of the dental hygienist profession in all EU-member states.
- ✔ Mobility of dental hygienists and cross-border cooperation among stakeholders
- ✔ Strengthen the position of dental hygienists by encouraging entrepreneurship activities and by promoting communication and mobility among the dental hygienists within the EU-nations.

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CONTENTS

ARTICLES

Patients' barriers and difficulties in understanding medical information

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Abstract

Aim. To assess patients' barriers and difficulties in understanding medical information.

Material and methods. A questionnaire-based survey was conducted on a convenience sample of laypersons. Study inclusion was done from three cities from Romania, in 2015-2016, on a voluntary basis. The questionnaire was developed considering data from scientific literature on this topic and authors' experience, and pretested on a small number of subjects in order to identify the deficiencies and correct them.

Results. Study sample included 62 persons, 39 females and 23 males, with ages from 18 years old to 64 years old. Patients argued primarily through not fully understanding in general the medical information as not having medical training. Asked about the difficulties in understanding the information presented to them by the doctors, main problems identified by them were in relation to the way the physicians explained i.e., used words they didn't understood, and information presented was perceived as being usually too brief. Main patients' difficulties when searching medical information on the internet were related to searching and finding data, and understanding the information found. Generally patients were not very interested in participating in conferences on health topics for laypersons, main reason given being lack of time.

Conclusions. Patients' barriers and difficulties in understanding medical information is firstly related to perceived difficulty to understanding the information without having adequate training in this scientific domain. Better ways to overcome this problem are needing considering health literacy influences health behaviour and access to health care systems, with general impact on health status.

Keywords: health, health literacy, internet, doctor-patient relationship.

INTRODUCTION

Nowadays in the medical practice patients autonomy is widely valued, being encourage to enable patients to make their own decision on which medical interventions will receive or not (1). In this context, in order to make an accurate decision, patients must understand the medical information presented to them by the physician, at an extent that can truly assess its benefactions and risks at least, therefore determine what is good or bad for them (2). Considering that most of the patients are laypersons, without medical training, patient's autonomy in the context of medical act depends largely on its ability to understand the information presented by his physician, and also to search and understand medical information to clarify the ambiguities. Patient-physician communication barriers often go unnoticed and can have negative effect on treatment outcome, but also health and safety of patients (3). Among factors that contribute to poor communication may be the relatively frequently encountered low level of health literacy among patients, and physicians' deficiencies in accurate listening of patients (4).

Aim and objectives

The aim of this study was to assess patients' barriers and difficulties in understanding medical information. The reasons patients avoid or refuse to know more on a medical topic, reasons of not understanding the information presented by their doctor, patients' difficulties when searching medical information on the internet, availability to participate to conference on medical topics for laypersons and if not interested, reasons why they do not want to participate were analysed from patient's perspective.

MATERIAL AND METHODS

A questionnaire-based survey was conducted on a convenience sample of laypersons. Study inclusion was done from three cities from Romania, namely Bucharest, Ploiesti, Curtea de Arges, in 2015-2016. Inclusion was done on a voluntary basis, being included only laypersons without medical training or professional activities in the medical field. There were excluded minors, and persons with understanding or other deficiencies that could negatively impact the manner in which the filling of the questionnaire was done. Study inclusion was done only after informed consent to study participation was granted, certified in writing, the form for it being in the beginning of the administered questionnaire.

Data collection was done using a questionnaire especially designed for this research. It was devolved considering data from scientific literature on this topic and authors' experience. In the first part of the questionnaire there was the form for certification in writing the agreement to study inclusion, followed by a section with question that try to understand patient's barriers in accessing medical information, in the end being placed the question that assessed general characteristics (origin, age, sex). The questionnaire was pretested on a small number of subjects in order to identify the deficiencies and correct them.

For data analysis Microsoft Excel software was used. Only descriptive statistics was used. For reporting data from qualitative variable frequency and percentages were used. For reporting data from quantitative variables mean was used. All questions that assessed patient's barriers in accessing medical information were registered on a 5 point Likert scale, i.e. strongly disagree (scored 1), disagree (scored 2), neutral (score 3), agree (score 4), strongly agree (score 4). As a measure for central tendency for data from Likert scale variable mean was also used as a measure for central tendency (5).

RESULTS

Study sample included 62 persons, 39 females and 23 males, with ages from 18 years old to 64 years old.

The patients were asked to assess the degree of truth of several statements regarding their behaviour in the past, regarding the reason of avoidance or refusal to learn more about a medical topic (Figure 1). Patients argued primarily through not understanding medical information as not having training in this scientific domain. Other reasons included considering that they do not have time for this, not liking discussing health related problems with acquaintances, and avoiding to know about illnesses as causing them discomfort.

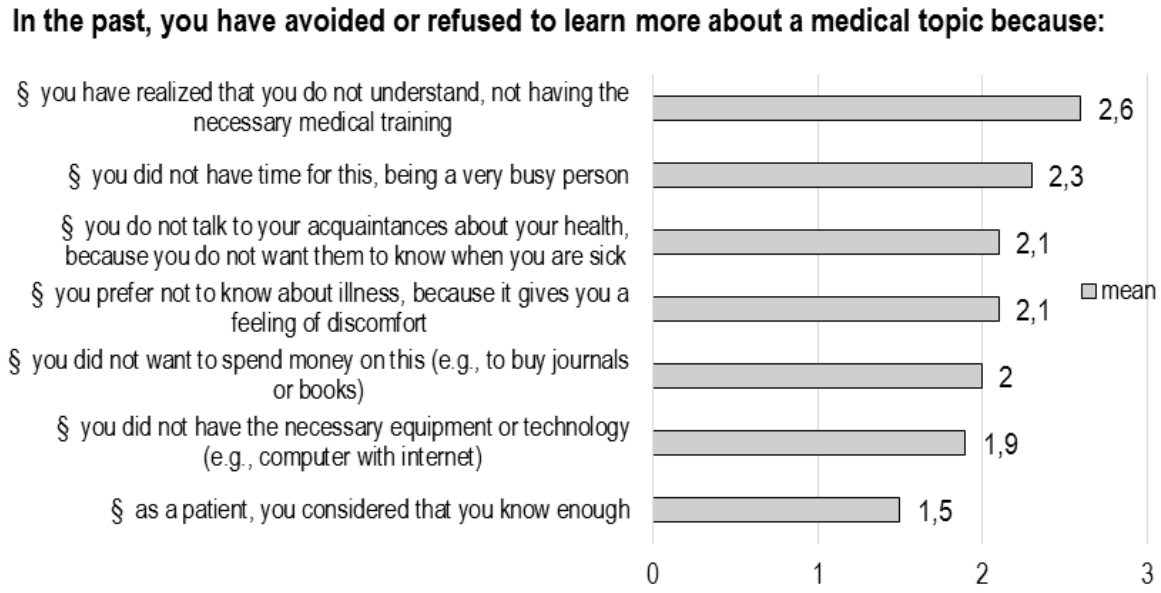

Figure 1. Patient's reasons of avoidance or refusal to learn more about a medical topic

Patients were asked why they consider they did not understand the information presented to them by the doctors. Main problems identified by them were in relation to the manner in which doctors explained the information to them i.e., used words they didn't understood, and information presented was perceived as being too brief.

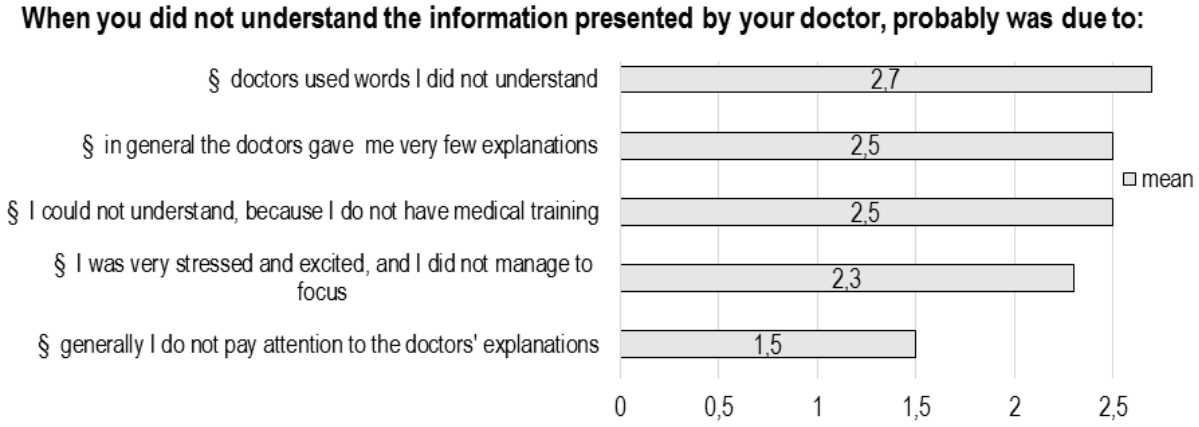

Figure 2. Patient's reasons of not understanding the information presented by their doctor

Main patients' difficulties when searching medical information on the internet were related to searching and finding data, and understanding the information found, due to lacking medical training but also finding contradictory information.

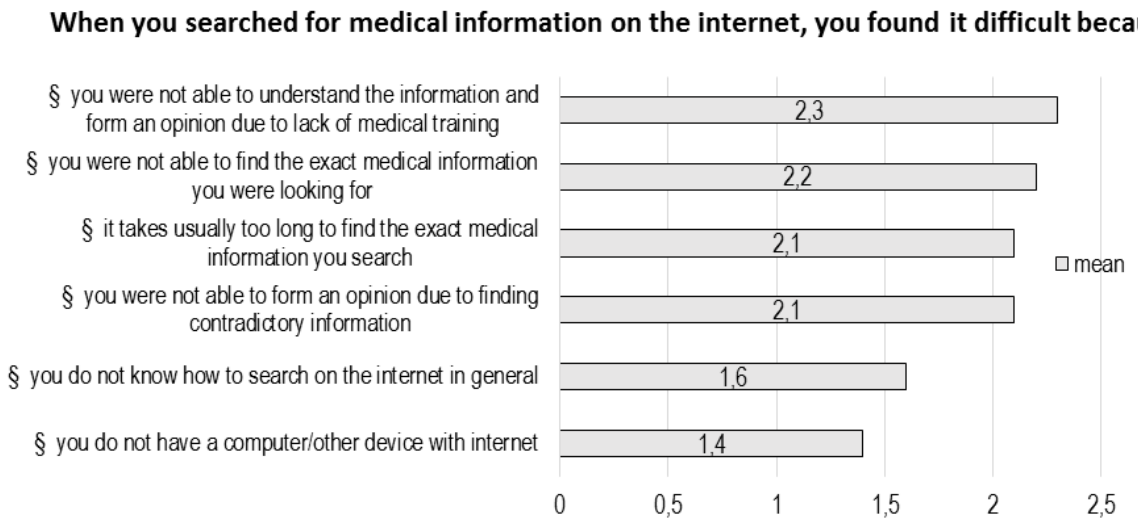

Figure 3. Patients' difficulties when searching medical information on the internet

Participants were asked in regard to the willingness to attend conferences or meetings for laypersons on health related topics (e.g., about oral hygiene maintenance, or healthy diet). From the participants only 13 (21%) subjects said they wanted to participate, 21 (34%) participants said that might participate and almost half of the participants (n=28; 45%) declared they were not interested at all to participate. Main reason for refusing to participate to this type of meeting was lack of time. Other reasons included previous experiences with these meeting where instead of medical information mainly advertising was presented, and the opinion that are other easier ways to find out the same information.

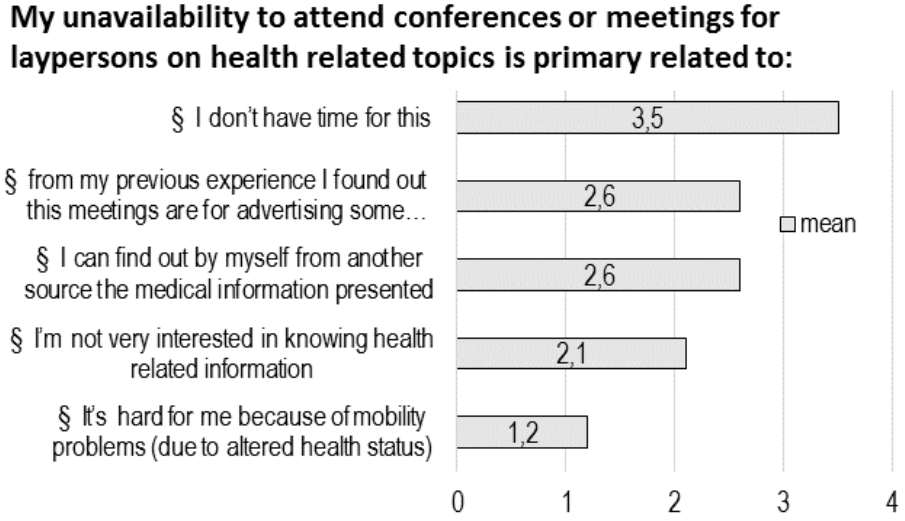

Figure 4. Patient's reason not to participate to conferences or meetings on health related topics

DISCUSSIONS

According to this study's results, patients argued primarily through not understanding in general the medical information as not having medical training. Asked about the difficulties in understanding the information presented to them by the doctors, main problems identified by them were in relation to the way the physicians explained i.e., used words they didn't understood, and information presented was perceived as being usually too brief. Main patients' difficulties when searching medical information on the internet were related to searching and finding data, and understanding the information

found. Generally patients were not very interested in participating in conferences on health topics for laypersons, main reason given being lack of time.

According to this study's results patients perceived the medical information as difficult to understand, both when they informed themselves from different sources, and when they get the information from their physicians. This may be a rather big problem considering low health literacy is related to poorer health outcomes and poorer use medical services (6). Generally laypersons want to be informed about medical aspects even if realize that it is difficult for them to understand the information due to the lack of training, and trust more the information found out from their physicians than from the media (7; 8). Predictors of low health literacy include older age, lower education level, barriers regarding access to books and magazines on health topics (9).

Patient-doctor relationship is a key aspect of the medical treatment, often with a large impact on treatment conduct and even treatment outcome. Often physician consider that they communicate better the medical information to the patient that they truly do. Often patients due to stress or other reasons do not ask questions that might help clarifying their concerns. These may lead to various problems, from not adequately following the doctor recommendations to possible complaints about the medical act. An effective doctor-patients communication should lead to achieving a good interpersonal relationship, exchange of information, and include the patient in the decision made regarding his own health state (10).

Patients from worldwide access health information on the internet, but is questionable how and how well they can appraise the quality of the information found (11). In this study patients' difficulties while searching medical information on the internet were related mainly to searching and finding the targeted information, and making an opinion on the topic, due to lacking medical training but also finding contradictory information. Previous researches show that those with access barriers to healthcare are more likely to search health information online and also participate in health chat groups (12).

Among study limitations can be named the small sample size, the origin of the subjects, all from only three urban areas, and taking into account only very few factors as barriers to laypersons' information on medical topics.

CONCLUSIONS

Patients' barriers and difficulties in understanding medical information is firstly related to perceived difficulty to understanding the information without having adequate training in this scientific domain. Better ways to overcome this problem are needing considering health literacy influences health behaviour and access to health care systems, with general impact on health status.

REFERENCES

1. Entwistle VA, Carter SM, Cribb A, McCaffery K. Supporting patient autonomy: the importance of clinician-patient relationships. J Gen Intern Med. 2010;25(7):741-5.
2. Varelius J. The value of autonomy in medical ethics. Med Health Care Philos. 2006;9(3):377-88.
3. Graham S, Brookey J. Do patients understand?. Perm J. 2008;12(3):67-9.
4. Khan T, Hassali M, Al-Haddad M. Patient-physician Communication Barrier: A Pilot Study Evaluating Patient Experiences. J Young Pharm. 2011;3(3):250-5.
5. Sullivan GM, Artino AR Jr. Analyzing and interpreting data from likert-type scales. J Grad Med Educ. 2013;5(4):541-2.
6. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. Ann Intern Med. 2011;155(2):97-107.
7. Preoteasa CT, Dumitrache A, Enache M, Iosif L, Preoteasa E. Patient's information on medical aspects. Romanian Journal of Oral Rehabilitation. 2018;10:36-40.

8. Preoteasa CT, Axante A, Macris A, Chirita A, Imre M, Tancu AM, Preoteasa E. Patient's expectations and perception of the private dental practice. Medicine in Evolution. 2014;20(4):679-83.
9. Jeong SH, Kim HK. Health literacy and barriers to health information seeking: A nationwide survey in South Korea. Patient Educ Couns. 2016;99(11):1880-7.
10. Ha JF, Longnecker N. Doctor-patient communication: a review. Ochsner J. 2010;10(1):38-43.
11. Scantlebury A, Booth A, Hanley B. Experiences, practices and barriers to accessing health information: A qualitative study. Int J Med Inform. 2017;103:103-8.
12. Bhandari N, Shi Y, Jung K. Seeking health information online: does limited healthcare access matter?. J Am Med Inform Assoc. 2014;21(6):1113-7

Alternatives for the treatment of white chalky lesions arising from fixed orthodontic treatment

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Abstract

The main purpose of this study was to present to the patients the risks of chalky white spots' appearance during fixed orthodontic treatment in the case in which the hygiene measures recommended are not complied with. I have chosen to treat a number of 15 patients who at the end of the fixed orthodontic treatment showed visible chalky white spots on the vestibular sides of the teeth. The initial sample has been divided at random in 5 parts, each featuring a different method of treatment.

Keywords: chalky white lesions, demineralization, oral health, fluorine, saliva.

INTRODUCTION

In recent years there has been an increased prevalence of the appearance of white chalky spots on the teeth due to negligence of the risk factors on the part of the patients but also due to the very large increase in the number of bearers of fixed orthodontic appliances.

A good communication between the patient and the dentist is very helpful in the awareness of the importance of oral hygiene, helping to maintain oral health and the health of the entire body. [1]

A correct removal of plaque is performed by dental brushing and mainly by its adjuvants. The mechanical dislocation of the dental plaque achieved by dental brushing with a toothbrush is successfully completed by the auxiliary means of oral hygiene and chemical inhibitors present in personal and professional cleaning products. [2]

Modern lifestyle has led to various dental diseases, other than dental caries, which occur by loss or deterioration of the enamel If they are not treated correctly and in time, these white chalky spots are evolving toward permanent damage to the enameland this enamel loss can leads to Dentinal Hypersensitivity. [3]

Effective bacterial plaque control is an important factor in maintaining oral health during fixed orthodontic treatment. The patients have a high risk for the development of enamel lesions (white spot lesions) and gingival inflammation caused by changes induced in oral hygiene procedures. The brackets, arch wires and other components of fixed orthodontics may produce different sites for plaque accumulation and obstacles for its removal, leading to a significant development of bacterial plaque. The rough surfaces of brackets, arch wires and bands limit the salivary and muscular self-cleaning processes. [4]

Other important factors in the development and progression of carious lesions are patient-related, such as genetic factors, medical and dental histories, diet, the salivary concentration of phosphates, calcium and bicarbonate and the level and quantity of fluoride. It has been shown that the brackets collating technique and different microbial factors increase the risk for enamel demineralization in patients with fixed orthodontic appliances. [4] Therefore, patients with fixed orthodontic appliances must comply with the oral hygiene rules indicated by the doctor and to carry out checks and professional cleaning regularly.

Enamel demineralization around brackets is unavoidable if oral hygiene is precarious. Plaque accumulation lowers the pH and thus the first white spot lesions may set in, even 2 or 3 weeks after plaque accumulation, on the vestibular side of teeth. [5]

Aim of the study

The main purpose of this study was to present to the patients the risks of chalky white spots' appearance during fixed orthodontic treatment in the case in which the hygiene measures recommended are not complied with.

The enamel demineralization is a superficial dissolution the surface enamel. It is the earliest stage of dental cavities, and is most commonly observed on the vestibular surfaces of the teeth like matte-white areas. Demineralization is caused by regular exposure of the tooth's enamel to the acids, such as those produced during the accumulation of bacterial plate. The white chalky lesions can be also caused by direct exposure to acids from food and beverages.

The white chalky spot represents a change in the outer composition of enamel, known under the name of decalcification or demineralization, which may or may not lead to the development of dental cavities.

The formation of white spots or demineralization of the enamel around the orthodontic brackets is a usual complication during and after a fixed orthodontic treatment, which marks the result of a case completed successfully. This thesis is a contemporary review

of the risk factors, of the methods of prevention and of the fate of the inconvenience caused by orthodontic appliances. The importance of good oral hygiene during orthodontic treatment should be explained. Prevention programs shall be submitted to all patients in orthodontic treatment. In the literature, suggestions are made on how to prevent this condition from occurring.

Demineralization is an inevitable side effect associated with fixed orthodontic treatment, especially when there is a bad oral hygiene situation. Secondary acid products of the bacteria from the plate are responsible for the subsequent demineralization of the enamel and formation of the white chalky lesions (WSL). They may cause cavities, thus resulting in a poor aesthetics, the discontent of the patient and even in some cases to legal complications. The formation of white spots after the completion of orthodontic therapy is discouraging to a specialty whose goal is to improve aesthetics in the dental-facial region.

From the clinical point of view, the formation of white spots around the elements of the orthodontic appliances may appear still at 4 weeks of the beginning of the treatment, and the prevalence among patients orthodontically treated varies from 2% to 96%. The labiogingival area of the lateral incisors is the most common place for the chalky white spot, and the maxillary posterior regions are the least common. Men are also more affected than women. According to the studies, it has been observed that a marked increase in the number of white spots occurred during the first 6 months of treatment and continued to grow at a slower rate of up to 12 months, so very careful assessment of oral hygiene is recommended in the initial months of treatment.

MATERIAL AND METHOD

In this study, some minimally-invasive methods of treatment of chalky white spots were used, methods that are very at hand and easy to use by any dentist.

We have chosed to treat a number of 15 patients who at the end of the fixed orthodontic treatment showed visible chalky white spots on the vestibular sides of the teeth. In order to diminish the white chalky appearance of the initial enamel lesions, it must be remineralized. Remineralization of enamel represents a useful tool to counteract the loss of mineral tissue due to the bacteria. [6]

The initial sample has been divided at random in 5 parts, each featuring a different method of treatment.

The following 5 treatment options have been:

1. Natural remineralization due to the components of the saliva;
2. The use of toothpaste and mouth water with amino-fluorides (Elmex Caries Protection GABA International AG, Therwil, Switzerland, Batch no. 10073018)
3. The use of pastes CPP-ACP "Easter Plus Melon (GC);
4. The application of varnishes with fluorine Clinpro White Varnish-3M ESPE ;
5. Performance of resins infiltrations (ICON-DMG);

1. The first method: Natural remineralization due to the components of the saliva. Saliva plays numerous roles including the protection against the occurrence of dental cavities by neutralization of acid, the provision of mineral ions to help remineralization and formation of the protective pellicle of the enamel. The saliva flow provides self-cleaning of the teeth. Calcium, phosphate and fluoride contained in saliva and stored in dental biofilm are necessary for effective remineralization and maintenance of the enamel surface integrity. The teeth which are less exposed to the flow of saliva are frequently exposed to the appearance of the white spots lesions. Once the causes of retention of food debris (brackets) and are removed, the vestibular surfaces are easy to maintain, dental plaque is no longer accumulated this level and demineralized areas are subject to beneficial action of saliva. In this way there is

a partial remineralization and a blur of the unpleasant aspect of the chalky white spots. The patients were monitored for a period of 3 months.

2. The second procedure: The use of toothpastes and mouth water with amino-fluorides.

Elmex Caries Protection ammo-fluoride toothpaste was used 2 times a day, and Elmex Caries Protection mouthwash was used once a day. The survey was made on a period of 3 months. Subjects were trained to use the toothpaste with amino-fluoride twice a day (once in the morning and once at night before going to bed), and then rinse with the mouth water from the same range.

3. The third method: The CPP-ACP paste.

Numerous studies have shown that the CPP-ACP pastes are effective in remineralization of the carious lesions (Shen et al, 2001; Reynolds, 2007). This is due to casein phosphopeptides (CPP) which are molecules that are capable of releasing calcium and phosphate ions and stabilizing the amorphous calcium phosphate (ACP), which is also the source of calcium and phosphate.

The MI paste can be used both with and without a special tray. In general, it would be more efficient if using a tray. The MI paste should not be used as normal toothpaste. It should be applied just before bedtime after the teeth have been brushed beforehand with the usual toothpaste. The best way to apply MI Paste is to take a "pea-sized" amount and to spread it between your thumb and middle finger. Then it must be applied with your fingers on both inside and outside of the teeth from the top and from the bottom. If necessary, take the paste once or twice again and apply until the teeth are covered effectively on all surfaces. A special brush can also be used to help spread the paste between the teeth. Usually, for the first 30 days, it is recommended to apply the paste in the tray. After that, it can be applied whether in the tray, or with the finger. It is important that the patient does not rinse his mouth after applying the paste.

4. The fourth method: Fluoric Varnishes - Clinpro White Varnish-3M ESPE.

Tooth remineralization may be performed in the dental practice using desensitizing gel or varnish applications or at home, through a rigorous dental hygiene and the use of fluorinated toothpastes or special gels. Topical fluoride applications are very important for both permanent and temporary teeth. [7] There are numerous studies demonstrating that fluoride varnishes are highly effective in preventing carious lesions and, in fact, topical fluoride application together with general fluoride administration is included among the 4 caries prevention measures as established by the WHO. [8] The topical applications of fluoride restore the enamel structure by converting the hydroxyapatite into fluorapatite through the ionic substitutions game, but also by precipitation of calcium fluoride on the surface of enamel, that protects the underlying hydroxyapatite from the acid attack. [9] In this study, the varnish was applied on the first day, the third day and the fifth day, following the manufacturer's instructions.

5. The fifth method:

In the recent years, doctors recommend the treatment of WSL (white spot lesion) by infiltration immediately after taking-off the brackets, using very fluid composites which penetrate the micro porosities of enamel. [9]

As long as the surface of a lesion remains intact, there is a possibility of initiating a remineralization process. But at the same time, in the unfavorable conditions of low oral health, such lesions may develop even further. DMG has developed a product through which these early lesions can be infiltrated with a low viscosity resin in this way, the demineralization progress is stopped. The procedure is similar in many cases with traditional methods of restoration we use daily in restorative dentistry medicine and thus it is known to the dentist.

Once it has been photopolymerized, the infiltration agent rebuilds the enamel micro porosities, thus preventing further demineralization. The Icon-infiltrator can be applied a second time to enlarge the enamel micro-hardness. A great advantage of this method is that the appearance of the lesion changes, the chalky area disappearing or being barely perceptible.

RESULTS

- In the first method: along with rigorous oral hygiene and proper nutrition: no carbonated beverages, no excess of sweets and sugars, the chalky white lesions present have stopped from evolution.

- In the second method: the application of the amine fluoride and sodium monofluorophosphate contained in the Elmex products, together with the correct hygiene and proper diet resulted in complete remineralization of the lesion and restoration of porosities. The visual appearance has improved.

- In the third method: significant improvements of the chalky white lesions occurred compared to the baseline. The CPP-ACP pastes are a useful agent for regression of chalky white spots, the damaged surface has greatly diminished the porous appearance, and visual enhancement has been found.

- In the fourth method: the local fluoridation method to stop the demineralization resulting from fixed orthodontic treatment is most often used by practitioners. In this case also, one can observe the remineralization of the porous surface and the improvement of the visual appearance.

- In the fifth method: this study showed that resin infiltration produced the most favorable aesthetic results and improved the roughness of the demineralized surface of the teeth.

CONCLUSIONS

- Maintaining correct oral hygiene by systematically disrupting the bacterial plaque along with a correct diet are essential for stopping WSL progression during fixed orthodontic treatment;

- The topical action of saliva on the structure of demineralized enamel during orthodontic treatment has partial effects, at 30% of patients WSL being still present after 3 months off. [9]

- Monthly topical application of Profluorid Varnish with a concentration of 5% NaF reduces significantly, almost completely the WSL which appeared after the fixed orthodontic treatment.[9]

Applying CPP-ACP (MI Paste Plus Melon) pastes gave a more satisfactory result than the other two previous methods. There has been a decrease in enamel demineralization surfaces, but the lesions with large surface have not disappeared completely.

- The infiltration method with Icon DMG is the most effective in restoring the damaged enamel structure in one single meeting/sitting, the aesthetic appearance being clearly superior towards the other adopted alternatives. [9]

REFERENCES

1. Daniela Jumanca, Anamaria Matichescu, Atena Galuscan. An Experimental Method Of Producing Hydroxyapatite. Rev.Chim.(Bucharest)♦69♦No. 6 ♦2018

2. Atena Galuscan, Daniela Jumanca, Liliana Vasile, Angela Codruta Podariu, Lavinia Ardelean,Laura Cristina Rusu. Chemical Antibacterial Inhibitors Used In Toothpaste. Rev. Chim. (Bucharest) ♦ 63 ♦ No. 7 ♦ 2012
3. Atena Galuscan, Daniela Jumanca, Ramona Amina Popovici, Angela Codruta Podariu, Laura Cristina Rusu, Teodora Stefanescu. Sem Analysis Of Hybrid Layer Adhesion In Substances Used For Dentinal Hypersensitivity. Rev.Chim. (Bucharest)♦67♦No. 6 ♦2016.
4. Atena Galuscan, Daniela Jumanca, Angela C.Podariu, Adina Dumitrache, Ramona A. Popovici, Laura C. Rusu. The assessment of enamel demineralisation by fluorescent light in fixed orthodontics. Key Engineering Materials Vol. 638†©2015 pp 262-269 Trans Tech Publications Switzerland. Doi: 10.4028/Www. Scientific.Net/Kem. 638.262
5. Anamaria Matichescu, Daniela Jumanca, Angela Codruța Podariu, Atena Galuscan. White Spot Lesions – Consequences Of Fixed Orthodontic Treatments. International Journal Of Medical Dentistry. Volume 22• Issue 3 July / September 2018 • Pp. 257-262
6. Daniela Jumanca, Atena Galuscan, Angela Podariu, Lavinia Ardelean, Laura Cristina Rusu. Nano-Hydroxyapatite For Dental Enamel Remineralisation. Rev. Chim. (Bucharest) ♦ 64 ♦ No. 5 ♦ 2013
7. Daniela Jumanca, Atena Galuscan, Angela Codruta Podariu. Protection Of Demineralized Enamel Surfaces In Temporary Teeth Using Fluorinated Varnishes. Rev.Chim.(Bucharest)♦67♦No. 4 ♦2016
8. Podariu, A., Jumana, D., Galuscan, A., Vacaru, R., Munteanu, R., Tratat De Preventie Oro-Dentara, Editura Waldpress, 2003
9. Daniela Jumanca, Atena Galuscan, Angela Codruta Podariu, Lavinia Ardelean, Laura Cristina Rusu. Infiltration Therapy - An Alternative To Fluoride Varnish Application For Treatment Of White Spot Lesion After Fixed Orthodontic Treatment. Rev. Chim. (Bucharest) ♦ 63 ♦ No. 8 ♦ 2012

Aesthetic characteristics of lithium disilicate ceramic: machinable versus pressed technique – A questionnaire - based study

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Abstract

The aim and objectives of the study was to evaluate aesthetics characteristic of lithium disilicate ceramics indirect restorations made by 2 different techniques.

Materials and method. A questionnaire with 10 questions regarding the aesthetic and clinical characteristic of 5 different types of lithium disilicate ceramics indirect restorations was addressed to 30 observers with different background knowledge. They were instructed to score each characteristic with a grade from 1 to 10 (1 the poorest, 10 the best). The data was analyzed with dedicated software.

Results. Dental technicians were the most critical by giving the lowest grades. Dental students and dentists evaluated approximately in the same way the restorations. Pressed technique received better grades than CAD CAM technique.

Conclusions: In the limit of this study, the observers have revealed that both techniques are suitable for indirect restoration, but the pressed technique had better esthetic results than CAD CAM technique.

Keywords: questionnaire, lithium disilicate, CAD CAM, heat-pressed ceramics

INTRODUCTION

Replacing lost dental structures with a material having similar properties with natural teeth is a key objective of restorative dentistry [1,2]. In the last decades, exciting new developments in dental materials and manufacturing techniques have led to the success of contemporary metal-free ceramic systems. With high esthetic potential, improved optical properties, reliable mechanical characteristics, excellent consistency in terms of precision and accuracy due to the manufacturing technologies, possibility of adhesive cementation, lithium disilicate became today one of the most important materials for the rehabilitation of prosthetic patients [3,4].

The increase of flexural strength from 120-150MPa for the feldspar ceramic to 360- 400 MPa for the lithium disilicate ceramic represented an important step in restorative dentistry [3,5]. Moreover, since 2006, the manufacturing techniques for ceramic systems evolved, nowadays, for lithium disilicate, both heat pressing and CAD-CAM are recommendable, with certain advantages and disadvantages [6,7,8,9].

Heat pressing technique involves a process during which temperature and pressure are applied simultaneously in order to melt the ceramic ingot and press the material into a mold, having the exact configuration of the restoration.

CAD CAM technique is a process in which a precrystallized block of lithium disilicate is milled, according to the digital design of the restoration. After milling, heat treatment (840-850^{0}C for 10 min) determines a full crystallization of the material, with the increase of the flexural strength.

The qualities of the restorations obtained by the two methods are controversial in literature; there are studies suggesting that the CAD CAM technique has better results than the conventional technique [10]; moreover, it has rapidly become popular, as it reduces the number of clinical sessions and manufacturing [11] and offers a certain independence from the dental technician. Other studies emphasize the strength, marginal fitting and survival rate of the pressed lithium disilicate [6,7,8,12,13].

Most of the existing studies regarding the lithium disilicate ceramic restorations evaluated mainly the mechanical properties of this material [3]. To the best of our knowledge, there are no studies that evaluated the esthetic outcome of lithium disilicate indirect restorations manufactured by different techniques, as perceived by visual observation, through questionnaires.

Aim and objectives

The objective of the study was to evaluate and compare the opinions of three different groups of dental professionals regarding the aesthetics characteristic of lithium disilicate ceramics restorations manufactured by two different methods: CAD-CAM and heat-pressed technique.

The null hypothesis was twofold: 1. There was no difference between the esthetic characteristics of the restorations fabricated by the two methods (CAD-CAM and heat pressing) as perceived by the three groups of observers and 2. The three groups od evaluators had the same perception upon the characteristics of the restorations.

MATERIAL AND METHODS

Five different conventional preparations were made on an ideal maxillary plaster cast: for full crown on the maxillary right second molar, Class I inlay preparation on the maxillary right first molar, for onlay on the maxillary right first premolar, for veneer on the maxillary left central incisor, and for overlay on the maxillary left first molar. For each prepared tooth,

two ceramic restorations were made from lithium disilicate, using CAD CAM and heat pressing (Fig-1).

Figure 1. Cast maxillary model

CAD CAM technique

The prepared maxillary stone model was scanned using a laboratory scanner (inEos X5 – Densply Sirona) for the virtual model; the restoration was further constructed in digital format using the Cerec 4.2 software (Densply, Sirona). In each case, the design proposed by the software was corrected to improve the marginal contour and the axis of insertion.

The restorations were then milled in presintered stage from lithium disilicate ceramic blocks (e.max CAD – Ivoclar Vivadent AG, Schann, Liechtenstein) using a milling machine (Cerec InLab MC XL - Densply Sirona); further, the restorations were sintered for full crystalization in a fully-automatic, microprocessor-controlled firing unit (VITA VACUMAT 6000 M – Vita Zahnfabrik), glazed and pigmented (Fig 2).

Figure 2. Cad cam restorations: A) precrystallized restorations after the milling; B) restorations after the crystallization and individualization process

On the same maxillary stone model, wax patterns were manufactured from residue-free, organic wax and further invested in a phosphate-bonded investment IPS PressVEST Speed (Ivoclar Vivadent AG, Schann, Lichtenstein), using a base and silicone ring. The mold was heated in the same firing unit (VITA Vacumat 6000 MP; VITAZahnfabrik, Germany) at 850^0C for 45 minutes. IPS e.max Press ingots were than pressed into the mold at 920^0C with specific plungers. After pressing, the muffle was removed from the furnace and the investment was allowed to cool until reaching room temperature. The restorations were divested using airborne-particle abrasion with 50-mm glass beads (Miniblaster; Bellede St. Claire, Encino, California) at a constant air-pressure of 3 bars. In the end, all the restorations were glazed and individualized (Fig 3).

Figure 3. Heat Pressed restorations: A) wax patterns; B) restorations after the pressing and individualization process

A questionnaire with 10 questions regarding the aesthetic and clinical characteristics of each restoration (morphology, color, surface texture, individualization, natural look-like, marginal fitting, proportionality, symmetry) (Table 1) was addressed to 30 observers, with different background knowledge (dental students, dentists and dental technicians) (n=10). Based on the observation, the subjects were instructed to score each characteristic with a grade from 1 to 10 (1 the lowest, 10 the best). The scores were recorded in an Excel database (Microsoft Office for Windows).

Table 1. The evaluated parameters for the restorations made with the 2 different techniques: CAD CAM and pressed technique

Question Number	Evaluated parameter
Q1	General Morphology
Q2	Positive Morphology
Q3	Negative Morphology
Q4	Color Appearance
Q5	Life look Appearance
Q6	Staining and Characterization
Q7	Surface Texture
Q8	Marginal Fitting
Q9	Proportionality and Symmetry
Q10	Insertion

Statistical Analysis

The data was analyzed statistically with computer software (SPSS v.23 for MacIntosh [Apple], IBM Corp.). Descriptive statistics was performed and differences in scores by manufacturing technique and observers groups were analyzed with Mann- Whitney U and Kruskal Wallis tests (α=0.005 for all tests).

RESULTS

Median and interquartile ranges of the scores off each restoration grouped by questions, observer groups and manufacturing techniques are presented in Table 2 and Table 3.

Table 2. Median (interquartile ranges) of the scores for the restorations grouped by restoration type

Category	CAD CAM					Heat Press				
	Full Crown	Overlay	Inlay	Onlay	Veneer	Full Crown	Overlay	Inlay	Onlay	Veneer
Q1	8,00(2,00)	8,00(1,00)	8,00(1,00)	8,00(1,75)	8,00(1,75)	9,00(1,00)	9,00(1,75)	9,00(0,00)	9,00(2,00)	9,00(0,00)
Q2	8,00(1,00)	8,00(2,00)	8,00(1,00)	8,00(1,00)	8,00(2,00)	9,00(1,00)	9,00(1,00)	9,00(1,00)	9,00(1,50)	9,00(0,00)
Q3	8,00(1,75)	8,00(1,00)	8,00(1,00)	8,00(1,00)	7,00(2,00)	10,00(1,00)	9,00(1,00)	9,00(1,00)	9,00(2,00)	9,00(1,00)
Q4	9,00(1,75)[a]	9,00(1,00)	9,00(1,00)[b]	9,00(1,75)[c]	8,00(1,00)	9,00(1,00)[a]	9,00(1,00)	9,00(0,75)[b]	9,00(1,00)[c]	9,00(0,75)
Q5	8,00(1,00)	8,00(2,00)	8,00(1,75)	8,00(2,00)	8,00(1,75)	9,00(1,75)	9,00(1,75)	9,00(2,00)	9,00(1,00)	9,00(1,00)
Q6	8,00(1,75)	8,00(2,00)	8,00(2,75)	8,00(2,00)	8,00(2,00)	9,00(1,00)	9,00(2,00)	9,00(2,00)	9,00(1,00)	9,00(1,00)
Q7	8,00(2,00)	8,00(1,00)	8,00(2,00)	8,00(1,00)	7,00(3,00)	9,00(1,75)	9,00(1,75)	9,00(1,00)	9,00(2,00)	9,00(0,75)
Q8	8,00(2,00)	8,00(1,00)	7,00(2,50)	8,50(2,75)[d]	9,00(1,75)[e]	9,00(1,75)	9,00(1,50)	8,00(2,00)	9,00(1,75)[d]	9,00(0,75)[e]
Q9	9,00(2,75)	9,00(2,00)	8,00(2,00)	8,00(2,00)	8,00(2,00)	10,00(1,00)	9,00(1,00)	9,00(1,00)	9,00(1,75)	9,00(1,00)
Q10	9,00(2,75)[f]	9,00(2,00)[g]	9,00(1,00)	9,00(1,00)	9,00(0,75)[h]	9,00(1,00)[f]	9,00(1,00)[g]	10,00(1,00)	9,00(1,00)	9,00(1,00)[h]

*Same superscript letter indicates no significant statistical difference.

*Same superscript letter indicates no significant statistical difference.

Table 3. Median (interquartile ranges) of the scores for the restorations grouped by observers

Category	DentalStudent		Dentist		Tehnician	
	CAD CAM	Heat Press	CAD CAM	Heat Press	CAD CAM	Heat Press
Q1	8,00(1,00)	9,00(0,00)	8,00(1,00)	10,00(1,00)	7,00(1,00)	9,00(1,00)
Q2	8,00(1,00)	9,00(0,00)	8,00(1,00)	10,00(1,00)	7,00(1,75)	9,00(1,00)
Q3	8,00(2,00)	9,00(1,00)	8,00(2,00)	10,00(1,00)	7,00(1,00)	9,00(1,00)
Q4	9,00(1,50)	9,00(1,00)	9,00(2,00)	9,50(1,00)	8,00(1,00)	9,00(1,00)
Q5	8,00(1,00)	9,00(1,00)	8,00(2,00)	10,00(1,00)	7,00(1,00)	9,00(1,00)
Q6	8,00(2,00)	9,00(1,00)	8,00(2,00)	10,00(1,00)	7,00(2,00)	9,00(1,00)
Q7	8,00(1,00)	9,00(1,00)	8,00(2,00)	9,50(1,00)	7,00(2,00)	8,00(1,00)
Q8	9,00(2,00)	9,00(1,00)	8,00(1,75)	9,00(1,00)	7,00(3,00)	9,00(1,00)
Q9	9,00(1,75)	9,00(1,00)	9,00(2,00)	10,00(1,00)	8,00(2,00)	9,00(1,00)
Q10	9,00(0,00)	9,00(1,00)	9,00(2,00)	10,00(1,00)	8,00(3,75)	9,00(0,00)

Considering **morphology**, all the restorations fabricated by heat-pressed technique received better scores than CAD CAM restorations, and the differences were statistically significant ($p \leq 0.003$). When comparing the three categories of observers, significant differences were found between the overall scores ($p \leq 0.05$) except for inlays morphology for which the scores given by the observers were not significantly different ($p=0.812$).

When further analyzing in detail the perception of **positive morphology (cusps, ridges) and negative morphology (grooves, fossae)**, there were significant differences between the grades received by the two techniques ($p \leq 0.002$). CAD CAM technique restorations received higher grades on positive morphology, while the pressed technique restorations were better appreciated for the reproduction of the depressions.

Regarding the scores for **color appearance**, there were no statistically significant differences between grades received by the two techniques for crowns, inlays and onlays ($p=0.581$, $p=0.224$, and $p=0.322$ respectively). However, the dentists gave higher scores, and the results were statistically different between the three groups of observers, except for the grades attributed to inlays ($p=0.205$).

When analyzing the **life-look appearance**, there were statistically significant differences between the two techniques for all restorations ($p<0.005$). When comparing groups of observers, there were significant differences in scores only for crowns ($p=0.013$).

Regarding the **surface staining and characterization**, there were statistically significant differences between the two techniques for all restorations ($p<0.005$), but there was no statistically significant difference between the three category of observers when evaluating the onlays and veneers ($p=0.096$ and $p=0.586$ respectively).

The scores for **surface texture** were significantly different between the two techniques for all restorations ($p<0.005$), but no statistically significant difference was recorded between the scores given for inlays ($p=0.157$).

All restorations were perceived differently in respect with the **marginal fitting**, with the exception of onlays ($p=0.120$) and veneers ($p=0.422$). There were statistically significant differences between the scores given by the three groups of observers only when comparing the onlays ($p=0.003$).

When evaluating the **proportionality and symmetry of the restorations**, there were statistically significant differences between the two techniques for all restorations and for scores given by the three 3 categories of evaluators ($p<0.05$).

Regarding the **insertion** there were no statistically differences between the two techniques for crowns, overlays and veneers ($p=0.104$, $p=0.326$, and $p=0.186$ respectively), but When comparing the 3 category of evaluators, there were statistically significant differences between the grades given to all restorations, with the exception of onlays made with the two techniques ($p=0.148$).

DISCUSSIONS

The first null hypothesis was rejected since there were significant differences between the esthetic characteristics of the restorations fabricated by the two methods, as perceived by the three groups of observers. From the sum of the scores, the best perceived were the restorations made by the heat-pressed technique, in comparison with CAD CAM technique.

When comparing the restorations from the point of view of the overall grades, the most criticized were the restorations with minimal dimensions (inlays and veneers). In practice, these restorations are difficult to be manufactured, and individual characterization, texture and staining, may be challenging. This is a possible justification why the more extended restorations (full crowns, overlays) received better grades.

There were statistically significant differences between the elevations (positive morphology) and depressions (negative morphology) of the restorations made with the 2 techniques. For the pressed technique, it is easier to model a desired morphology using wax patterns, whilst milling fossae, pits or grooves are dependent by the diameter of the tip of the milling burs. This could be a reason why the CAD CAM restorations received lower grades on negative morphology.

There are still significant fit discrepancies among different techniques. The results of the study regarding the marginal fitting and the insertion of the restorations are in accordance with the specialty literature: heat pressed technique obtained better results than the CAD CAM technique [6,7,8,14]. However, there are studies than concluded exactly the contrary: the fully digital workflow provided better marginal fit than the conventional fabrication [15].

The second null hypothesis was also rejected, since dental technicians were the most critical when judging the restorations, by giving the lowest scores overall, followed by dentists and dental students.

Observers with different background knowledge seem to have a different perception regarding color parameters and clinical integration as it is defined for perceptibility and acceptability thresholds [16]. Moreover, some studies suggest that from all of these different category of observers, dental technician are the most experienced in recognizing differences in color as they have lower perceptibility and acceptability limits, in comparison with the rest [17].

When comparing the 2 techniques from the point of view of the grades received only from the dental specialists (dentists and dental students), we observed a difference in the way of perceiving the 2 techniques. CAD CAM technique, which has the newest technology, received better grades from the students (which are more attracted to the digital era, and all the new gadgets that arise yearly). On the other hand, the more experienced specialists, the dentists, appreciated more the pressed technique.

The small number of observers could be a limitation of this study, which may generate results that are non-representative for all the dental specialists involved in the field of prosthodontics.

The study must continue with the investigation of the dental technician students. A possible correlation between dental technician student - dental technician and dental student-dentist could be investigated.

CONCLUSIONS

In the limit of this study, the observers have revealed that both techniques are suitable for manufacturing indirect restoration, but the heat pressed technique had, for now, better esthetic results than CAD CAM technique.

Acknowledgment

This study was supported by the Research Project Proiect de Cercetare Doctorală (PCD 2016) Nr.7690/115 from 15.04.2016. All authors are considered to have equal contribution in the making of this study and article. The authors would also like to thank Ms. Chadmi Ladmia for her collaboration in sample fabrication.

REFERENCES

1. Coldea A, Swain MV, Thiel N. Mechanical properties of polymer-infiltrated-ceramic-network materials. Dental Materials. 2013;29(4):419–426
2. Anusavice KJ. Degradability of dental ceramics. Adv Dent Res. 1992;6:82-89
3. Zarone F, Ferrari M, Mangano FG, Leone R, Sorrentino R. Digitally Oriented Materials; Focus on LithiumDisilicate Ceramics. Int J Dent 2016:10
4. Fabbri G, Zarone F, Dellificorelli G at all. Clinical evaluation of 860 anterior and posterior lithium disilicate restorations: retrospective study with a mean follow-up of 3 years and a maximum observational period of 6 years. Int J Periodontics Restorative Dent. 2014;34(2):165-177
5. Sonmez N, Gultekin P, Turp V, Akgungor G, Sen D, Mijiritsky E. Evaluation of five CAD/CAM materials by microstructural characterization and mechanical tests: a comparative in vitro study. BMC Oral Health. 2018 Jan 8;18(1):5
6. Guess PC, Vagkopoulou T, Zhang Y, Wolkewitz M, Strub JR. Marginal and internal fit of heat pressed versus CAD/CAM fabricated all-ceramic onlays after exposure to thermo-mechanical fatigue. J Dent 2014;42(2):199-209

7. Mously HA, finkelman M, Zandparsa R, Hirayama H. Marginal and internal adaptation of ceramic crown restorations fabricated with CAD / CAM technology and heat-press technique. J Prosthet Dent. 2014;112(2): 249-256
8. Anadioti E, Aquilino SA, Gratton DG at al. 3D and 2D marginal fit of pressed and CAD / CAM lithium disilicate crowns made from digital and conventional impressions. J Prosthodont. 2014; 23(8): 610-617
9. Neves FD, Prado CJ, Prudente MDS et al. Micro-computed tomography evaluation of marginal fit of lithium disilicate crowns fabricated by using CAD CAM systems or the heat-pressing technique. J Prosthet Dent. 2014; 112(5):1134-1140
10. Reich S, Fischer S, Sobotta B, Klapper HU, Gozdowski S. A preliminary study on the short-term efficacy of chairside computer-aided design/computer-aided manufacturing-generated posterior lithium disilicate crowns. Int J Prosthodont 2010;23(3):214-6
11. Van Noort R. The future of dental devices is digital. Dental Materials. 2012;28(1):3–12
12. Gerogianni P, Lien W, Bompolaki D, Verrett R, Haney S, Mattie P, Johnson R. Fracture Resistance of Pressed and Milled Lithium Disilicate Anterior Complete Coverage Restorations Following Endodontic Access Preparation. J Prosthodont. 2018 Apr 22
13. Guess PC, Strub JR, Steinhart N, Wolkewitz M, Stappert CF. All-ceramic partial coverage restorations--midterm results of a 5-year prospective clinical splitmouth study.J Dent. 2009 Aug;37(8):627-37
14. Anadioti E, Aquilino SA, Gratton G et all. Internal fit of pressed and computer-aided design/computer-aided manufacturing ceramic crowns made from digital and conventional impressions. J Prosthet Dent.2015;113(4):304-309
15. Ng J, Ruse D, Wyatt C. A comparison of the marginal fit of crowns fabricated with digital and conventional methods. J Prosthet Dent.2014;112(3):555-560
16. Paravina RD, Ghinea R, Herrera LJ, Bona AD, Igiel C, Linninger M, Sakai M, Takahashi H, Tashkandi E, Perez Mdel M. Color difference thresholds in dentistry. J Esthet Restor Dent. 2015 Mar-Apr;27 Suppl 1:S1-9
17. Alghazali N, Burnside G, Moallem M, Smith P, Preston A, Jarad FD. Assessment of perceptibility and acceptability of color difference of denture teeth. J Dent. 2012;40 Suppl 1:e10-7

The assessment of relationship between dentist and contagious patient

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Abstract

Aim and objectives: The study proposes to identify the possibility of a change in the medical relationship between dentists and patients with an infectious disease (HIV, HVB, HCV), compared to the relationship between dentists and patients without any infectious diseases, from the perspective of dentists with experience in the profession.

Material and methods: The studied lot is formed of 100 dentists that practice in the Constanta county. They completed a quiz which comprised of questions about the medical relationship between the dentist and patients that are known to have infectious diseases (HIV, HVB, HCV.).

Results: According to the values obtained by comparing the results from the group of dentists with less than 3 years of experience on the stress levels on the treatment of both a patient that was recently/previously diagnosed with an infectious disease and a patient without infectious diseases, there us a statistically significant difference. The same aspect was observed aswell in the case of the other group of dentists, with more than 3 years of experience.

Conclusions: There is an obvious change in the medical relationship between the physician and the contagious patient (HIV, HBV, HCV).

Keywords: infectious diseases, medical relationship, contagious patient.

INTRODUCTION

A dental practitioner has the general obligation to provide care to those in need. The decision to not provide treatment to an individual due to the fact that he/she is infected with HIV, hepatitis B virus, hepatitis C virus or any other blood-carried pathogen, based exclusively on this fact, is unethical. The decisions about the type of provided dental treatment or recommendations should be based on the same principles as all the other patients. In all cases the dentist must determine if the abilities, knowledge, equipment or experience of other practitioners is needed. The dentist should also determine, after the consultation, if the dental treatment required would significantly compromise the general health status of the patient [1].

A much debated issue in literature is the one related to treating HIV-positive patients. These patients constitute a challenge to the ethics of dental practice and have generated a series of ethical dilemmas due to the severity of the disease, epidemiologic concerns and the social stigma that these patients are confronted with. There are numerous papers that try to explore the ethical limits of the rights and obligations of both HIV-positive patients and doctors. Around what constitutes the doctor's obligations to not discriminate HIV-positive patients, some dentists claim the fact that too much emphasis is put on the patient's rights, while little emphasis is put on the doctor's rights. From some points of view the doctor's autonomy and right to choose who to treat and in what circumstances are sacrificed; thus it is considered that the dentist should have the right to refuse treating HIV-positive patients [2]. All the organizations that respect patient's rights claim that all dentists have the obligation to treat HIV-positive patients. It is not just non-ethical but also illegal for a doctor to refuse these patients [3].

Aim and objectives

The study proposes to identify the possibility of a change in the medical relationship between dentists and patients with an infectious disease (HIV, HVB, HCV), compared to the relationship between dentists and patients without any infectious diseases, from the perspective of dentists with experience in the profession. It was also looked at establishing a statistical relationship between the experience in the dental profession and both the way in which the medical relationship unfolds between dentists and patients with infectious diseases and the knowledge about the risk of percutaneous infection with HIV, HVB, HCV.

MATERIAL AND METHODS

The studied lot is formed of 100 dentists, both male and female, ages 25-50 years, that practice in the Constanta county. The first step in this study is the collection of data through a quiz which comprised of questions about the medical relationship between the dentist and patients that are known to have infectious diseases (HIV, HVB, HCV.). For the purpose of analizing the doctor's knowledge on the risk of percutaneous infection with, the quiz contained three questions regarding this topic.

The data was harvested, centralized and the comparison analysis was done using statistical and analitical methods. The processing of data was done using Ms Office Excel 2016.

RESULTS AND DISCUSSIONS

The participants lot was comprised of 100 dentists, split into two categories, as follows: dentists with less than 3 years of experience and dentists with more than 3 years of experience. The doctors participating in the study were: dentistry college graduates (44%)

without other specializations in the medical/dental field, resident dentists (10%) and doctors with postgraduate studies in the field – master, PhD (46%).

In order to evaluate the level of stress the dentist is exposed to when treating a healthy patient, without any infectious diseases (HIV, HVB, HCV) the two groups' scores on the t test were compared using Ms Officer Excel 2016. By comparing the scores of the groups represented by the dentists with less than 3 years of experience and over 3 years of experience, the t test scored 0.65 (p=0.65). This result leads to the conclusion that there is no significant statistical difference between the two groups (0.65 > 0.05) regarding the level of stress that a dentist can experience during the treatment of a healthy patient without infectious diseases (HIV, HVB, HCV). Following the same steps, for the stress level when treating a patient with recently diagnosed infectious diseases (HIV, HVB, HCV), the value was 0.00 (p=0.00), which leads to the conclusion that there is a statistical difference (0.00 ≤ 0.01) between the two groups. The same result was obtained when comparing the scores between the two groups in the case of treating a patient with a previously known infectious diasease – p=0.0, which indicates that there is a statistically significant difference between the two groups.

Table 1. t-test values

Item	Compared groups	t-test value
1. Stress level evaluation during the treatment of a healthy patient without infectious contagious diseases	The group of physicians with experience < 3 years and a group of physicians with experience> 3 years	**0.65**
2. Stress level evaluation during the treatment of a patient recently diagnod with an infectious contagious diseases	The group of physicians with experience < 3 years and a group of physicians with experience > 3 years	**0.00**
3. Stress level evaluation during the treatment of a patient previously known infectious diasease	The group of physicians with experience < 3 years and a group of physicians with experience> 3 years	**0.00**
1,2	Answers given by physicians with < 3 years experience to question 1, compared to the answers to question 2	**0.00**
1,2	Answers given by physicians with > 3 years experience to question 1, compared to the answers to question 2	**0.00**
2,3	Answers given by physicians with < 3 years experience to question 2, compared to the answers to question 3	**0.31**
2,3	Answers given by physicians with > 3 years experience to question 2, compared to the answers to question 3	**0.00**

According to the values obtained by comparing the results from the group of dentists with less than 3 years of experience on the stress levels on the treatment of both a patient that was recently diagnosed with an infectious disease and a patient without infectious diseases, there us a statistically significant difference (p=0.00). The same aspect was observed aswell in the case of the other group of dentists, with more than 3 years of experience.

By comparing the results of the group of doctors with less than 3 years of experience of the stress levels between treating a patient that recently discovered the infectious disease and treating a patient with known infectious diseases, there was no statistically significant difference (p=0.31, p>0.05). Regarding the same aspect, in the case of the group of dentists with more than 3 years of experience, there was a statistically significant difference (p=0.00, p≤0.01).

Regarding the question that evaluated the conversational aspect in case of a patient with an infectious disease, most of the answers were showing a shorter conversation (58%). The largest percentile regarding this same aspect was in the group of dentists with less than 3

years of experience, with a shorter conversation (80%), compared to the group of dentists with more than 3 years of experience, which registered a high percentile of the answer according to which they do not differentiate in communicating with a patient that has a known infectious disease (60%).

Regarding the question „Is it less probable to treat a patient with a known infectious disease?", the largest percentile was registered on the answer that had the lowest probability of treating of a patient with a known infectious disease – 60%. In the case of the group that had less than 3 years of experience, on the same answer, the percentile was 84%. On the same question, for the group of dentist with more than 3 years of experience, the most frequent answer was that the doctor does now differentiate between a patient with infectious diseases (HIV, VHB, VHC) and a healthy patient – 64% percentile.

For the question "Do you focus more on dental procedures when treating a patient known to have a communicable infectious disease or are you more focused on hygiene and safety issues?", the highest percentage was recorded in the response that the doctor did not makes any difference regarding this aspects.

Regarding the self-esteem of hygiene and safety training in the treatment of a patient known to be communicable infectious disease (on a scale of 0 to 10), the group of physicians with less than three years of experience recorded the highest percentage value for the score equal to 6. The same applies to the group of physicians with more than three years of experience, but with different values, the highest percentage being 76% for the score ranges of 6 to 10.

The self-rating of ethical training (on a scale of 0 to 10) of the group of physicians with less than three years of experience recorded percentages of 0 to 5 (88%), and in the case of a group of physicians with more than three years of experience, the highest percentage was recorded for the interval between 6 and 10 (- 96%), the maximum value being 10.

The risks of transmission of HIV, HBV, HCV after a percutaneous accident are: 0.3%, 30%, and 3% [4].

Regarding the questions that addressed doctors' knowledge of the risk of transmitting HIV, HBV, HCV after a percutaneous accident, there were high percentages for incorrect answers - 70%, 64% and 76%.

A percentage decrease was observed by comparing the two groups, the group of doctors with more than 3 years of experience showed a lower tendency to provide incorrect answers than the other group.

CONCLUSIONS

There is an obvious change in the medical relationship between the physician and the contagious patient (HIV, HBV, HCV). Physicians with less experience in the dental profession feel more stressed when treating a patient suffering from a communicable infectious disease (HIV, HBV, HCV). As professional experience grows, the more stress experienced when treating a known patient diagnosed with an infectious transmissible disease (HIV, HBV, HCV) decreases. More training is required regarding the ethics, hygiene and work safety issues.

REFERENCES

1. Mathur S, Chopra R. Ethical Issues in Modern Day Dental Practice. Online Journal of Health Ethics, 8, 2, 2013
2. Sheriff SO, Sheriff DS. Ethical dilemmas in dentistry. Niger Med J. 52, 205–6, 2011
3. General Dental Council. Standards for dental professionals. May 2005. Available from: http://www.gdcuk.org

4. Roşca A, Smeu G, Ioan N, Buda L, Modalități de reducere a riscului de transmitere a infecției prin expunere profesională, Available from: https://www.atitimisoara.ro/content/ghiduri/2006/36%20Modalitati%20de%20reducere%20a%20riscului%20de%20transmitere%20a%20infectiei%20prin%20expunere%20profesionala.pdf

The effect of vitamin E in the precancerous condition of the mouth and the decrease in number of relapses

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Abstract

Oral cancer is a tumor of the upper digestive tract and accounts for about 8% of all malignant tumours. It is a malignant process that develops from the epithelial cell that contains altered genetical information that causes the uncontrolled division and growth, affecting the healthy surrounding tissues or organs. The cancer of the oral cavity affects men predominantly.

Several factors (risk factors) contribute to the onset of oral cancer: smoking, excessive alcohol consumption, prolonged sun exposure, oral irritation, unhealthy eating, lack of oral hygiene. The most important factor is smoking. 98% of patients with oral cancer have been abusive smokers for 15-20 years. The risk of illness is caused by chronic mucosal irritation with tobacco products.

The cancer of the oral cavity can also occur due to long-lasting, chronic, untreated pathological processes called precancerous processes such as: all forms of diskeratosis of the oral mucosa, degenerative-proliferative processes (ulcerations, granulomas) and changes in tissues due to scarring of tuberculous, syphilis, actinomic, post-traumatic origin. Risk factors, precancerous conditions as well as the aging of the body cause constant, sometimes irreversible, dysplasia of the oral cavity epithelium that leads to cancer.

Keywords: *precancerous, carcinogenesis, antioxidant vitamins, vitamin E, oral cavity*

INTRODUCTION

Vitamin E is the term for a family of chemical substances that are structurally related to alpha-tocopherol. Vitamin E occurs naturally in eight different forms: four tocopherols: alpha(α), beta(β), gamma(γ) and delta(δ)-tocopherol; and four tocotrienols: alpha, beta, gamma and delta-tocotrienol. The Greek characters refer to the number and position of the methyl groups at the 5, 7 and 8 positions. All forms consist of a chromanol ring with a long aliphatic side chain, bound to the chromanol ring at the second position. Tocotrienols differ from their corresponding tocopherols in that the saturated phytyl side chain is replaced with an unsaturated isoprenoid side chain [1].

Herbert Evans and Katherine Scott Bishop discovery the Vitamin E in 1922, when they found that "antisterility factor-x" was essential for reproduction in rats [2]. Barnett Sure confirmed Evans and Bishop's observations after performing similar experiments; he called the substance "Vitamin E" because vitamins A, B, C, and D were then already known to the scientific community [3]. Evans first published the chemical formula of Vitamin-E in the Journal of Biological Chemistry, in 1936 [2].

The effect of antioxidant vitamins such as tocopherols, carotenoids and ascorbic acid on the carcinogenicity mechanism is more beneficial if these chemo-preventive substances are administered in polytherapy as it is well known that in lung cancers carotenoids have enhanced prevention effect, the ascorbic acid acts on the salivary gland cancer and tocopherols act on head and throat cancers [4].

Vitamin-E exhibit antioxidant properties by acting as a lipid-soluble free radical scavenger in cell membranes. Thus, Vitamin-E may involve in both initiation and promotion stages. Among the other potentially anticarcinogenic effects of Vitamin E are its ability to inhibit formation of the carcinogenic chemical nitrosamine from nitrites in some foods, and its ability to promote immune system function [5].

Despite the various etiological studies, the etiology of almost all of these pathologies remains unknown.

Despite the various etiological studies, the etiology of almost all of these pathologies remains unknown.From the point of view of their environmental origin, the etiological factors can vary, the most frequently reported being the consumption of tobacco, alcohol and chewable tobacco that contains areca nuts extract under the influence of ultraviolet rays.

Early diagnosis is of utmost importance in the prevention of oral cancer in early stages because in the last stages it can progress to severe dysplasia and even carcinoma in situ and/or squamous. For most pathologies, treatment results are not satisfactory despite different therapies and, later after surgery, different local and systemic maneuvers may be performed, such as corticosteroids, calcineurin inhibitors and retinoids.

Precancerous lesions of the oral mucosa are considered as malignant potentiators which are included in pathologies with early diagnostic involvement. Oral leucoplasia, oral submucosal fibrosis and oral erythroplasty are the most common oral mucosal diseases that show a very high incidence of malignant transformation. The lichen planus of the oral mucosa is one of the malignant potential disorders that can be divided into six different subtypes: papular, reticular, platelet, atrophic, erosive and bullous. The atrophic and erosive subtypes present a higher risk of malignant transformation compared to the other subtypes [6].

Clinically, leucoplasia can affect any part of the oral and oropharyngeal cavity and can be divided into two subtypes, including homogeneous and non-homogeneous types [7]. Homogeneous lesions are characterized by a uniform, thin colou and exhibit superficial surface keratin lesions [7,8]. Non-homogeneous lesions have been defined as white and erythematous, also called erythro leukoplasias, which may be irregular, smooth or nodular. Verrucous leucoplasia is another type of non-homogeneous leukemia [7,8].

Oxidative processes in the body are recognized as having a role in the pathogenesis of the cancer which may be caused by disorders of weak nutritional lifestyle. This process may result in changes of the DNA, the basic mechanism in cancer induction. The high antioxidant effect is of utmost importance in defending the body against free radicals.

MATERIALS AND METHODS

The study was performed on a group of 20 patients, men and women, smokers aged between 35-50.

The clinical method in the dental office, which includes the anamnesis and the objective examination, was applied for the judicious clinical assessment of the physiological status of the oral cavity of the patients, respectively of the pathological disturbances occurring in the oral cavity.

The epidemiological method investigated incidence, prevalence, morbidity, mortality, lethality. The materialization of this research method was achieved through a series of epidemiological studies.

RESULTS

The distribution of cases according to conservative treatment with vitamin E in leucoplasia is illustrated in Figure 1.

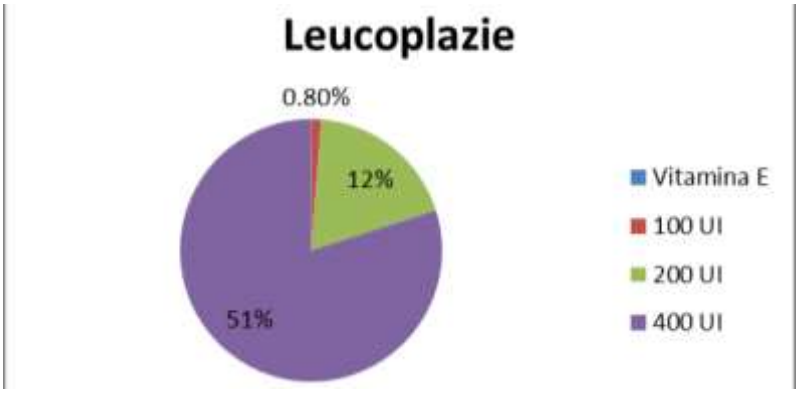

Figure 1. Distribution of cases according to the conservative treatment with vitamin E

Results of the statistical analysis of the cases with oral leucoplasia under conservative vitamin E therapy show that the leucoplasia remission in patients treated with 400 IU/day vitamin E for 6 weeks was higher than in patients treated with 200 IU/day. The remission in patients treated with 100 IU/day vitamin E is insignificant.

DISCUSSIONS

The role of vitamin E in the prevention of oral cancer consists in the inhibition of the tobacco-specific nitrosamine reaction that undergoes a specific activation and detoxification process. As for the dietary supplement, vitamin E can prevent oral cancer in very early stages, that is in the premalignant lesion stage [9]. The main role of vitamin E is to increase immunity, to control the free radicals on mediated cell disorders, to maintain membrane integrity, to inhibit the growth of the cancer cell, cytotoxicity. The specialized literature suggests that the antioxidant role of vitamin E in the treatment of oral mucosal lesions includes oral leukoplasia, oral dermal lichen, oral submucosal fibrosis and oral cancer. Thanks to its antioxidant effect, vitamin E is thought to help in preventing and slowing the development of head and throat cancer. It also improves the effects of

chemotherapy in cancer pathologies and it reduces side effects of both chemotherapy and radiotherapy [9].

Vitamin E with its antioxidant effect inhibits oral cavity carcinogenesis, reduces the risk of developing oral cancer and relieves premalignant lesions such as oral leucoplasia [9]. These oxidative processes in the body are recognized as having a major role in the pathogenesis of cancer, which can be induced also by inadequate nutritional habits and faulty lifestyle practices. This process can cause DNA alterations, which is a basic mechanism in the induction of cancer [9].

The increased antioxidant effect, both through food intake and supplementation, is crucial for the body in its fight against free radicals [10]. To reduce the risk of oral and pharyngeal cancer, especially oral cell carcinoma, the diet should be optimized, primarily to reduce calory intake, monounsaturated fats and red meat or meat products. Major dietary micronutrients with antioxidant action include vitamin E (alpha-tocopherol), vitamin A, β-carotene, lycopene, vitamin C, zinc and selenium. There is considerable evidence suggesting the role of nutrients, especially antioxidants such as vitamin E, vitamin A, β-carotene, vitamin C, lipoic acid, zinc, selenium and spirulina in preventing this disease [11].

Antioxidants are considered to be a group of chemo-preventive compounds that can deactivate the free radicals and prevent their formation. These antioxidant nutrients act to inhibit the growth of cancer cells and to destroy them by apoptosis (programmed cell death), by stimulating cytotoxic cytokines, by acting on the gene expression, by not providing the tumor with the necessary blood and by preventing cell differentiation. It is also considered that antioxidants have a role in reducing the adverse effects of chemotherapy when co-administered.

The evaluation performed on the serum glicoproteins from squamous cell carcinoma of the mouth treated with radiotherapy associated with vitamin E revealed that the effectiveness of vitamin E on glycoconjungates is of major importance in reducing the progression of the disease [12]. A study was conducted on 26 patients with squamous cell carcinoma in the oral cavity, divided into two groups: the first group was given a radiotherapy dose of 6000 cGy in five fractions per week for a six-week period and the second group received radiation therapy associated with supplemental vitamin E at a dose of 400 IU/day for the entire radiotherapy period. Thus, glycoconjugate levels were significantly lower in radiation-treated patients supplemented with vitamin E than in patients receiving only the radiotherapy dose. This discovery may be useful in assessing the progression of the disease, for identifying patients resistant to therapy, and for highlighting the importance of vitamin E in reducing the levels of glycoconjugates of squamous cell carcinoma [12].

Just like vitamin E, vitamin A and other carotenoids have also shown the same beneficial effect in precancerous states as well as in the prevention of relapses thanks to their antioxidant effect. The study on maintaining the protective effect of beta-carotene or vitamin A on the remission of precancerous lesions located in the oral cavity in people who consume chewable tobacco run by Stich et al., showed that the administration of vitamin A in doses of 60 mg/week over a 6-day period led to a complete remission of leukoplasia in 57% of the subjects and a reduction of the micronucleus cell of 96%. Beta-carotene at a dose of 2.2 mmol/week induced a 14.8% leukoplasia remission and a 98% micronuclear cell reduction. After a 6-month period when vitamin A and beta-carotene were completely suppressed, leukoplasia reappeared in 50% of the cases, the micronucleus frequency in the oral mucosa increased and the nucleus structure regained its initial form as before the administration of the chemopreventive compounds [13].

Administration of vitamin A and beta-carotene, 180 mg/week, plus vitamin A (100,000 IU/week) or 200,000 IU vitamin A alone/week for people who consume chewable tobacco reduced the micronuclear cell frequency in the oral mucosa, the remission of oral leucoplasia, and inhibited the development of new leukoplasia [14]. The study uses a testing

system that includes in-depth knowledge of the exposure level to tobacco nitrosamines and to oxygen reactive species that generate polyphenol, easily quantifying the micronuclei of the exfoliated buccal mucous membrane, and evaluation of oral leucoplasia by non-invasive procedures. These studies provide "solid" information on the incidence of premalign lesions and carcinomas. By administrating a dose of beta-carotene up to a level not considered overdose one can obtain a reduced frequency in micronuclear cells and remittance of oral leukoplasias over extended periods of time [14].

CONCLUSIONS

Vitamin E is a dietary supplement with a major impact in preventing precancerous lesions thanks to its antioxidant effect. Vitamin E is provided by natural sources rich in fat-soluble vitamins such as certain vegetables, vegetable oils, cereals, oleaginous fruit (walnuts, almonds, hazelnuts) and oilseeds. Studies demonstrate that the free radical reaction is involved in the development of degenerative diseases due to the sensibility of the body to the oxidative stress of free radicals.

Vitamin E as a marker for chemoprevention can inhibit carcinogenesis in the mouth, respectively reduce the risk of developing bone cancer pathologies. Vitamin E may reverse premalignant lesions such as oral leukoplasia.

The high antioxidant effect is essential in defending the body against free radicals.

Oral cancer is generally preceded by precancerous lesions including leukoplasia, lichen planus, oral submucous fibrosis, oral epithelial dysplasia, erythroplasia. Ttobacco and alcohol represent major risk factors in oral cancer.

REFERENCES

1. Aguilar F, et al. Opinion on mixed tocopherols, tocotrienol tocopherol and tocotrienols as source of vitamin e added as a nutritional substance in food supplements. The EFSA Journal. 2008; 640:1–34.
2. Sen CK, Rink C, Khanna S. Palm oil-derived natural vitamin E alpha-tocotriebnol in brain health and disease. J Am Coll Nutr. 2010; 29:314S–23S.
3. Wolf G. The discovery of antioxidant function of vitamin E: the contribution of Henry A. mattill. J Nutr. 2005; 135:366.
4. Lal H., Pandey R, Aggarwal SK. Antioxidant vitamins and chemoprevention. Indian J Clin Biochem. 1999; 14 (1):1-11.
5. van Poppel G, van den Berg H. Vitamins and Cancer. Cancer Lett. 1997; 114:195–202.
6. Yardimci G, Kutlubay Z, Engin B, Tuzun Y. Precancerous lesions of oral mucosa. World J Clin Cases. 2014; 2(12):866–872.
7. Axell T, Pindborg JJ, Smith CJ, van der Waal I. Oral white lesions with special reference to precancerous and tobacco-related lesions: conclusions of an international symposium held in Uppsala, Sweden, May 18-21 1994. J Oral Pathol Med 1996; 25:49-54.
8. Östör AG. Natural history of cervical intraepithelial neoplasia: a critical review. Int J Gynecol Pathol. 1993; 12:186-92.
9. Md. Iqubal A, Khan M, Kumar P, Kumar A, Ajai K. Role of Vitamin E in Prevention of Oral Cancer:-A Review. J Clin Diagn Res. 2014; 8 K(10):ZE05–ZE07.
10. Silverman S Jr, Gorsky M, Lozada-Nur F, Giannotti K. A prospective study of findings and management in 214 patients with oral lichen planus. Oral Surg Oral Med Oral Pathol. 1991; 72:665-70.
11. Silverman S Jr, Gorsky M, Lozada F. Oral leukoplakia and malignant transformation: a follow-up study of 257 patients. 1984; 53:563-8.
12. Chitra S, Shyamala Devi CS. Effect of vitamin E on protein bound carbhohydrate complexes in radiation treated oral squamous cell carcinoma patients. Indian J Clin Biochem. 2008; 23(1):92-4.

13. Stich HF, Mathew B, Sankaranarayanan R, Nair MK. Remission of precancerous lesions in the oral cavity of tobacco chewers and maintenance of the protective effect of beta-carotene or vitamin A. Am J Clin Nutr. 1991; 53 (1 Suppl):298S-304S.
14. Stich HF, Brunnemann KD, Mathew B, Sankaranaryanan R, Nair MK. Chemopreventive trials with vitamin A and beta-carotene: some unresolved issues. Prev Med. 1989; 18 (5):732-9.

Pathological aspects of upper third molar

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Abstract

Upper third molar represents the primary cause of numerous affections of the oral cavity, of maxillaries and of the cervicofacial region. The purpose of this paper is to determine the incidence of lesions that appear at the maxillary third molar.

The third molar being the last tooth that erupts in the oral cavity, presents the most frequent pathology of eruption, following the dental maxillary incongruence. The main cause of the pathology of the eruption of the wisdom molar is the absence of space on the level of the alveolar arches consecutively with the phylogenetic regression of the maxillary [1,2]. The upper third molar can remain included, frequently asymptomatic, can present a pathology related to the eruption or, after it is erupted in the oral cavity, can present all the injuries usual at every tooth from the arch, beginning with the dental decay, pulp-periapical injuries, injuries of the marginal parodont and ending with the rest of the radicula.

The upper wisdom molar is tributary to the pathology of any other tooth, but it has also its own pathological, individual inheritance. The morphology of the tooth and of the tuberosity maxillary area influences the oral pathology on the level of the upper third molar [3].

Keywords: upper third molar, morphology, pathology, injury, maxillary.

INTRODUCTION

The upper third molar, or the wisdom tooth, is situated on number eight in the arch, occupying the most posterior place [4,5,6]. It is the smallest among the molars having the most variable dimensions and form and the hardest accessibility during the therapeutic labour.

The upper third molar, as a result of the topography, phylogenic and ontogeny, directly or indirectly is the main cause of the numerous affections of the oral cavity, of the maxillary or of the cervical facial region. In the pathology of the eruption of the wisdom molar, we meet a multitude of affections: infections, cysts, tumors, neuralgias, anomalies of teeth position, mastication dysfunctions, the modification of the occlusion and mioarthropathies [7,8]. It can lead to serious perturbations in the harmony of the dental maxillary apparatus and in the general health condition, being the point of departure for a multitude of complications [9,10]. This influences the diagnosis and the treatment in all the specializations of the dental medicine [11].

MATERIAL AND METHOD

In the desire to gain our own experience regarding the pathology of the upper third molar and to add the observations obtained to those of our predecessors, we accomplished a study with the patients that came to our dental medicine department, guided or from their own initiative, for pains related to the maxillary wisdom teeth, or for other affections of the oral cavity and for whom the clinical examination underlined injuries on the level of the upper third molars.

In order to study the pathology of the upper wisdom molar after its eruption in the oral cavity, we made a statistic on the level of four offices of dental medicine from Oradea, following three parameters: the type of injury, the age and the sex of the patients.

Although initially we propose an exhaustive study, with many questions and answers, once the time was passing we considered wise to limit ourselves to some aspects, embracing the idea that knowing everything about a thing is an illusion and that the person who believes this pays the tribute to walk on the land with moving sand.

During the two years were investigated 398 patients with the origin from urban environment, with the age between 17 and 78, who presented affections related to the upper wisdom molars.

In order to be able to correlated the type of affection with the age, we divided the patients in six categories of age: 17-25; 26-35; 36-45; 46-55; 56-65; 66-78.

RESULTS

The affections of the upper third molar that we identified are: decay, pulpitis, acute or chronic apical parodontitis, canker, radicular rest, chronic marginal parodontopathy and pericoronitis. The percentage distribution of upper wisdom tooth lesions is illustrated in Figure 1.

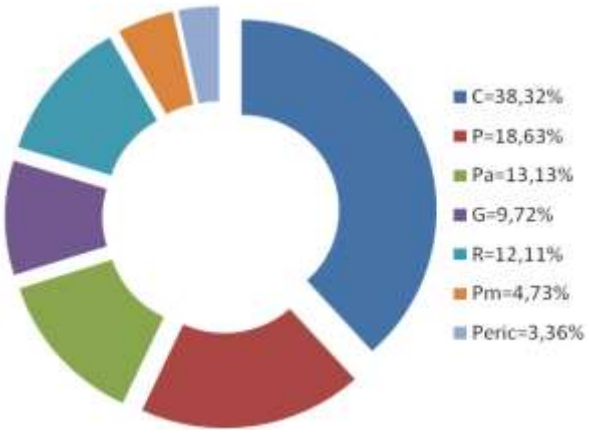

Figure 1. Figure 1: Diagram of the upper wisdom tooth injuries: C=caries; P=pulpitis; Pa=apical periodontitis; G=gangrene; R=radicular remains; Pm=periferic periodontitis; Peric=pericoronaritis

Our study showed that the greatest percentage is that of the caries (Figure 2), followed by the pulpitis injury (Figure 3) and by that of apical parodontitis (Figure 4), in close percentages. Are followed by the injuries of radicular rest (Figure 5) and of pulpitis canker, also having close values, and on the last places, with a very small percentage: the chronic marginal parodontitis (Figure 6) and the pericoronitis (Figure 7).

Figure 2. molar 28 – caries

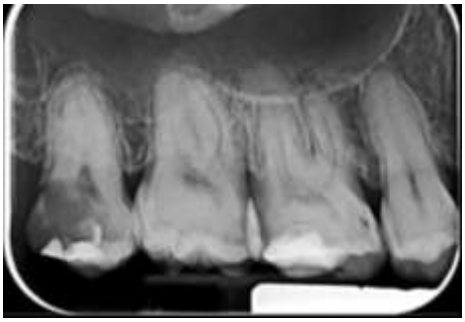

Figure 3. molar 18 - pulpitis

Figure 4. molar 18 - apical periodontitis

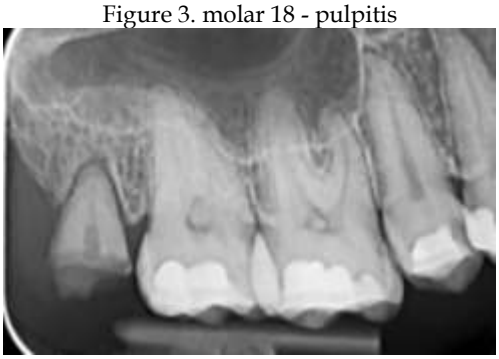

Figure 5. molar 18 - radicular remains

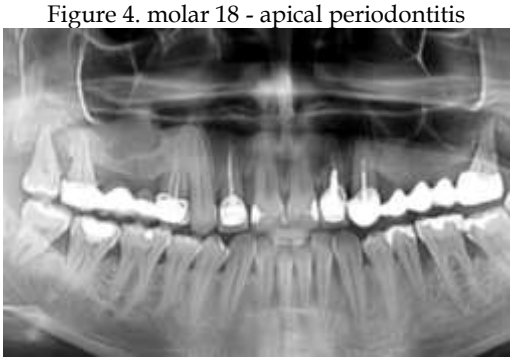

Figure 6. molar 18 - periferic periodontitis

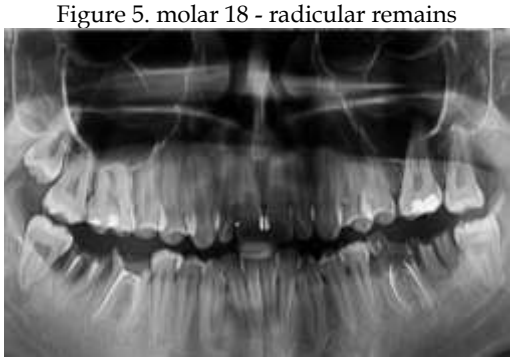

Figure 7. molar 18 - pericoronaritis

Between caries predominates the deep one, and in the pulpitis injury it predominates the total serous pulpitis. There is a small percentage of chronic apical parodontitis exacerbated.

The percentage division of the injuries of the upper third molar on groups of age is represented in the Figures 8, 9, 10, 11, 12 and 13.

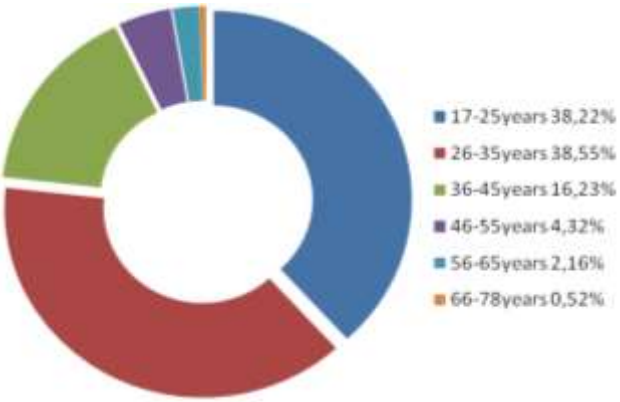

Figure 8. Diagram of caries lesions

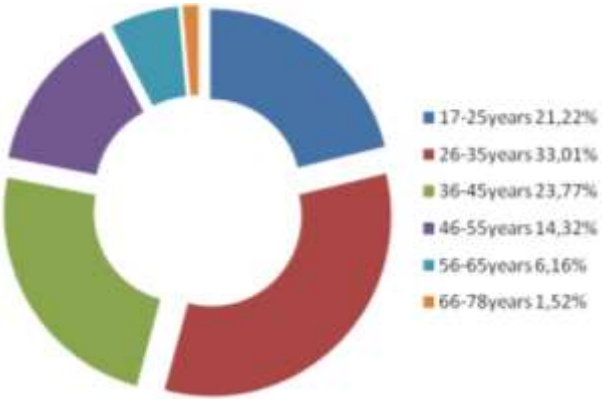

Figure 9. Diagram of pulpitis lesions

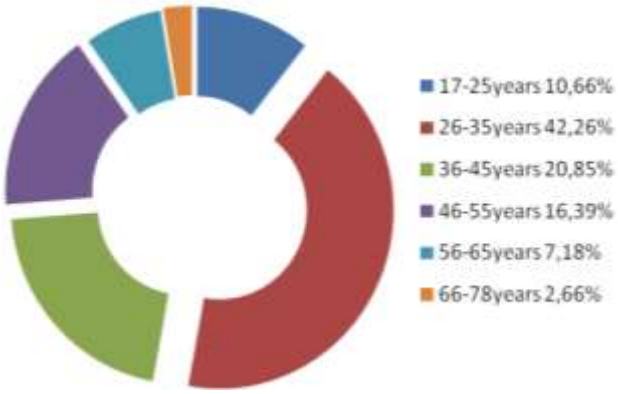

Figure 10. Diagram of apical periodontitis

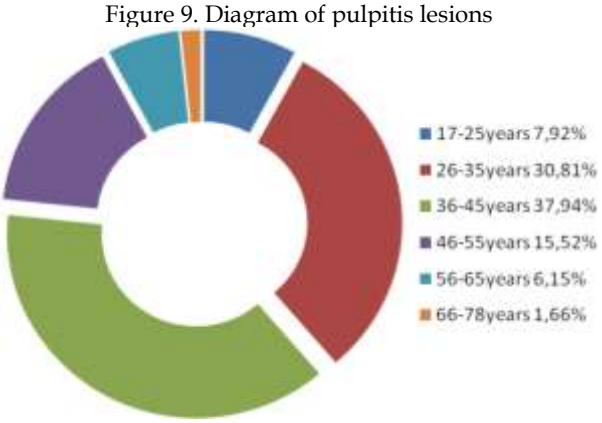

Figure 11. Diagram of gangrene lesions

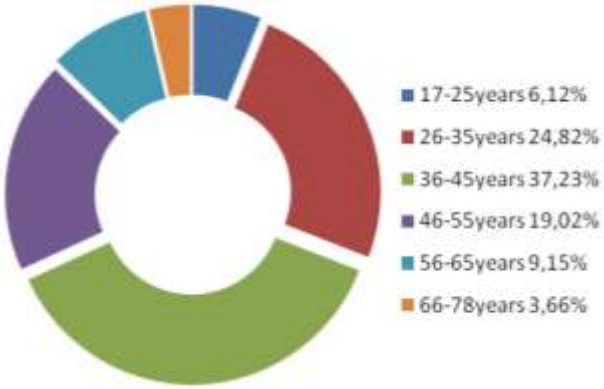

Figure 12. Diagram of radicular rest

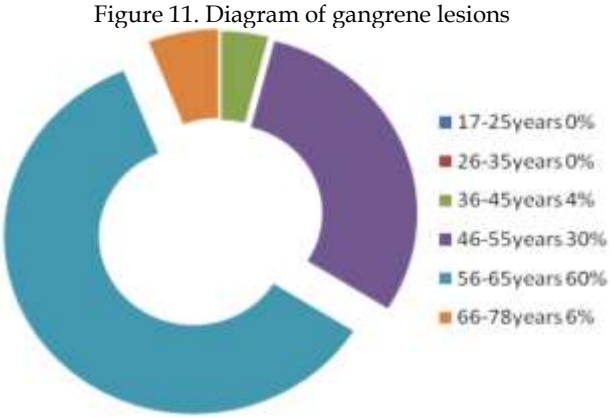

Figure 13. Diagram of chronic marginal parodontopathy

From the total of patients that were addressing the dental medicine department 166 are of masculine gender and 232 are of feminine gender. The distribution on genders of the injuries of the upper third molar is represented in Figure 14.

Figure 14. Comparing distribution on genders of the injuries of the upper third molar (women-exterior; men-interior)

In order to be able to compare the percentage of the dental injuries on the level of the upper third molar on groups of ages we overlap all the graphics in a single one (Figure 15).

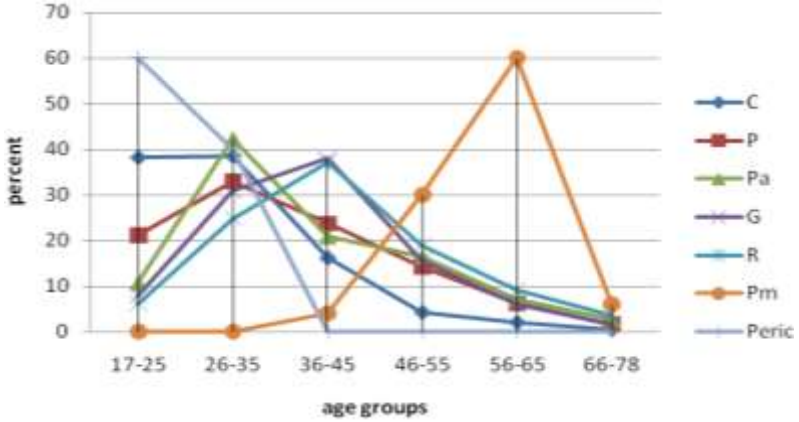

Figure 15. Comparation between the percentage of the injuries on groups of age

DISCUSSIONS

Due to the difficult and prolonged eruption accompanied sometimes by phenomena of congestive acute pericoronaritis, with the partial covering of the occlusal surface by a mucous hood favoring the formation of an ideal hatch for food rests and bacteria, it is difficult the auto cleaning and the cleaning by brush. Also the position of the tooth on the arch, posterior and not a few times vestibular, associated with the occlusal morphology with numerous channels and fossette makes the keeping of the dental hygiene by brushing not enough. To all these is added also the lack of knowing the correct techniques of brushing by the population. Oral hygiene is a crucial factor in having a good oral health, which is associated with overall health and health-related quality of life [12]. One way to increase the child's interest in oral health is to provide updated information, education and permanent motivation of parents. At the same time, the school has important potential resource to instil healthy habits to children due to the considerable time that children spend at school [13].

All these concur to the appearance very early of the sickening by rottenness of the upper wisdom molar.

Once the rottenness process is installed and not treated in time, due to the fact that the tooth is younger, with voluminous pulp chamber, there is the imminent danger of the pulpitis injuries. Because the apex is still large, the pathologic process includes quickly the periapical tissue. In conclusion, the pulp-periapical injuries are installed short while after the eruption.

The most frequent cause of endodontic failure is the apical percolation and subsequent diffusion stasis into the canal. The main reasons for this failure are incomplete canal

obturation or an untreated canal. A canal is often left untreated because the dentist fails to recognize its presence [14]. Anatomic variations can be observed in every group of teeth, but those that do not follow the so-called "normality" are few and constitute an exception to the rule. Third molars, however, do not allow such anatomical classification due to the great morphologic variation observed. The dentist must be aware of this fact in order to provide correct treatment [15].

In case of the patients with pericoronaritis, they benefited by an antiinflammatory treatment, gingivectomy or extraction. I met also cases of egression of the upper third molar, consecutive with the absence of the antagonist, the therapeutic labour being the extraction.

Removal of third molars is a routine procedure that is performed daily within dentistry [16,17]. Research has demonstrated that common symptoms associated with third molars are namely pain, swelling, discomfort and morbidity being the most common symptoms [16,17,18]. Currently, there are a number of approaches including advances in dentistry surgical tools, analgesics and hands on techniques which aim to reduce the post-operative morbidity, oedema and trismus, conversely with no significant difference. Consequently, new approaches need to be considered to effectively reduce these postoperative symptoms. Kinesio Taping has become a prevalent therapeutic tool in musculoskeletal, neurological and lymphatic conditions [19,20,21,22,23]. Kinesio Taping originated in the 1970's by Kenso Kase [24,25]. Subsequent scientific research states that Kinesio Taping can improve blood flow and lymphatic drainage by removing lymphatic fluid and haemorrhages [25] however not all current evidence supports its use and thus far there have been no high quality studies to outline its physiological effects. It is therefore plausible that Kinesio Taping has the potential to reduce morbidity, trismus and oedema [26].

CONCLUSIONS

From our study we observe that the groups of age 17-25 and 26-35, that correspond to the age of the eruption of this tooth, have the maximum percentage in the case of the rottenness injury. For this we could affirm about the upper third molar that it "erupts with rottenness".

The age group 26-35 years owns the maximum in the case of the injuries of pulpitis, apical parodontitis, and the group of age 36-45 in the case of affections of canker and radicular rest. In case of the injury of chronic marginal parodontitis the maximum percentage is owned by the group of age 56-65.

From the statistic performed we find that the frequency of the accidents and of complications related to the eruption of the upper wisdom molar is considerably greater for women (62.52%) than for men (37.48%), their greatest percentage being up to the age of thirty.

The upper third molar has a special position in the category of permanent teeth, due to the frequency of the caries and pulp complications. The upper wisdom molar by his distal position on the arch and the indirect visualization of the entering in the radicular channels, aggravate the performing of a correct endodontitis treatment. To these is added also a great morphological and numeric variety of the roots and radicular channels. All these, together with the reduced functional and prosthesis value of this tooth make that the most frequent therapeutical labour to be its extraction from the arch.

If the molar of six years can be considered "the queen of the chess", what is the formation of the permanent occlusion [27], by analogy, the upper third molar can be considered a "pawn" that we can sacrifice.

REFERENCES

1. Tetsch P, Wilfired W. Operative Extraction of Wisdoom Teeth. Wolfe Medical Publications Ltd; 1990.
2. Boboc G. Aparatul dento-maxilar. Ed Medicală, Bucureşti; 1996.
3. Nimigean V, Podoleanu L. Anatomia descriptivă şi aplicată a maxilarului şi mandibulei. Ed. Cerma, Bucureşti; 1995.
4. Rândaşu I. Proteze dentare, Vol II. Ed Medicală, Bucureşti; 1988.
5. Chira I. Morfologia funcţională a aparatului dento-maxilar. Ed Didactică şi Pedagogică, Bucureşti; 1981.
6. Bratu D, Ardelean-Leretter M, Colojoară C, Romînu M. Dinţii umani permanenţi, morfologie, desen şi modelaj. Ed. Signata, Timişoara; 1991.
7. Bratu E, Grivu O, Voinea C. Erupţia dentară normală şi patologică. Ed Helicon, Timişoara; 1996.
8. Regezi JA, Sciuba J. Oral Pathology: Chemical–Pathologic Correlations. W.B. Saunders Company, Philadelphia; 1993.
9. Vasiluţă I. Contribuţii la studiul sinuzitei maxilare odontogene. Timişoara; 2000.
10. Jablonski S. Ilustrated Dictionary of Dentistry. W. B. Saunders Company, Philadelphia; 1982.
11. Ricketts RM. Prognostische Untersuchungen zur Entferung dritter Unterkiefermolaren. Medica-Stuttgart; 1980.
12. Bica A, Podariu AC, Krems CD, Podariu AS, Popovici RA. Tooth Brushing Behavior in 6-11 Year Olds Children and the Importance of a Break of Tooth Brush Once a Day in School. Revista de Cercetare si Interventie Sociala, 2016; 54:115-124.
13. Popovici RA, Podariu AC, Anculia RC, Serafin AC, Tigmeanu CV, Krems CD, Levai MC. Accessibility to Dental Health Care: Risk Factor in Oral Health at Rural Area Community. Revista de Cercetare si Interventie Sociala, 2017; 59:48-61.
14. Ingle JI, Backland LK, Taintor FJ (EDS). Endodontics, 5th edition. Lea and Febiger, Philadelphia, 2002;752.
15. Nimigean V, Nimigean VR, Sălăvăstru DI. A rare variant of internal anatomy of a third mandibular molar: a case report. Rom J Morphol Embryol, 2011; 52(2):691–693.
16. BUPA. Wisdom Teeth Removal; 2015.
17. Kalron A, Bar-Sela S. A systematic review of the effectiveness of Kinesio Taping-fact or fashion?. European journal of physical and rehabilitation medicine, 2013; 49:699-709.
18. Kase K, Hashimoto T, Tomoki O. Development of Kinesio taping perfect manual. Kinesio Taping Association, 1996; 6:117-128.
19. Lim EC, Tay MG. Kinesio taping in musculoskeletal pain and disability that lasts for more than 4 weeks: is it time to peel off the tape and throw it out with the sweat? A systematic review with meta-analysis focused on pain and also methods of tape application. British J of Spor Med, 2015; 49:1558-1566.
20. NHS. Wisdom tooth removal; 2015
21. NICE. Guidance on the Extraction of Wisdom Teeth; 2015.
22. Morris D, Jones D, Ryan H, Ryan CG. The clinical effects of Kinesio (R) Tex taping: A systematic review. Physiotherapy theory and practice, 2013; 29:259-270.
23. Mostafavifar M, Wertz J, Borchers J. A systematic review of the effectiveness of kinesio taping for musculoskeletal injury. The Physician and sports medicine, 2012; 40:33-40.
24. Parreira PC, Costa LC, Hespanhol LC, Lopes AD, Costa LO. Current evidence does not support the use of Kinesio Taping in clinical practice: a systematic review. Journal of Physiotherapy, 2014; 60:31-39.
25. Kase K, Wallis J, Kase T.Clinical therapeutic applications of the Kinesio taping method, 2nd edition. Japan; 2003.
26. Henderson S, Alexanders J, Shaw T. The Clinical Effectiveness of Using Kinesio Tape Following Wisdom Teeth Extraction. Physiother Rehabil. 2016; 1:103.doi:10.4172/2573-0312.1000103.
27. Wheeler RC. Dental Anatomy, Physiology and Occlusion. W. B. Saunders Company, Philadelphia; 1974.

Chair-Side Cad/Cam Ceramic Veneers with a novel preparation Design

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Abstract

Aim and objectives. The aim of this case report is to present the smile design enhancement with chair-side CAD/CAM ceramic veneers treatment. The minimal invasive restorations are obtained by performing two different preparation designs, namely classical and crenelated preparation, that displays a novel marginal contour. This consists of several sinusoidal lines that are deemed to increase the contact surface between enamel and ceramic veneers and, therefore, enhance the adhesion and retention to dental substrate

Keywords: *veneers, new design, CAD-CAM technology, minimal invasive*

INTRODUCTION

Dental veneers represent the most appropriate prosthetic solution to several unaesthetic and disfunctional issues, such as misalignments, diastemas, discolorations, abnormal morphologies or minor oclusal disfunctions. Many designs of ceramic veneers have been described in the literature in order to enhance both intrinsec biomechanical properties and their final clinical appearance. Yet, all of them displayed the classical liniar contour, with its major advantage of simplicity, but also with its major drawback of a small contact surface between the dental veneers and the adjacent enamel. This particular aspect led to numerous debonding cases and, eventually, to unsuccessful treatment outcome.

The novel design of dental veneers displays a sinusoidal marginal contour, which is expected to provide three major advantages: higher retention due to the marginal micro-intrications between the dental structure and the dental veneer, higher adhesion due to larger superficial contact at the interface, and a more accurate positioning of the veneer during the luting procedure. This type of dental veneer is a subject of a recent patent request [1] and it has not been described in the literature before, to the best of our knowledge.

CASE REPORT

1. ANAMNESIS

A 31-year-old female patient with no relevant medical history was referred to the Clinic of Prosthodontics (Faculty of Dental Medicine, Timişoara) with her urge to improve the appearance of her anterior teeth. The patient confirmed the lack of any systemic pathology and only emphasized the sheer dissatisfaction with her smile design. After signing the informed consent, the patient agreed to provide also the written consent for publishing photos with her clinical case for scientific purposes.

2. CLINICAL EXAMINATION AND DIAGNOSES

An intraoral and extraoral examination were performed of both hard and soft structures, occlusion, periodontal status and the condition of existing dental restorations. The patient displayed gingival inflamation caused by dental plaque, inadequate composite fillings on 1.3, 1.2, 1.1, 2.1, 2.4, 2.6, associated with decays on 3.5 and 4.3. Clinical evaluation showed an unesthetic smile with a substantial diminished crown lenght on the upper frontal group, incorrect proprotion lenght/width of the crown and the gingival zenits at different heights (Fig.1). Diagnostic models were obtained with polyvinyl siloxane and cast in type IV dental stone.

Figure 1. Initial status of teeth and gingival tissue

3. TREATMENT AND EVOLUTION

A diagnostic wax-up was made with repositioned gingival margins, which served later on as a guide for the surgical contouring of the buccal gingival margins. An addition

silicone was used as a template for transfering the wax-up to the patient's teeth. Bis-acrylic resin (Luxatemp, DMG) was loaded into the silicone index and positioned on the upper frontal teeth. The mock-up permit the visualisation of the final result and the surgical treatment was performed guided by this mock-up. Incisions were made with an internal bevel for all frontal incisors, with mimimal reduction from the interproximal areas, but osteotomy was not required.

Immediately after surgery, provisional restorations with the mock-up design were luted to maintain the gingival level at the required height.

The prosthetic treatment plan consists of one all ceramic crown bonded to the upper left lateral incisor, three classical veeners bonded to right lateral and central upper incisors and two crenelated veneers for both upper canines. The tooth preparation for the classical veneers consisted of a buccal reduction of 0.8 mm and 1 mm from the incisal edge, displaying a liniar proximal contour. The upper left lateral incisor followed the standard preparation guidelines, with an axial reduction of 1.5 mm and an incisal reduction of 1.5mm.

The most particular aspect of the tooth preparation for the novel crenelated veneers is its the marginal contour, that consists of three sinusoidal lines that outline the contour of the facial dental veneer. The proximal limits were positioned just behind the interdental contact, in order to close the small diastemas between the canines and the lateral incisors. The height of the crenelated lines is generally corelated with the type of the tooth, namely: 2-2.5 mm for the lateral incisors and inferior central incisors, and 2.5-3 mm for the central upper incisors and for the canines. Due to the insufficient height of patients' canines, the values were slightly lower, similar to the lateral incisors. The depth of the sinusoidal proximal margins decreased progressively from 0.6-0.8 mm in the gingival third, to 0.4-0.6 mm in the middle third, and to 0.3-0.4 mm in the incisal third. The facial face of the tooth was reduced by 0.8 mm and the incisal margin by 1 mm in order to provide an aesthetic final restoration (Fig.2).

Figure 2. Initial unaesthetic smile caused by teeth disproportions and high smile line

Then a digital impression was taken, using an intraoral scanner Planscan (Planmeca) (Fig.3). Retraction corde was inserted in the gingival sulcus for a better visualization of the finish lines. After taking the digital impression, direct provisionals were manufactured as interim restorations.

Figure 3. Preparation design for the crenelated veneers

Based on the 3D model of the preparations that was generated, the PlanCAD software generates the digital design of the restorations (Fig.4, fig.5). Then five Empress CAD veneers and one Empress CAD crown were milled. (Fig.6, fig.7).

Figure 4. Marginal contour of the novel preparation for the crenelated veneers

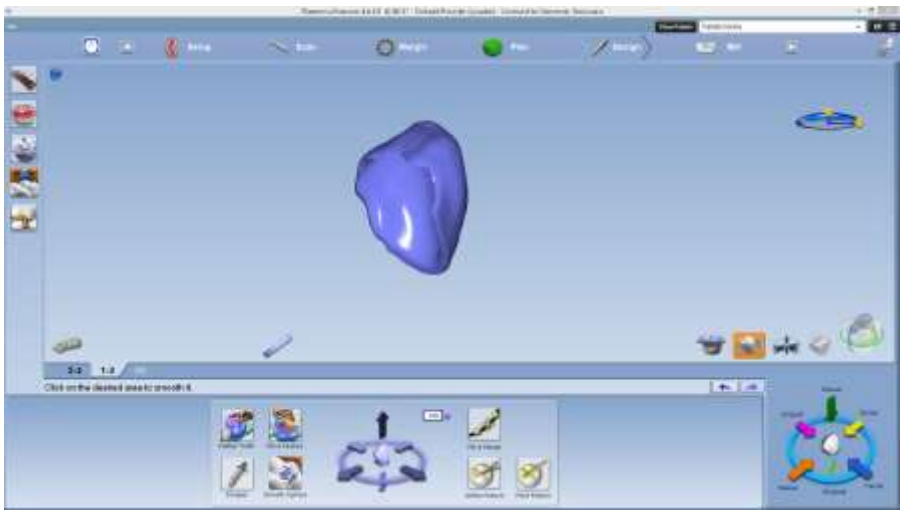

Figure 5. Digital design of the crenelated veneers

Figure 6. Final Empress CAD restorations

Figure 7. Sinusoidal proximal contour of the final crenelated veneer

After glazing and crystallisation, all restorations were prepared for the adhesive cementation protocol: etched for 60 seconds using hydrofluoric acid, rinsed, dryed and silanized.

In order to prepare the dental surfaces for the adhesive cementation, a nonfluoride pumice was brushed on the prepared surfaces in order to remove all residual contaminants from saliva. After a good isolation, phosphoric acid (37%) was used to etch the preparations, then washed and dryed. Universal bonding (Adhese, Ivoclar) was applyed over the etched areas, dryed and light cured for 10 seconds. Teflon band was used in order to prevent any excess of the luting agent from adhering to the teeth. Luting resin (Variolink Esthetic, Ivoclar) was applyed on the veneers, starting with the central incisors. Excess of material was immediately removed immediate by using dental floss and brushes, then the cement was light-cured for 2 seconds. After a rigorous cleaning of all excess with a scaler, the veneers were light-cured for 20 seconds on each side. The same steps were performed for all teeth and, finally, the occlusion was assesed and adjusted. The final smile of the patient fulfill all the expectations (Fig.8).

Figure 8. Final outcome of the aesthetic rehabilitation

DISCUSSIONS

Aesthetic dentistry has become one of the most popular fields of nowadays dentistry, as beauty represents one of the best trigger for a young and healthy appearance. Thus, dentists have to satisfy the patients' high expectations. Indirect dental veneers and the wide range of highly esthetic dental materials that are developed are a method to meet these expectations.

Since the bonding of the first ceramic dental veneer in 1930 by Dr. Charles Pincus, thousands of experimental studies have been conducted in order to enhance both mechanical and cosmetic properties [2]. Despite the numerous studies, in literature only a certain, classical appearance of these prosthetic treatment options has been considered, with a liniar contour, i.e. a straight and sheer contact with the adiacent dental structure. Although this liniar design has the advantage of simplicity, it has the major drawback of a small contact surface with the adiacent enamel, and also the large amount of sound tooth removal [3]. As a consequence of the former, the retention itself is due mainly to the mechanical properties of the dental adhesives.

The preparation design represents one of the most controversial topics related to oral rehabilition with ceramic veneers. It has been described the „window preparation", that is situated on the buccal face of the tooth, with its limits in front of the proximal contacts. Although it has the advantage to be less invasive, the disadvantages are numerous: the margins of the restorations are very thin and prone to fracture and the resin cement is not uniformly spread, thus leading to the debonding of the dental veneers [4].

Another type of preparation design that has been described in the literature consists of a modification of the previous one, by preparing a palatal chanfrein in order to enhance the retention of the veneer to the dental support. Yet, this particular preparation proved to be invasive and its indications are quite few.

The crenelated (CR) veneers have not been described in the literature before, to the best of our knowledge, and they were proposed for a patent [1] as a practical solution to increase the adhesive and mechanical properties of dental veneers. The results obtained in a previous experimental study [5] showed that such crenelated joints are superior in comparison with classical joints, leading to the sheer conclusion that the new design of the veneer preparation has several advantages:

- Increases the adhesive forces by more than 60%, thus decreasing the probability of veneer debonding;
- Produces higher retention forces due to the peripheral micro-retentions that form an intricated joint between the veneer and the substrate;

- Provides better contact on the surfaces, thus combining both adhesive and mechanical forces that prevent the veneer debonding;
- Assures a more accurate positioning of the veneers *in situ* during the luting procedure.

Therefore, the *in vitro* research demonstrated that the crenelated veneers represent a successful long-term treatment option in aesthetic dentistry and that their longevity is mainly due to their sinusoidal contour and peripheral intrications with the substrate.

CONCLUSIONS

This particular case report represent the first *in vivo* study aimed to investigate the two types of dental veneers, in terms of preparation design, impression and luting procedures and the final outcome. Further clinical evaluation will assess the marginal adaptation of the veneers and their structural defects, the incidence of marginal plaque and decays, their cromatic stability over time, their gingival biocompatibility and, eventually, the patients' satisfaction of their clinical appearance.

REFERENCES

1. Maroiu A.- C., Sinescu C., Romînu M., Negruţiu M.-L., Rusu L.-C., Levai C.-M., RO 131840 A0, A 2017 00028/30.05.2017, BOPI nr. 5/2017.
2. Gurel L. G., The Science and Art of Porcelain Laminate Veneers, Quintessence Publishing Co. Ltd., 2003, p. 258-285.
3. Schmidt K., Chiayabutr Y., Philips K., Kois J., Influence of preparation design and existing condition of tooth structure on load to failure of ceramic laminate veneers, J Prosthet Dent 2012; 105 (6): 374-82.
4. Alhekeir D.F., Al-Sarhan R.A., Al Mashaan A.F, Porcelain laminate veneers: Clinical survey for evaluation of failure, The Saudi Dental Journal 2014; 26: 63-67.
5. Maroiu A.-C., Sinescu C., Negru R., Mârşăvină L., Bretean I. D., Duma V. L., Romînu M., Borţun C. M., Negruţiu M. L., Evaluation of the Adhesion of a Novel Design of Veneers to Dental Materials, Rev. Chim. (Bucharest), no.9, 2017.

Platelet-rich fibrin as a novel therapeutic option in regenerative dentistry: a case report

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Abstract

The purpose of this article was to report the clinical and radiographic findings about a case of a woman who needed dental implant rehabilitation, to demonstrate the clinical proceedings associated with PRF use as regenerative material that influence the healing outcome. At 6 months after surgery, no evidence of complications was observed; the clinical and radiological examination revealed bone formation and installed implant stability.

Keywords: *tissue regeneration, Platelet-rich fibrin (PRF), growth factors, platelet concentrates.*

INTRODUCTION

Regeneration with new attachment became a reality with the introduction of guided tissue regeneration technique and created interest in membranes. Placement of a mechanical barrier such as a membrane, over an osseous defect can prevent proliferating oral epithelium and gingival connective tissue from growing into the defect. Proliferating cells with osteogenic potential can then repopulate the defect resulting in more predictable bone repair (1).

Incorporation of biologically active molecules, particularly growth factors with platelets as the source has yielded promising results. This clinical interest in platelet derived products and lead to the evolution of platelet concentrates (2); *Choukroun et al* developed a simple method to prepare fibrin gels without exogenous supplements. This fibrin gel was designated as platelet-rich fibrin (PRF) and is widely recognized as a new alternative to improve the tissue repair (3).

The present study was undertaken to evaluate use of PRF to promote bone repair and dental implant osteointegration.

CASE REPORT

A 53-year-old female patient reported a masticatory discomfort related to her lower fixed bridge and requested for an immediate solution. After the detailed evaluation of the clinical and radiographic findings (*Figure 1*), it was decided to place three endosseous implants immediately after 44 and 45 extractions (as there was adequate alveolar bone and absence of periapical pathology), with the application of PRF. The patient signed the written informed consent according to the ethical guidelines following the Declaration of Helsinki.

Figure 1. Preoperative orthopantomograph

Surgery was performed under local anesthesia (4% articaine with 1:100,000 epinephrine). An incision was made in the alveolar ridge and another 2 relieving vertical incisions, which allowed for a complete view of the receptor bone site. The atraumatic extractions of teeth 44 and 45 were carried out (Figure 2).

Figure 2. Intraoral view after extraction of 44 and 45

A sample from patient's peripheral blood was collected immediately after venous stasis, with the use of a needle and a tube holder (through 4 tubes) (Figure 3), and immediately placed in a preprogrammed centrifuge (DM0412 Clinical Centrifuge).

Figure 3. Patient samples collected by venepuncture

To prepare the PRF, the blood samples were centrifuged for 14 minutes at 13,000 rpm (Figure 4), leading to fibrin clots, which were removed with the use of a surgical pincer and then separated from the red fraction from the blood cells with the use of scissors.

Figure 4. Centrifugation tubes in the preprogrammed centrifuge

The fibrin clots were deposited in a stainless steel box under a perforated platform, and then they were compressed with this device and converted into PRF membranes. Each membrane measured 1-1,5 mm thick (Figure 5).

Figure 5. The PRF clots placed in Choukroun's PRF Box

The sockets were debrided with curettes, and three external hex implants were planned.

Primary stability was achieved by wrenching the implant into the bone beyond the apex of the socket (Figure 6). The implants had torque values ranging from 35 to 40 N/cm2.

Figure 6. Implant placement

The cover screws were placed, and PRF membranes were prepared to cover the the surgical site (Figure 7).

Figure 7. PRF membranes placed

The surgical flap was repositioned and sutured with the use of polyglycolic acid monofilament 5-0 (Figure 8).

Figure 8. Continuous sutures placed

Post-operative instructions were given to the patient and was asked to report after one week. The sutures were removed after seven days. Six months after the implant placement, the patient was in the final stages of prosthetic rehabilitation and had not demonstrated any bone exposure or comorbidities. A subsequent periapical x-ray was performed to monitor the evolution of the implant's survival (Figure 9).

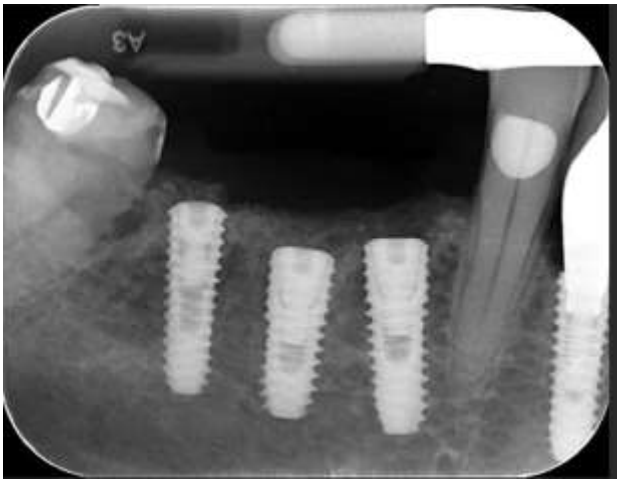

Figure 9. Periapical x-ray after 6 months

The healing was uneventful and patient showed good compliance and good oral hygiene maintenance during the course of observation period.

DISCUSSIONS

The placement of implants is a decent treatment option for the functional rehabilitation. To achieve the same determined goal, there are a few factors which play the key role in determining of the outcome of the implant.

Studies in the past years described that the growth factors in bone tissue were important to improve awareness of the peripheral blood in tissue repair, particularly with the creation of centrifugation processes that produce masses of platelet concentrates and fibrin (3,4).

PRF is a second-generation autologous fibrin gel consisting of concentrated platelets that are pooled up during the centrifugation process (5). Platelet α granules provide a rich source of growth factors, platelet derived growth factor (PDGF), vascular endothelial growth factor (VEGF) and transforming growth factor (TGF). These growth factors are the key to healing as they potentiate vital functions such as cellular proliferation and bone formation (6).

In our case, at 6 months after surgery, no evidence of complications was observed; the clinical and radiographic examination revealed bone formation and installed implants stability. Finally, unlike the other membranes used in tissue regeneration that have reported adverse immune response, PRF seems to be safe.

However, further long term clinical research with larger sample size and confirmatory histological evaluations and advanced radiodiological assessment can provide a greater insight to better assess the clinical benefits and actual regenerative process of PRF. Its application still needs standardization, controlled clinical trials, and major observations interactions between peripheral blood with medications and other factors that may affect the clotting process (7).

CONCLUSIONS

To conclude within the limitations, the case reported here demonstrate predictable clinical and radiological healing. This result must be considered with caution and further research through histological studies and use of advanced radiographic techniques is necessary to validate the role of PRF in tissue regeneration on a long-term basis.

All the authors equally contributed to this work.

REFERENCES

1. Tsesis, I., Rosen, E., Tamse, A., Taschieri, S., and Del Fabbro, M. Effect of guided tissue regeneration on the outcome ofsurgical endodontic treatment: a systematic review and meta-analysis. J. Endod. 2011;37:1039–1045.
2. Naag, S., Savirmath, A., Kalakonda, B.B., Uppada, U.K., Kamisetty, S., and Priyadarshini, E. Platelet concentrates: bioengineering dentistry's regenerative dreams. J. Dent. Res. Rev. 2015;2:86–90
3. Simonpieri A, Choukroun J, del Corso M, Sammartino G, Dohan Ehrenfest DM. Simultaneous sinus-lift and implantation using microthreaded implants and leukocyte- and platelet-rich fibrin as sole grafting material: a six-year experience. Implant Dent 2011;20:2-12.
4. Choukroun J, Diss A, Simonpieri A, Girard MO, Schoeffler C, Dohan SL, et al. Platelet-rich fibrin (PRF): a second-generation platelet concentrate. Part V: histologic evaluations of PRF effects on bone allograft maturation in sinus lift. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;101:299-303.
5. Choukroun J, Diss A, Simonpieri A, Girard MO, Schoeffler C, Dohan SL, Dohan AJ, Mouhyi J, Dohan DM. Platelet-rich fibrin (PRF): a second-generation platelet concentrate. Part IV: clinical effects on tissue healing. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2006 Mar;101(3):56-60.
6. Su CY, Kuo YP, Tseng YH, Su CH, Burnouf T. In vitro release of growth factors from platelet rich fibrin (PRF): A proposal to optimize theclinical applications of PRF. Oral. Surg. Oral. Med. Oral. Pathol. Oral Radiol. Endod. 2009;108:56–61.
7. Giannini S, Cielo A, Bonanome L, Rastelli C, Derla C, Corpaci F, et al. Comparison between PRP, PRGF and PRF: lights and shadows in three similar but different protocols. Eur Rev Med Pharmacol Sci 2015;19:927-30.

Personal development of dental school students

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Abstract

Personal development and job satisfaction are critical conditions for a successful career as a dental professional.

The main objective of this observational study is to identify the difficulties young dental school graduates confront on the job market and to provide a guideline to follow in the process of seeking the right employment and career choice for them.

The results show the need for a department within the university to provide career counseling to senior year students. Our hope is that this study will help future graduates find the most suitable career option for them to ensure their success and job satisfaction.

Keywords: personal development, career, dentist.

INTRODUCTION

It is widely accepted nowadays that a career in dental medicine implies the existence and pursuit of multiple opportunities and workplaces, not just that traditional one imagined in the past of a doctor working in his private practice. Due to the fact that dental school is a long and difficult education program, it is essential for the young graduate to "hit the ground running" on the job market. The situation of a doctor working in multiple clinics, emergency hospitals, of one that pursues certain specialities or follows a career in research and academia, or why not some of them at once, is more and more often. [1][2][3][4]

One motivation to pursue such alternative career paths is job satisfaction. Studies have shown that the most important factors regarding job satisfaction are related to personal development, income, doctor-patient relationship, free time and work collegues (including auxiliar staff). [5][6][7]

Aim and objectives

The aim of this study is to identify the main issues young dental school graduates confront with on the job market and to present them with career opportunities and personal development plans, so they could more easily adapt and improve both their professional and personal lives.

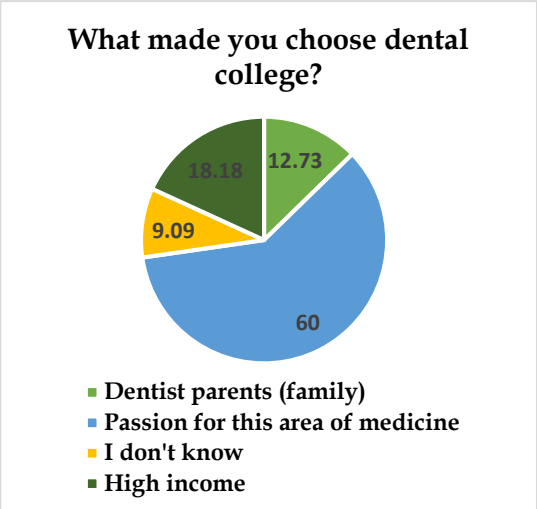
MATERIALS AND METHODS

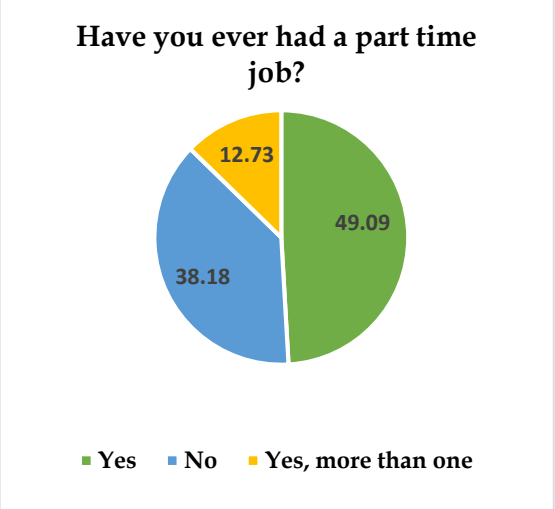
For us to be able to talk about a dental professional's career and what success in this field of expertise means, we must first establish a current level of personal development among local dental school students and young graduates. Although personal development as a concept may be considered as being a subjective and abstract topic, extremely difficult to quantify and evaluate, this observational study has used the means of a questionnaire addressed to 53 senior year students (fifth and sixth year) enrolled in the "Victor Babeş" University of Medicine and Pharmacy Dental School. The questionnaire was designed keeping in mind with the purpose of the study, to discover the gaps in personal and professional development among these students.

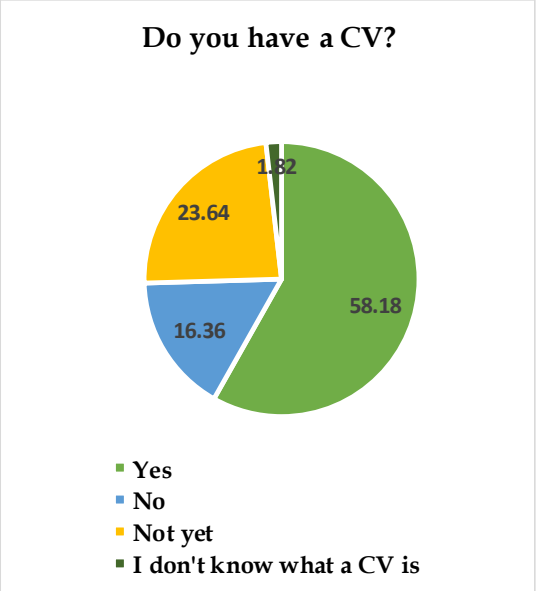
The questionnaire was created with the help of an online tool named "Question Pro – online research made easy™" and was made up of 10 questions, conceived in concordance with Gassman Scott's theory, who together with Peter Honey and Alan Mumford, developed questionnaires based on educational styles which can be adapted to suit any industry or field of expertise. The questions were made based on dentist's and dental students style of studying and on their activity, which requires quick reactions and a fast problem solving kind of thinking.[8][9][10]

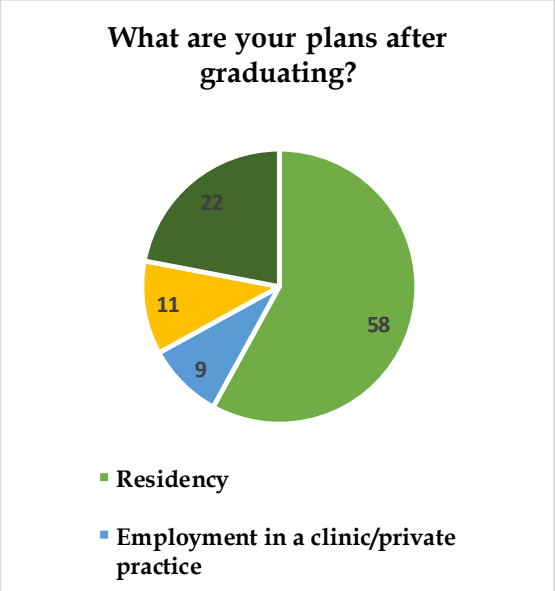
RESULTS

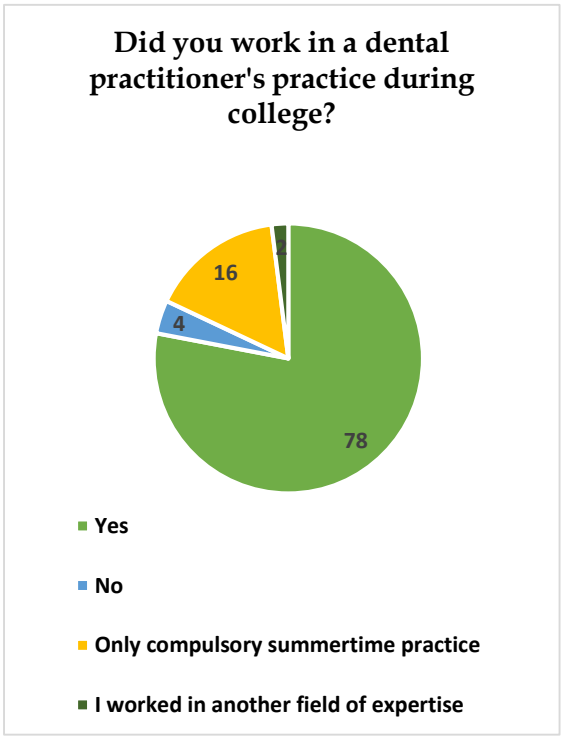
The answers obtained from the questionnaire are presented below as pie charts.

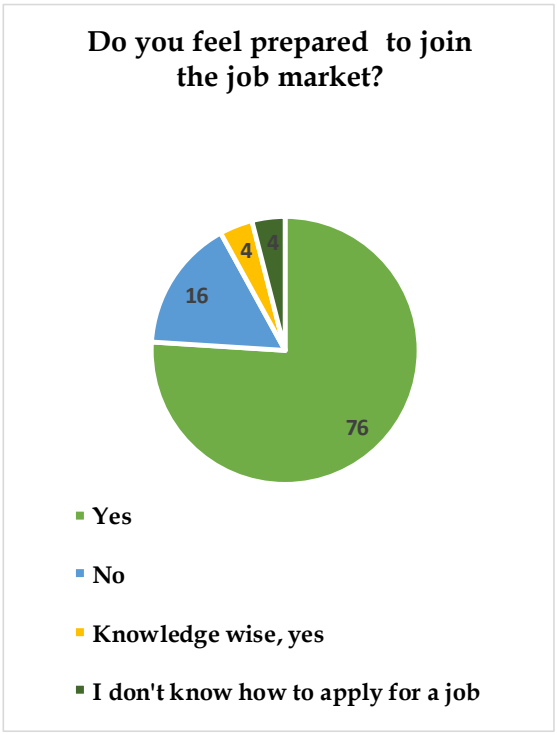

What made you choose dental college?
12.73
18.18
9.09
60
Dentist parents (family)
Passion for this area of medicine
I don't know
High income

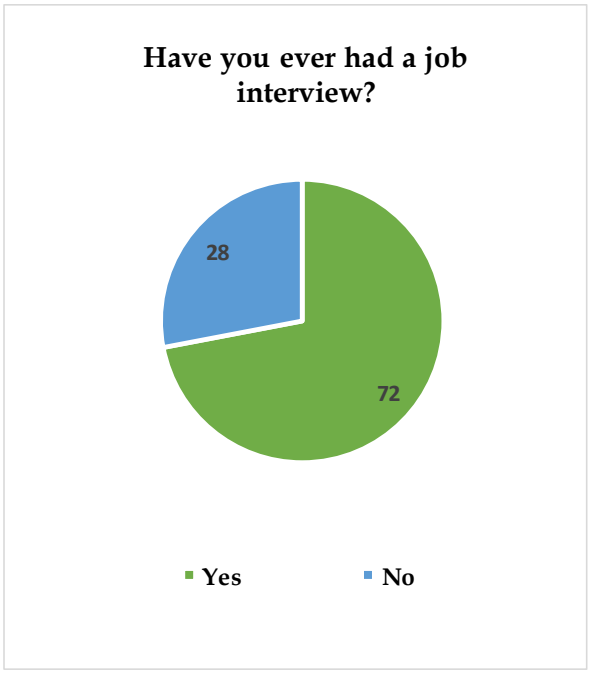

Have you ever had a part time job?
12.73
49.09
38.18
Yes
No
Yes, more than one

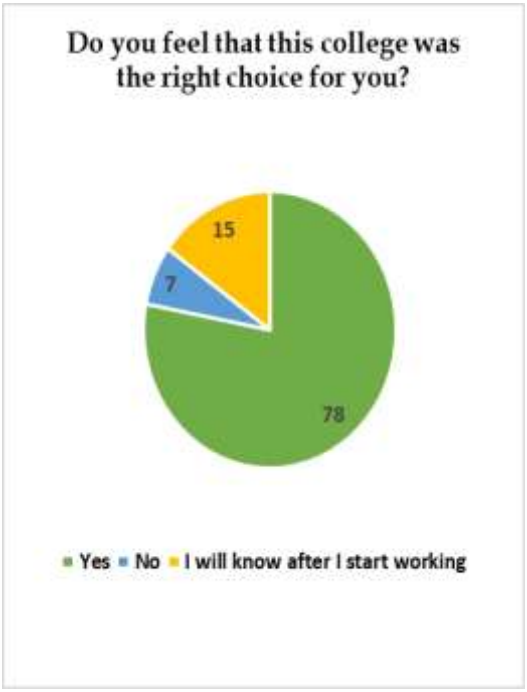

Do you have a CV?
1.82
23.64
58.18
16.36
Yes
No
Not yet
I don't know what a CV is

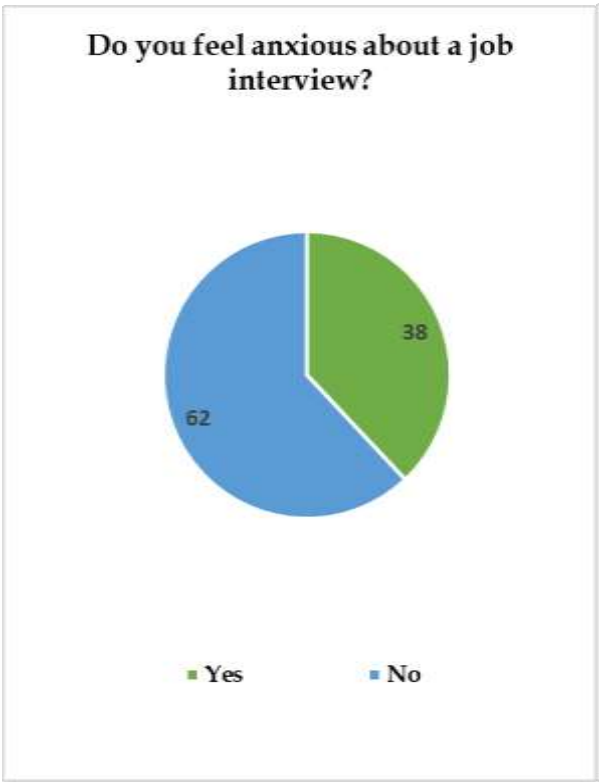

What are your plans after graduating?
22
11
58
9
Residency
Employment in a clinic/private practice

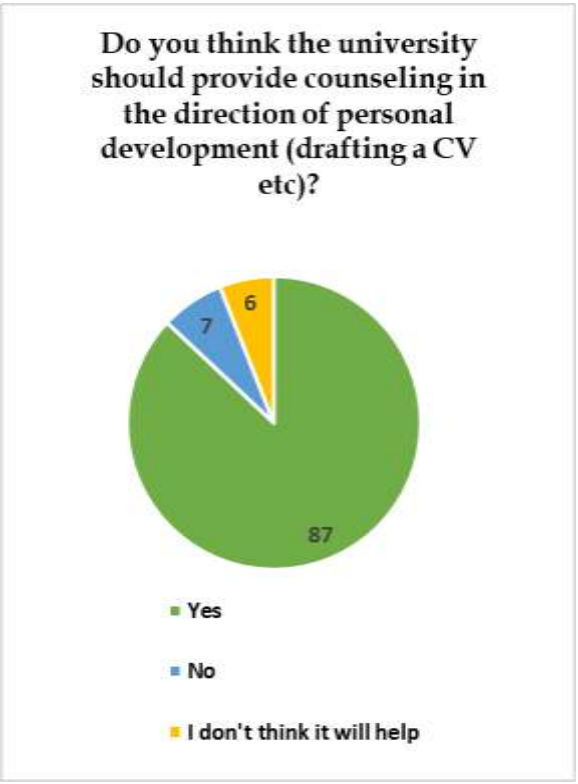

Did you work in a dental practitioner's practice during college?
16
4
1
78
Yes
No
Only compulsory summertime practice
I worked in another field of expertise


Do you feel prepared to join the job market?
4
4
16
76
Yes
No
Knowledge wise, yes
I don't know how to apply for a job


Have you ever had a job interview?
28
72
Yes
No


Do you feel that this college was the right choice for you?
15
7
78
Yes
No
I will know after I start working





The results show that the vast majority of students included in the research group (78%) were content with the career choice they made and in similarly high numbers (76%) also feel ready to join the job market. However, the given answers to some questions raise awareness of their readiness to compete on a free market. A large number of students don't have a curriculum vitae (approximately 42% of the interrogated ones), and almost a quarter of them (22%) have no practical experience. A significant number of students have never worked part time and have never went through a job interview (circa 30%). 38% of the research group manifest a degree of uncertainty regarding their future after graduation and their chances in a job interview, while the vast majority (78%) firmly believe the university should have a counseling department for students concerning personal development (offering advice on how to draft a strong CV, tips & tricks on how to handle a job interview etc).

We believe the subject group included in this study is representative for the whole senior year dental school students generation of the Victor Babeş University of Medicine and Pharmacy from Timişoara, and thus also for young graduates, for who the results can be extrapolated and applied to.

DISCUSSIONS

This study has identified some difficulties that senior year dental school students and young graduates face at the very beginning of their careers regarding personal development and job opportunities, and will also try to provide solutions.

First of all, it goes without saying that having success and being good at what you do in this field of expertise requires a certain degree of job satisfaction, one that can only be achieved by being truly interested and passionate about it. From this perspective, approximately 60% of students confess choosing this career out of passion, a significant number, but insufficient in our view. Another noteworthy percentage of students have worked in a dental office during their studies, a positive aspect, and also feel ready to join the job market and face competition (at the same time declaring they're not worried about a

interview or the applying for a job process). Although this confidence seems encouraging, it does seem exaggerated taking into consideration that ratio of students don't even have a CV in their senior year, a basic element of any job application. The lack of training and experience in this area is also emphasized by the large number of students who have never had a part time job during college. Outlook wise, most of them want to continue their education process by following a residency program and thus specializing themselves, a good but difficult process to achieve because of the small number of spots offered by the local system. The results of this study also show that work immigration is still an issues among dental school graduates, mostly because of low wages, but also because of the lack of professional development perspectives and the geographic distribution of dental professionals saturating the market in one place and leaving it completely uncovered in less desirable parts of the country.

However, most of these issues can be at least partially rectified by creating personal development counseling departments within universities, a desired structure even by the vast majority of students included in this study-questionnaire. These departments would help students discover their strong suits, through trainings in job interview techniques and strategies, through helping them draft a strong curriculum vitae etc. As far as the medical system goes, it's clear there is a need for more residency positions in dentistry to help prepare more dental specialists and to motivate them to practice locally and not emigrate.

CONCLUSIONS

1. Most senior year dental school students have chosen dentistry as a career out of passion and believe it fits their personality traits.

2. More than 50% of the research group have had at least one part time job during college.

3. Almost 42% don't have a CV as senior year students.

4. Following a residency program is their first option after graduating, followed by emigrating and practicing in a different state and being employed in a clinic or opening a private practice.

5. Most of them have practical job experience and believe they stand a good chance on the job market.

6. Over 70% of the ones that answered the questionnaire have the experience of a job interview (even in other fields of expertise)

7. 87% of the research group said they would benefit from the founding of a personal development counseling department within the university.

REFERENCES

1. Kaipa S, Pydi SK, Krishna Kumar RVS, Srinivasulu G, Darsi VRK, Sode M. Career satisfaction among dental practitioners in Srikakulam, India. Journal of International Society of Preventive & Community Dentistry. 2015;5(1):40-46. doi:10.4103/2231-0762.151976.
2. Myers HL, Myers LB. 'It's difficult being a dentist': Stress and health in the general dental practitioner. Br Dent J. 2004;197:89–93. discussion 83; quiz 100-1.
3. GORDON J. Christensen D.D.S, MSD., PhD The best way to bring a dentist into your practice; The best way to initiate a dental practice / Gordon J. Christensen, JADA, VOL 134, FEBRUARY, 2003
4. Burke, F. and Freeman, R. (2004). Preparing for dental practice. Oxford: Oxford University Press.
5. ANGHEL, Mirella, TALPOŞ NICULESCU, Cristina, Diagnosticul Oral – Ed a 2-a, rev, ed, Orizonturi Universitare, Timişoara, 2011
6. ANGHEL, Mirella, Noţiuni generale de ergonomie dentară, note de curs. Ediţia a 2-a rev, Editura Orizonturi Universitare, Timişoara, 2005

7. POPOVICI Ramona, CIOBANU Virgil, PODARIU Angela, Sănătate publiă orală, Management, Epidemiologie şi Biostatistică Medicală, Ed Mirton, Timişoara, 2014
8. WRIGHT, Robin, Top ten skills for success in dental commmunication, Ed American Dental Association, USA, MAY 2011
9. GASSMAN, Scott, Organizational Change Interventions, Milano The New School for Management and Urban Policy, 2009
10. POWERS, Edward, PhD. Foundations of Organizational Change, The New School, Milano, the New School for Management and Urban Policy. Fall 2008

Facial soft tissue thickness related to sagittal and vertical skeletal relations

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Abstract

Aim and objectives. To observe if there is a different distribution pattern of the thickness of facial soft tissue in patients with different skeletal patterns. Profile soft tissue thickness at different cephalometric landmarks was comparatively assessed in patients with different sagittal and vertical skeletal relations.

Material and methods. A cross-sectional study was conducted on a convenience sample of patients. Data collection was conducted by analyzing patient's medical file and by lateral cephalometric analysis for assessing facial soft tissue and skeletal features. Soft tissue thickness was assessed at the following soft tissue cephalometric landmarks: Nasion, Subnasale, Labrale superius, Stomion, Labrale inferius, Labiomentale, Pogonion, Mentale.

Results. Soft tissue thickness was variable at different cephalometric landmarks, highest mean values being recorded for Labrale inferius and Subnasale, and lower mean values being recorded for Nasion and Stomion. Soft tissue thickness registered some differences according to the skeletal class. Skeletal class III patients, compared to skeletal class I patients, registered decreased soft tissue thickness at most mandibular landmarks. Patients with hypodivergent jaws registered similar soft tissue thickness at the analyzed cephalometric landmarks compared to patients with normal divergence, while patients with hyperdivergent jaws registered quite a different pattern of soft tissue thickness.

Conclusions. Considering study limitation, there can be concluded that different soft tissue thickness distribution is found in persons with different sagittal and vertical skeletal facial pattern. Researches on larger samples need to identify the general pattern in this regard and best way to integrate these findings in the diagnostic and treatment plan of dental interventions in order to obtain better esthetic outcomes.

Keywords: skeletal class, facial divergence, facial esthetics, facial morphology.

INTRODUCTION

Facial esthetics receives in nowadays dental practice an increasing attention, being noticed also an emphasis on soft tissue thickness, as diagnostic data or treatment objective (1). Soft tissue thickness at different facial anatomical regions probably register variability, in the same subject in time, and between subjects in relation to multiple factors. Between the previous, sagittal and vertical jaw relations may be a factor with impact on soft tissue thickness. Skeletal relations generally associate additional to morphological characteristics also other particularities as functional ones (2). Knowledge of soft tissue thickness particularities according to skeletal class may be important diagnostic findings in orthodontic and prosthetic treatments (3).

Aim and objectives

Study aimed to observe if there is a different distribution pattern of the thickness of facial soft tissue in patients with different skeletal patterns. Profile soft tissue thickness at different cephalometric landmarks was comparatively assessed in patients with different sagittal and vertical skeletal relations.

MATERIALS AND METHODS

A cross-sectional study was conducted on a convenience sample of twenty patients. Patients with cephalometric X-ray films (lateral view) in their medical file, with permanent dentition including at least all four first permanent molars were included. There were excluded the patients a history of medical interventions, accidents or other issues with impact on facial soft or hard tissues (e.g., partial edentulism, prosthetic rehabilitations, orthodontic treatment), and patients with cephalometric X-ray films with major deficiencies (e.g., head positioning, of contrast).

Data collection was conducted by analyzing patient's medical file for general characteristics (i.e., age and sex), and by cephalometric analysis for assessing facial soft tissue and skeletal features. Cephalometric analysis was conducted on cephalometric X-ray films (lateral view) in the convenience manner, by tracing soft tissue and skeletal features on acetate sheets placed on top of X-ray films mounted on a light box, followed by making angular and linear measurements.

Soft tissue thickness was assessed by making linear measurements between bony and soft tissue at the following soft tissue cephalometric landmarks: Nasion [1], Subnasale [2], Labrale superius [3], Stomion [4], Labrale inferius [5], Labiomentale [6], Pogonion [7], Mentale [8]. Analysis was conducted similar to other previously reported researches (4; 5).

For skeletal relations the following angular measures were recorded:

- A-N-B angle for sagittal jaw relation (normal range between 1° and 5°);
- FMA angle for facial divergence (normal range between 22° and 28°);
- ANS-PNS/Go-Gn angle for vertical jaw relation (normal range between 19° and 31°).

According to A-N-B angle patients were classified as following: presenting a skeletal class I (values in the normal range); presenting a skeletal class II (values above the normal range); presenting a skeletal class III (values below the normal range).

According to FMA angle patients were classified as following: presenting a normal facial divergence (values in the normal range); presenting hyperdivergent facial pattern (values above the normal range); presenting hypodivergent facial pattern (values below the normal range).

According to ANS-PNS/Go-Gn angle patients were classified as following: presenting a normal intermaxillary divergence (values in the normal range); presenting hyperdivergent

intermaxillary pattern (values above the normal range); presenting hypodivergent intermaxillary pattern (values below the normal range).

Data analysis was conducted by comparing mean values of soft tissue thickness at different cephalometric landmarks in patients with different sagittal and vertical skeletal relations.

RESULTS

Study sample included 20 subjects, 13 females and 7 males, with ages between 10 and 32 years old.

Soft tissue thickness was variable at different cephalometric landmarks, highest mean values being recorded for Labrale inferius and Subnasale, and lower mean values being recorded for Nasion and Stomion (Table 1). Soft tissue thickness at Nasion, as registering lowest mean value and lowest variability, was used as value against which comparison was made.

Table 1. Soft tissue thickness at cephalometric landmarks assessed

Soft tissue thickness at:	Mean	Median	Range
Nasion [1]	6,20	6	4
Subnasale [2]	14,70	15,5	11
Labrale superius [3]	13,40	13,25	9
Stomion [4]	6,37	5	19
Labrale inferius [5]	15,20	15	13
Labiomentale [6]	11,95	12	9
Pogonion [7]	12,62	12,25	10
Mentale [8]	8,45	9	7

Soft tissue thickness registered some differences according to the skeletal class (Figure 1). Skeletal class II patients, compared to skeletal class I patients, registered decreased soft tissue thickness at Subnasale (2) and Stomion (4), and an increased soft tissue thickness at Labrale inferius (5). Skeletal class III patients, compared to skeletal class I patients, registered decreased soft tissue thickness at Stomion (4), Labrale inferius (5), Labiomentale (6), Pogonion (7), this landmarks mainly corresponding to mandible landmarks.

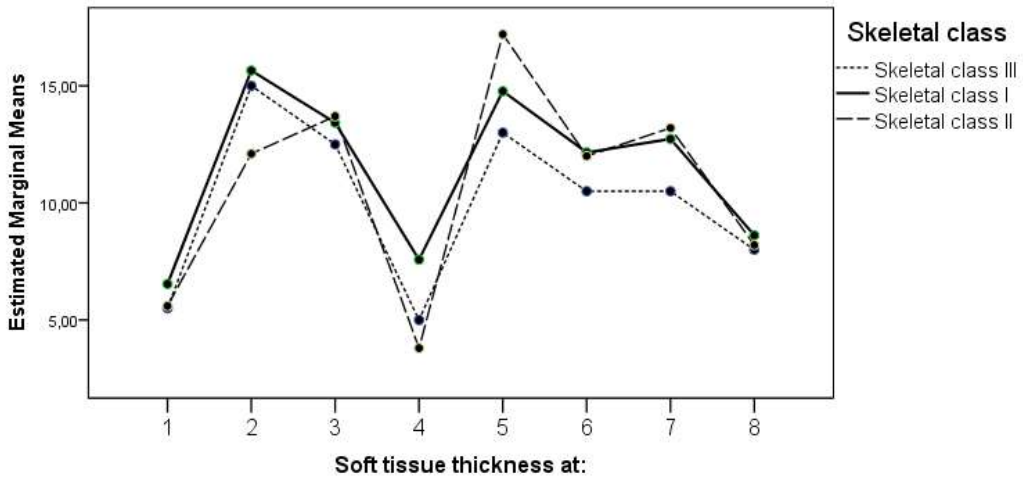

Figure 1. Soft tissue thickness at cephalometric landmarks assessed, according to skeletal class (1-Nasion; 2-Subnasale; 3-Labrale superius; 4-Stomion; 5-Labrale inferius; 6-Labiomentale; 7-Pogonion; 8-Mentale)

Soft tissue thickness registered some differences according to the facial divergence pattern (Figure 2). Both hypodivergent and hyperdivergent patients, compared to patients

with normal facial divergence, registered decreased soft tissue thickness at Stomion (4). Patients with hyperdivergent facial pattern also registered a decreased soft tissue thickness at Subnasale (2) and an increased thickness of soft tissue at Labrale inferius (5).

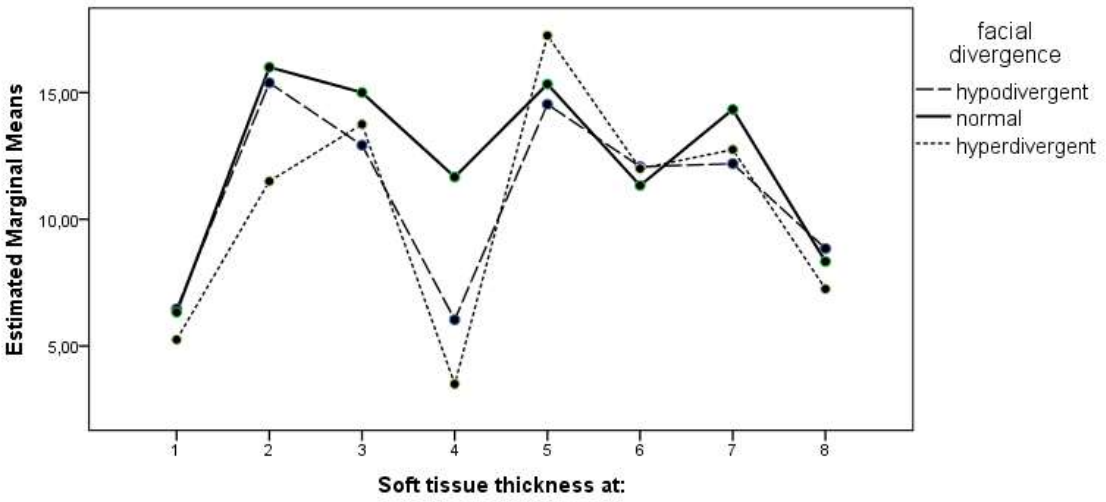

Figure 2. Soft tissue thickness at cephalometric landmarks assessed, according to facial divergence pattern (1-Nasion; 2-Subnasale; 3-Labrale superius; 4-Stomion; 5-Labrale inferius; 6-Labiomentale; 7-Pogonion; 8-Mentale)

Soft tissue thickness registered some differences according to the jaw divergence pattern (Figure 3). Patients with hypodivergent jaws registered similar soft tissue thickness at the analyzed cephalometric landmarks compared to patients with normal divergence. Patients with hyperdivergent jaws compared to patients with normal jaw divergence registered decreased soft tissue thickness at Subnasale (2) and Stomion (4), and increased soft tissue thickness at Labrale inferius (5).

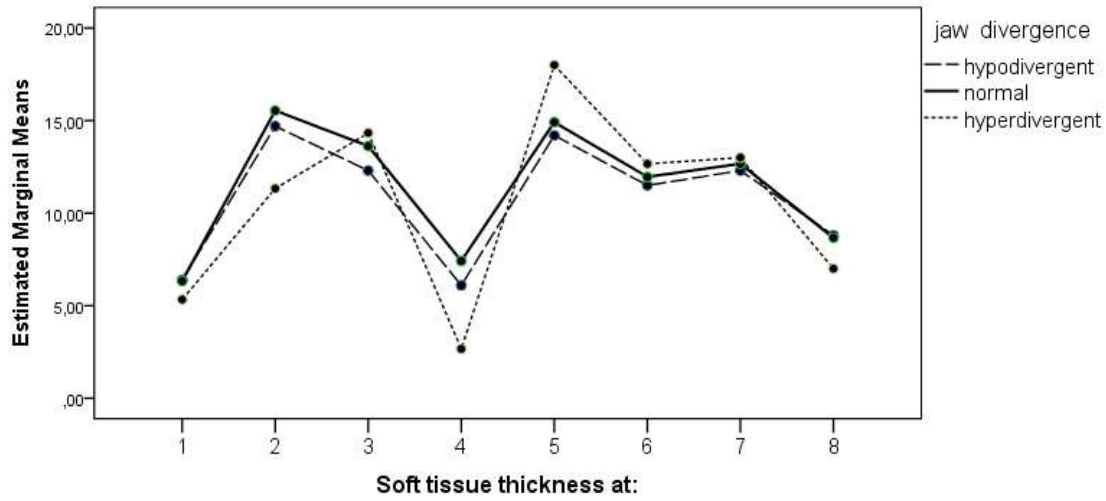

Figure 3. Soft tissue thickness at cephalometric landmarks assessed, according to jaw divergence pattern (1-Nasion; 2-Subnasale; 3-Labrale superius; 4-Stomion; 5-Labrale inferius; 6-Labiomentale; 7-Pogonion; 8-Mentale)

DISCUSSIONS

Soft tissue thickness was variable at different cephalometric landmarks, highest mean values being recorded for Labrale inferius and Subnasale, and lower mean values being recorded for Nasion and Stomion. Soft tissue thickness registered some differences according

to the skeletal class. Skeletal class III patients, compared to skeletal class I patients, registered decreased soft tissue thickness at most mandibular landmarks. Skeletal class II patients, compared to skeletal class I patients, registered decreased soft tissue thickness at Subnasale and Stomion, and an increased soft tissue thickness at Labrale inferius. Patients with hypodivergent jaws registered similar soft tissue thickness at the analyzed cephalometric landmarks compared to patients with normal divergence, while patients with hyperdivergent jaws registered quite a different pattern of soft tissue thickness.

Soft tissue registers great variability among different cephalometric landmarks. Similar to this research, other studies found that there is a decreased soft tissue thickness at Nasion and Stomion, and highest soft tissue thickness at Subnasale and Labrale inferiors (5). Even if distribution registered some similarities, the mean values reported were quite different, indicating a high variability of these characteristics.

Previous researches identified differences between skeletal classes regarding soft tissue thickness. Utsuno *et al.* (4) found that most important difference between skeletal class II and III was observed at Labrale inferius, this being a landmark for which also in this study was found an important difference between the two. These results are confirmed by the study of Kamak and Celikoglu (6), that found that soft tissue thickness at Labrale inferius is least in skeletal class III and greatest in skeletal class II, but they found different from this research that between skeletal classes there is a difference of soft tissue thickness at Labrale superius.

There are fewer studies analyzing soft tissue thickness according to facial divergence patterns. A previous study conducted by Somaiah *et al.* (7) suggested that in persons with clock-wise rotation of the mandible the soft tissue chin thickness is lower compared to the rest, this results being confirmed b this study. Accordingly to Jeelani *et al.* (5) soft tissue thickness is different in vertical facial patterns at Stomion, Pogoion, Gnathion and Menthon. In this research results were partially similar, differences being found at Subnasale, Stomion, Labrale inferius, Pogonion.

Similar to other studies this one brings evidence that difference in soft tissue thickness exists among different skeletal patterns. Considering knowledge of this facial parameters could contribute to obtain a better outcome from an esthetic point of view this should be more thoroughly known, as esthetics being very important for nowadays dental patient (8; 9).

Among study limitations the main one is related to small sample size, which lead to the difficulty in knowing if this study results are close to the pattern observed in the general population.

CONCLUSIONS

Considering study limitation, there can be concluded that different soft tissue thickness distribution is found in persons with different sagittal and vertical skeletal facial pattern. Researches on larger samples need to identify the general pattern and best way to integrate these findings in the diagnostic and treatment plan of dental interventions in order to obtain better esthetic outcomes.

REFERENCES

1. Halazonetis DJ. Morphometric evaluation of soft-tissue profile shape. Am J Orthod Dentofacial Orthop. 2007;131(4):481-9.
2. Preoteasa CT, Ionescu E. Link between skeletal relations and root resorption in orthodontic patients. International Journal of Medical Dentistry. 2011;15(3):267-271.
3. Preoteasa CT, Axante A, Hagiu AM, Cristea AD, Preoteasa E. Comparative analysis of phonetic tests used for assessing the smile display. Romanian Journal of Oral Rehabilitation; 8(1):43-50.

4. Utsuno H, Kageyama T, Uchida K, Kibayashi K. Facial soft tissue thickness differences among three skeletal classes in Japanese population. Forensic Sci Int. 2014;236:175-80.
5. Jeelani W, Fida M, Shaikh A. Facial soft tissue thickness among various vertical facial patterns in adult Pakistani subjects. Forensic Sci Int. 2015;257:517.e1-517.
6. Kamak H, Celikoglu M. Facial soft tissue thickness among skeletal malocclusions: is there a difference? Korean J Orthod. 2012 Feb;42(1):23-31.
7. Somaiah S, Khan MU, Muddaiah S, et al. Comparison of soft tissue chin thickness in adult patients with various mandibular divergence patterns in Kodava population. Int J Orthod Rehabil. 2017;8:51–56.
8. Preoteasa CT, Axante A, Macris A, Chirita A, Imre M, Tancu AM, Preoteasa E. Patient's expectations and perception of the private dental practice. Medicine in Evolution. 2014;20(4):679-83.
9. Preoteasa CT, Dumitrache A, Enache M, Iosif L, Preoteasa E. Patient's information on medical aspects. Romanian Journal of Oral Rehabilitation. 2018;10:36-40.

Abutment geometry influence on the accuracy of digital and conventional impressions

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Abstract

The aim of this *in vitro* study is to determine the influence of abutment geometry influences over the accuracy of both, digital and conventional impressions.

Material methods. Four maxillary central incisors from a Frasaco typodont model were prepared for all ceramic crowns with occlusal convergence angles (0,5,15 and 25 degrees).The abutments were scanned using a high resolution scannerand saved in standard tessellation language file (STL) format.Then, all abutments were scanned using an intraoral scanner and saved in STL format as well. Three conventional polyvinyl siloxane (PVS) impressions were made for each preparation, which were poured with Type IV dental stone and and digital models were created from the cast models. All STL files were compared using metrology software (Geomagic Studio 2013), in terms of trueness and precision.

Results. Both groups, the intraoral scanner and digitalized conventional impression, presented an increase in accuracy, as the occlusal convergence of the abutments was close to 25 degrees.When the occlusal convergence angle was close to 0 degrees, both groups had similar accuracy values.

Conclusions. Within the limitation of this study, it can be concluded, that the accuracy of digital impressions for one single abutment is superior to conventional impression.

Keywords: *abutment geometry, digital impression, intraoral scanner, trueness, precision*

INTRODUCTION

The aim of dental impressions is to obtain a copy of the prepared teeth, adjacent structures, as well as the interoclusal relationships. The main impression techniques that are used nowadays are represented by digital and conventional impressions. The main purpose of both is recording, as precise as possible teeth preparations, their accuracy being measured in terms of trueness and precision [1]. Trueness canbe interpreted as the ability of a measurement to match the actual value of the quantity being measured [2]. Precision, however, is the "ability of a measurement to be consistently repeated.

The first disadvantage of conventional impressions is that involves a multistep process which is susceptible to errors [3]. Digital impression aims to eliminate these errors by utilizing a more reliable and standardized method. The outputs of the scanning process are point-clouds and triangle meshes, which are used in the second step, the design, and then the milling machine is used to manufacture the final restoration [4,5].

Nowadays, with the increase in data aquisition quality, the development of optical impressions has reached a point that it allowsthe recording of precise abutment geometry [6,7,8].

However conventional impressions are still the most utilized means of recording tooth preparations, and in some cases, mostly in full arch impressions, their accuracy may even exceed that of optical impressions [9].

The geometry of a preparation influences the resistance and retention of a restoration. The parallel the walls of the abutment, the greater the retention, but also the risk of creating undercuts. These undercuts can distort a conventional impression when separated from the preparation. Undercuts do not influence digital impressions due to the fact that the scanning tip can be rotated 360 degrees around the abutment [8,10,11]

Aim and objectives

The aim of this study was to determine and evaluate the influence of tooth preparation geometry in the accuracy of both digital and conventional methods.

MATERIAL AND METHODS

Standard resin maxillary left incisors were prepared for an all ceramic crownswith a dental surveyor at the different convergence angles. A total of four preparations were fabricated with occlusal convergences ranging from 0, 5, 15 and 25 degrees.

Then, a desktop scanner(D700,3Shape) was used to obtain the reference model.

The same preparations were scanned with an intraoral scanner (PlanmecaPlanScan) and saved in standard tessellation language file (STL file)-the intraoral group.

Conventional impressions were made with polyvinyl siloxane (PVS), three copies being obtained(n=3) for each reference abutment, resulting ina total number of fifteen. From these impressions, plaster models were poured. (Fig. 1). All casts (three per reference model) were scanned and exported as STL files-PVS group (Fig.2).

Figure 1. Type IV dental stone models

Figure 2. Model scanning with the intraoral scanner

All scanning data and computations were performed using metrology software (Geomagic Studio 2013). Precision values were obtained by superimposing each model scan from the intraoral group and PVS group. Comparing the digital model of the reference group with the rest of the scans, verified the trueness of each group.

RESULTS

Using Geomagic Studio 2013 software, we compared geometric differences between the scans.Overlapping the STL files allowed the measurement of deviation patterns from the reference models. (Table 1).

Table 1. Trueness and precision values for the intraoral group and the PVS group

Impression Technique		0 degrees	5 degrees	15 degrees	25 degrees	Mean±SD
PVS	Trueness	29.1µm	25.3µm	24.7µm	24.5µm	25.9±2.16µm
	Precision	24.5µm	20.3µm	18.6µm	21.2µm	21.1±2.47µm
PlanScan	Trueness	25.3µm	20.6µm	17.4µm	15.3µm	19.6±4.35µm
	Precision	22.7µm	19.5µm	14.9µm	15.7µm	18.2±3.6µm

The overall trueness values of all groups showed that PlanScan group had the smallest deviation, with a mean value of 19.6 µm, followed by the PVS group (25.9 µm) (Fig.3). Precision values were better for the PlanScan group (18.2 µm), followed by the PVS group (21.1 µm) (Fig.4).The highest precision values were found in the PlanScan group for all of the occlusal convergence angles tested.

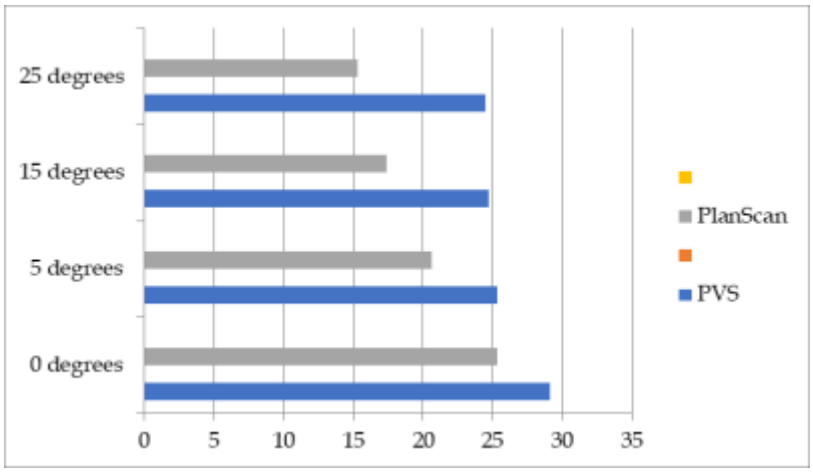

Figure 3. Graphical representation of the mean trueness values for the test groups

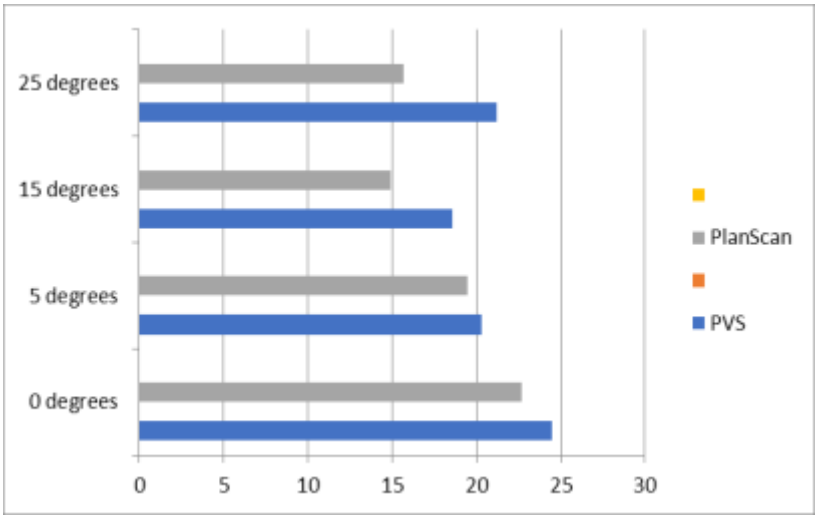

Figure 4. Graphical representation of the mean precision values for the test groups

DISCUSSIONS

The results of this study revealed that for one single abutment, digital impressions are more precise than conventional impression.

The incidence of undercuts was evaluated by Marghalani [11] who compared different angles of preparation and showed that visible undercuts were present on half of the preparations. Negative angles of the abutments can cause the distortion of conventional impressions, and should be blocked before taking the impression. These undercuts do not influence the accuracy of a digital impression,, and if needed, they can be addressed easily.

Metrology software was used to overlap scans from all groups. Depending on the occlusal convergence, differences in trueness and precision were found. The scans made with an intraoral scanner (PlanScan, Planmeca), showed the highest precision and trueness. The PVS group presented significant differences from the reference scan, with the lowest values in terms of trueness and precision. Similar studies showed that the accuracy of digital impressions is higher than conventional methods.

Caution is indicated when interpreting the results of this study. Other studies [12,13] had shown that even if digitalimpressions are accurate when registering single crown preparations, full arch scans limits the accuracy of the scan. A possible reason for the decrease in accuracy may be related to the way the data is recorded, by a ''best fit algorithm'', that attaches all captured images to previous recordings. [13] The larger the surface recorded, the higher the chance of errors to appear.[4]

This study has a number of limitations. Firstly, resin teeth were prepared at the required occlusal convergence, that are not similar to dentin and enamel regarding the reflection of light, surface texture and the overall hardness. Secondly, the scans and conventional impressions were taken in absence of humidity, saliva, possible blood or the patient's movements. Because of these differences, more studies are required in the future in order to establish the best impression method in any given situation.

CONCLUSIONS

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

- Both groups, the intraoral scanner and digitalized conventional impression, presented an increase in accuracy, as the occlusal convergence of the abutments was close to 15 degrees.
- When the occlusal convergence angle was close to 0 degrees, both groups had similar accuracy values

- The overall trueness values of all groups indicated that PlanScan group had the smallest deviation.

REFERENCES

1. Ender A, Mehl A. Accuracy of complete-arch dental impressions: a new method of measuring trueness and precision. J Prosthet Dent 2013;109:121-8.
2. International Organization for Standardization. ISO 5725-1:1994 Accuracy (trueness and precision) of measurement methods and results? Part 1: General principles and definitions. Geneva: ISO; 1994.: www.iso. org/obp/ui/#iso:std:iso:5725:-1:ed-1:v1:en.
3. Yuzbasioglu E, Kurt H, Turunc R, Bilir H. Comparison of digital and conventional impression techniques: evaluation of patients' perception, treatment comfort, effectiveness and clinical outcomes. BMC Oral Health 2014;14:10.
4. Su TS, Sun J. Comparison of repeatability between intraoral digital scanner and extraoral digital scanner: an in-vitro study. J Prosthodont Res 2015;59:236-42.
5. Ting-Shu S, Jian S. Intraoral digital impression technique: a review. J Prosthodont 2015;24:313-21
6. Alghazzawi TF. Advancements in CAD/CAM technology: options for practical implementation. J Prosthodont Res 2016;30:72-84.
7. Christensen GJ. Will digital impressions eliminate the current problems with conventional impressions? J Am Dent Assoc 2008;139:761-3.
8. Chan DC, Chung AK, Haines J, Yau EH, Kuo CC. The accuracy of optical scanning: influence of convergence and die preparation. Oper Dent 2011;36: 486-91.
9. Cho SH, Schaefer O, Thompson GA, Guentsch A. Comparison of accuracy and reproducibility of casts made by digital and conventional methods. J Prosthet Dent 2015;113:310-5
10. Tiu J, Al-Amleh B, Waddell JN, Duncan WJ. Clinical tooth preparations and associated measuring methods: a systematic review. J Prosthet Dent 2015;113:175-84.
11. Marghalani TY. Frequency of undercuts and favorable path of insertion in abutments prepared for fixed dental prostheses by preclinical dental students. J Prosthet Dent 2016;116:564-9.
12. Andreas Ender, DMD,a Thomas Attin, DMD,b and Albert Mehl, DMDc. In vivo precision of conventional and digital methods of obtaining complete-arch dental impressions.. J Prosteth Dent 2016.
13. Eneko Solaberrieta, Asier Garmendia, Aritza Brizuela, Jose Ramon Otegi, Guillermo Pradies, and Andras Szentpétery. Intraoral Digital Impressions for Virtual Occlusal Records: Section Quantity and Dimensions. BioMed Research International Volume 2016.

The prevalence of early loss of primary molars and its consequences: A retrospective study

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Abstract

Aim and objectives: The objective of the research was to evaluate the prevalence of early loss of primary molars and its main consequences.

Material and methods: The study was conducted in the Paediatric Department of the Faculty of Dental Medicine of "Carol Davila" UMP, Bucharest.

The study sample comprised 154 patients (mean age 7.91±0.24 years), consulted over a period of 2 years.

Statistical determinations were performed using Chi-squared tests (significance level=95%; $p \leq 0.05$).

Results: Early loss of a primary molar was recorded in 54.6% of patients. Premature loss registered in 12.35% of the primary molars. Space reduction after early extraction was recorded especially in patients over 8 years of age (49.5%) and in all premature tooth losses older than 2 years.

Conclusions: The prevalence of early loss of primary molars was high. The first lower primary molars were the most commonly missing teeth.

Keywords: prevalence, early loss, primary molars.

INTRODUCTION

Early loss of primary molars may be defined as a loss of a deciduous molar before its natural time of exfoliation and is usually caused by dental caries, trauma or atypical root resorption [1-5].

The greatest frequency of premature loss of the primary teeth has been recorded in molars [6, 7].

The premature loss of primary molars may have multiple consequences which affect mainly the permanent dentition. The most important negative consequences are the space reduction on the dental arches and malocclusion of the permanent teeth accompanied by masticatory dysfunction [5, 8-10]. The space maintainers prevent tooth movement and inclination, loss of space for permanent teeth, crowding and impaction [11]. After the premature loss of primary molars should also considering balancing and compensating extractions [15].

Aim

To evaluate the prevalence of early loss of primary molars and to assess its main consequences.

MATERIALS AND METHODS

The retrospective study was conducted in the Paediatric Department of the Faculty of Dental Medicine of "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania.

The patients study sample (PSS) was comprised of 154 patients (72 boys and 82 girls) aged between with dental age between 5.24-9.85 years (mean age 7.91±0.24 years) who were consulted and treated in the Paediatric Department over a period of 2 years (2013-2015). The patients study group was selected out of an initial group (PIG) of 282 subjects.

The selection criteria were: healthy patients who had at least one primary molar early extraction.

The teeth study sample (TSS) was comprised 260 prematurely extracted teeth selected out of an initial sample of 2105 teeth.

The necessary variables were obtained by studying the dental casts and clinical observation records of the patients: sex, age (age groups: under 8 years and over 8 years), prematurely lost molars (more than a year earlier than the normal physiological permutation), the time elapsed since the extraction (below 1 year / between 1-2 years / over 2 years), type of the dental movement of the neighbouring teeth or the antagonists, the amount of the available space (preserved / reduced / closed) in millimetres calculated by comparing the existing space to the average mesio-distal dimensions of the first and second primary molars or to the homologous tooth, if present [12].

Statistical determinations were performed using PSPP v.1.0.1 software. Chi-squared test were applied for a significance level of 95% ($p \leq 0.05$).

RESULTS

The prevalence of patients with at least one early loss of a primary molar was 54.6% (n=154) (Fig. 1).

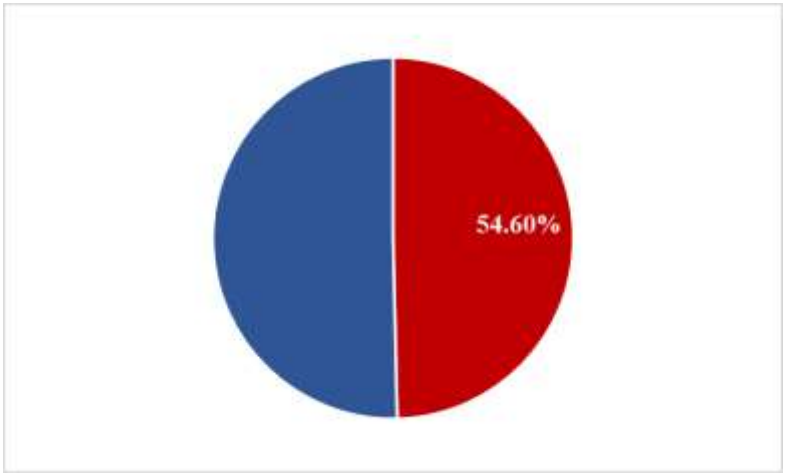

Figure 1. Prevalence of early primary molar loss in the initial patients' study sample

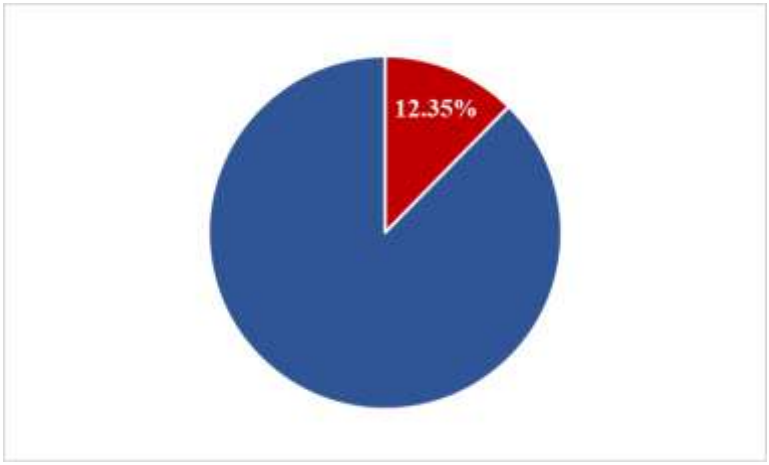

Figure 2. Prevalence of early tooth loss in the initial teeth sample

Prematurely lost deciduous molars represented 12.35% (n=260) of the primary molars in the initial sample (Fig. 2). The molars' study sample consisted of 62.8% (n=163) first primary molars and 37.2% (n=97) second primary molars. The majority of prematurely extracted primary molars were registered in the mandible – 60.5% (n=157).

The average number of missing teeth per patient was somewhat larger in girls (1.76 teeth compared to 1.66 teeth in boys).

All prematurely missing teeth were extracted due to severe carious destruction or severe pulpal complications.

The greatest frequency of early primary molar loss was recorded in the mandible (60.5%, n=157), especially in the first lower molars (first left primary molar – 19.4%, n=50; first right primary molar – 18.6%, n=48).

Space reduction was recorded more frequently in patients over 8 years of age (49.5%, n=99; $p>0.05$).

Space reduction was recorded in all premature tooth losses older than 2 years ($p<0.001$) (Fig. 3).

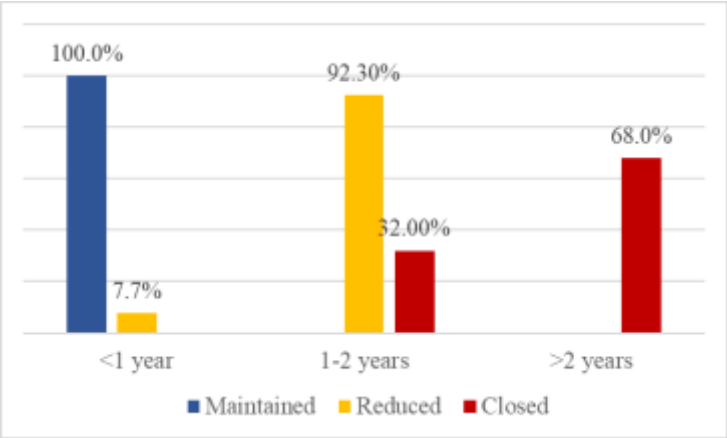

Figure 3. The situation of the postextractional space in the study sample of molars

Horizontal movement of the neighbouring teeth was recorded especially in the case of teeth missing for 1-2 years (84.6%, n=66) while in teeth missing for over 2 years both horizontal and vertical movement of neighbouring and opposing teeth was recorded (52%, n=26) (p<0.001) (Fig. 4).

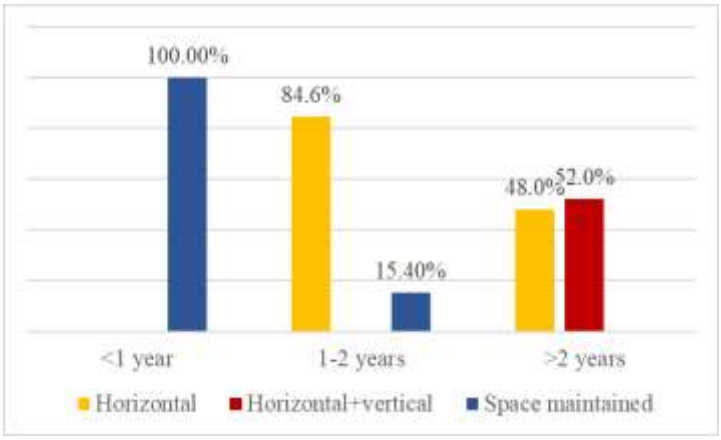

Figure 4. Type of space reduction in the molars' study sample

Both types of neighbouring teeth movements were recorded more frequently and with higher severity in the maxilla, although the results only had a descriptive value (p>0.05).

Neither subjects' gender nor the type of molar did influence the type of teeth migration (p>0.05).

The severity of the space loss was higher in first primary molars (49.4%, n=81) (Fig. 5).

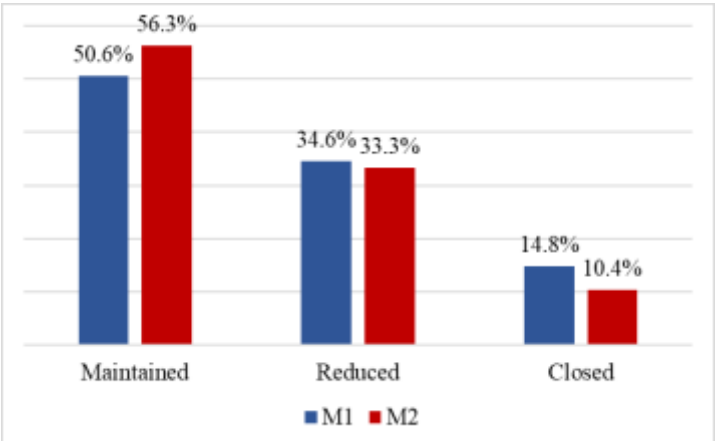

Figure 5. Severity of space loss according to the type of primary molar

DISCUSSIONS

Many studies in the world have reported premature extractions of deciduous molars as a significant clinical problem. The early loss of primary teeth, especially the molars, can produce numerous consequences such as malocclusion in permanent teeth [6, 7].

The frequency of early loss of primary molars was found that varies widely in the world 15-83% depending on the country where the study was conducted. [1-7,16]

Our study presented a high prevalence of early loss of primary molars (54.6%) similar with the findings of Al-Shahrani in 2015 [13]. This result was somewhat higher than the one reported by Andronic in 2017 (48 %) [14] and in disagreement with Cavalcanti et al., 2008 (27.2%) [9] and Ahamed et al., 2012 (16.5%) [6].

Our results showed that early primary molar loss affected 12.35% of the primary molars in the initial study sample. All primary molars were extracted due to dental caries

The girls were somewhat more affected than boys but the result was not statistically significant ($p>0.05$). This finding is in disagreement with the study of Ahamed et al. in 2012 in which boys were more affected. However, leaving away the category of patients who presented four early extracted molars (where girls were almost three times better represented than boys, 7.7% / 2.8%), boys presented on average more prematurely lost dental units (41% / 41.7%) [6, 8].

Space reduction was recorded more frequently in patients over 8 years of age (49.5%) ($p<0.001$) result that agrees with Ahamed et al. (2012) [6].

In this study, the greatest frequency of early primary molar loss was recorded in the mandible (60.5%), especially in the first lower molars (7.4 – 19.4%; 8.4 – 18.6%) results that are in agreement with Ahamed et al. (2012) [6, 7] and Cavalcanti et al. (2008) [9] and in disagreement with Kobylińska et al. (2015) [8] who found that maxillary first molars were most frequently extracted and with Andronic (2008) who found that the most commonly missing teeth was the mandibular second primary molars [9].

Both horizontal and vertical teeth migration were recorded more frequently in the lower teeth, although the results only had a descriptive value ($p=0.727$).

CONCLUSIONS

In conclusion, in the present study, the prevalence of early loss was high especially in mandible. The lower primary molars were the most commonly missing teeth.

To prevent the premature extraction of primary molars, dental caries prophylaxis methods should be implemented. In all molars missing for over 2 years both severe horizontal movement of neighbouring teeth and vertical movement of opposing teeth were recorded.

If early extraction of primary molars is necessary, space maintenance should be considered to prevent reduction of the length of the dental arch and malocclusion in permanent dentition.

REFERENCES

1. Pokorná H, Marek I, Kucera J, Hanzelka T. Space Reduction After Premature Loss of a Deciduous Second Molar – Retrospective Study. IOSR-JDMS. 2016; 15(11), DOI: 10.9790/0853-1511020108.
2. Tunison W, Flores-Mir C, ElBadrawy H, Nassar U, El-Bialy T. Dental Arch Space Changes Following Premature Loss of Primary First Molars: A Systematic Review. Ped Dent. 2008; 30(4):297-302.
3. López-Gómez SA, Villalobos-Rodelo JJ, Ávila-Burgos L, Casanova-Rosado JF, Vallejos-Sánchez AA, Lucas-Rincón SE, Patiño-Marín N, Medina-Solísa CE. Relationship between premature loss

of primary teeth with oral hygiene, consumption of soft drinks, dental care, and previous caries experience. Sci Rep. 2016; 6: 21147, DOI: 10.1038/srep21147.
4. Bhujel N, Duggal MS, Saini P, Day PF. The effect of premature extraction of primary teeth on the subsequent need for orthodontic treatment. Eur Arch Paediatr Dent. 2016; 17(6):423-434.
5. Raja SM, Mohan M, Jeevanandan G. Premature loss of primary teeth and developing malocclusion: A review. JPR. 2018; 12(2):190-3.
6. Ahamed SSS, Reddy VN, Krishnakumar R, Mohan MG, Sugumaran DK, Rao AP. Prevalence of early loss of primary teeth in 5–10-year-old school children in Chidambaram town. Contemp Clin Dent. 2012; 3(1):27–30.
7. Miyamoto W, Chung CS, Yee PK. Effect of Premature Loss of Deciduous Canines and Molars on Malocclusion of the Permanent Dentition. J Dent Res. 1976; 55(4):584-90.
8. Kobylińska A, Borawska J, Chojnowska A, Janczewska J, Turska-Szybka A, Olczak-Kowalczyk D. Frequency and causes of premature extractions of deciduous molar teeth – a retrospective study. Nowa Stomatol. 2015; 20(1):3-9.
9. Cavalcanti AL, De Alencar CRB, Medeiros Bezerra PK, Granville-Garcia AF. Prevalence of early loss of primary molars in school children in Campina Grande, Brazil. Pak Oral Dental J. 2007, 28(1):113-6.
10. Saloom HF. Early Loss of Deciduous Teeth and Occlusion. Iraqi Orthod J. 2005; 1(2):36-9.
11. de Carvalho TM, Miranda AF. Preventive Orthodontics: Space Maintainers in the Early Loss of Deciduous Tooth - Clinical Case Report. EC Dental Science 10.5 (2017): 143-148.
12. Barbería E, Suárez MC, Villalón G, Maroto M, García-Godoy F. Standards for mesiodistal and buccolingual crown size and height of primary molars in a sample of Spanish children. EJPD. 2009; 10(4):169-75.
13. Al-Shahrani N, Al-Amri A, Hegazi F, Al-Rowis K, Al-Madani A, Hassan KS. The prevalence of premature loss of primary teeth and its impact on malocclusion in the Eastern Province of Saudi Arabia. Acta Odontol Scand. 2015; 73(7):544-9.
14. Andronic AI. Prevalence of early loss of primary teeth in 6-10 years old school children in Sibiu. AMT. 2017; 22(4):128-129.
15. Rock WP. Extraction of primary teeth - balance and compensation. IJPD. 2002; 12(2):151-3.
16. Northway WM, Wainright RL, Demirjan A. Effects of premature loss of deciduous molars. Angle Orthod. 1984; 54(4):285-329.

The fea study of the biomecanic behavior of canine reconstructed with glass ionomer cement

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Abstract

The aim of this study is to determine the stress behavior of a GIC root decay restoration with the finite element analysis (FEA). The structure of the finite element analysis consists of GIC material and 4 geometric variables (no bone loss, 1 surface radial loss, 2 surfaces and circumferential loss).

Material and Method Geometric reconstruction of simulated elements is done based on the X-ray. The DICOM image collection is imported into Mimics 10.01, where two color layers are applied, which are then transformed into volumes. Surface integrity was accomplished using Geomagic Studio 2013 software. Subsequent to the reconstruction, classical geometric modeling was carried out using the SolidWorks 2013 CAD environment. Finite element analysis was performed with the *Ansys 13* software.

Results In case of GIC restorations, among the three types of bone loss there are no significant differences in the stresses at the level of the same elements of the assembly. The maximum values of the restoration stresses, in the case of without bone loss simulation, exceed the maximum adhesion strength of GIC. Instead, in the situation with bone loss, the stress state in the restoration is reduced due to the deformation suffered by the tooth.

Conclusions Pressures in dental root restorations are lower in the case of reconstruction using GIC.

Keywords: finite element analysis, glass ionomer cement, root decay

INTRODUCTION

GICs are commonly used in restorative therapy due to its qualities such as biocompatibility, bond to tooth structure, fluoride release and fluoride rechange, anticariogec properties. Its application in root dental decay is frequent. The extension of dental caries to the dental root and loss of the alveolar bone support leads to increased the pressure on restorations and the reduction of clinical performances.

The purpose of the study is to check through the finite elements what pressure is exerted on GIC restorations in the absence of an alveolar wall, of 2 walls, or of all of them.

MATERIALS AND METHODS

EXPERIMENTAL PART

Geometric patterns achievement

Geometric reconstruction. The achievement of a numerical restoration requires the construction of a geometric model (2D or 3D) in order to define a set of contouring conditions. In order to achieve a genuine model, geometric reconstruction of simulated elements is required based on the X-ray scan images. For a genuine model the X-ray scan images are used for geometric reconstruction of simulated elements.

The DICOM image collection was thus imported into Mimics 10.01, where two color layers were applied (Fig. 1 and fig. 2).

Using Mimics 10.01 the DICOM image collection has been imported and two colour layers were applied each of them corresponding to a segmentation interval: first for hard tissues (870-2800 HU – cortical and spongy bone) and second for soft tissues (80-280 HU). The operation of image segmentation assume the conversion of 2D pixels (from DICOM grayscale images) into object pixels [1, 2, 3]

$$HU = 1000 \times \frac{\mu - \mu_{water}}{\mu_{water} - \mu_{air}} \quad [1]$$

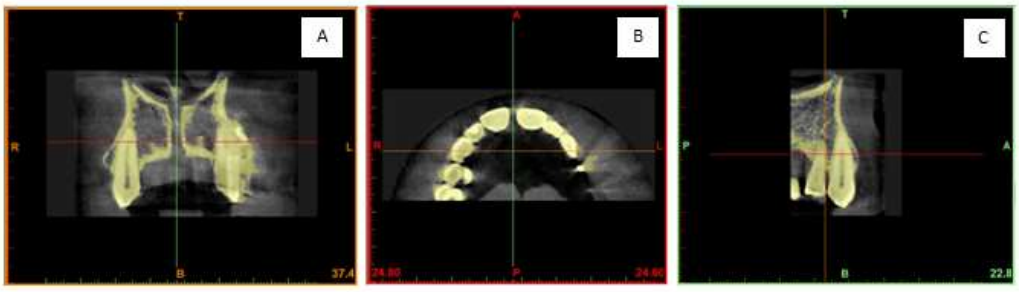


Figure 1. Color layer applied

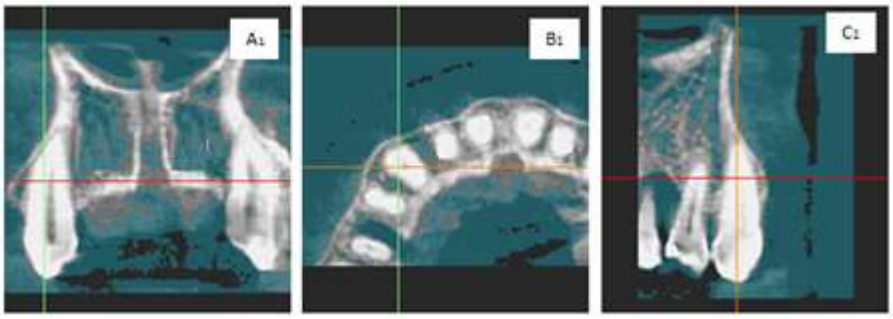


Figure 2. Color layer applied to low density tissues (soft tissues)

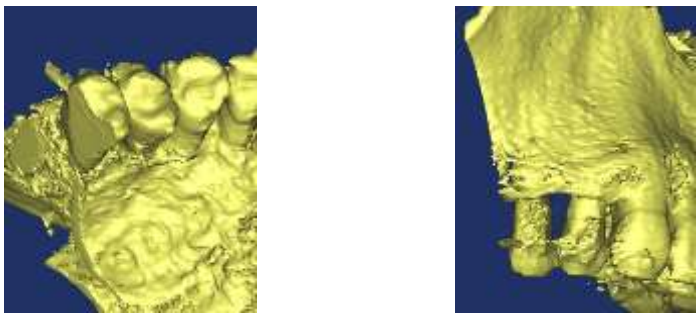


Figure 3 Primary 3D Reconstruction of a Canine Area - Isometric Views.

In the process of transforming the colour layers into volumes, due to a large amount of X-ray artifacts, the quality of resulting volume it is quit poor (containing surfaces such as: spike, self-intersecting, discontinuous, surfaces which make impossible to place the contour conditions correctly) (Figure 3).

Using the Geomagic Studio 2013 software the surface integrity can be improved. In our case the canine extracted from the reconstruction software was imported as a cloud of points (fig. 4 A). Due to surface discontinuities, some areas need to be restored. The process can be performed automatically (when the angles between the triangular surfaces involved do not exceed a critical value) or manually (in cases of strong network distortion) (fig.4)

After filling up all the discontinuous zones, a re-discrete of the entire canine side surface was made to obtain a smoother volume. Each of these operations is done with loss of shape and dimensions, which represents a necessary compromise in order to ensure the possibility of carrying out a numerical simulation, namely the prior generation of a volume mesh.

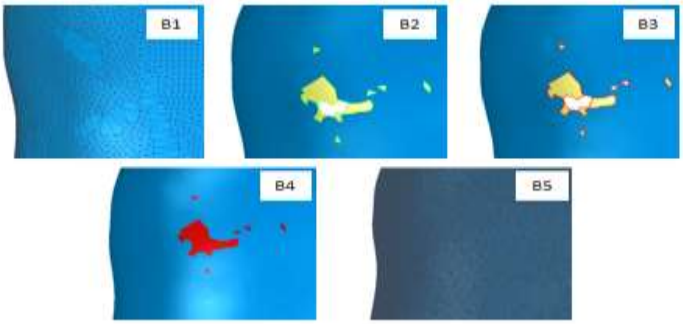


Figure 4. Removal of self-intersecting triangles and surface meshing refinement: B1-coarse mesh, B2 - eliminated surfaces, B3 and B4 filling surfaces, B5 fine meshing

The refinement of the geometric model was obtained by increasing approx. 3 times the number of triangles in the surface (from 95687 to 282276). Thus, the resulting volume obtained a smooth aspect, valid for the numerical analysis (fig.5 C).

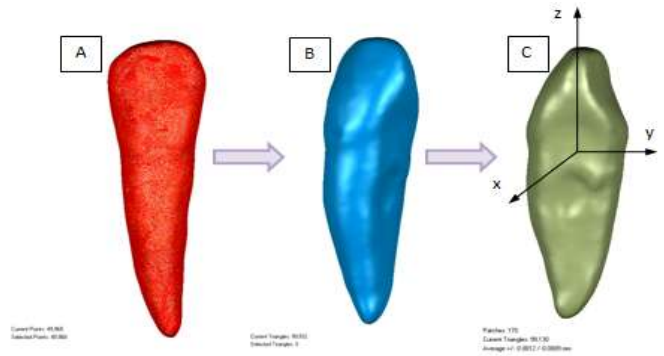
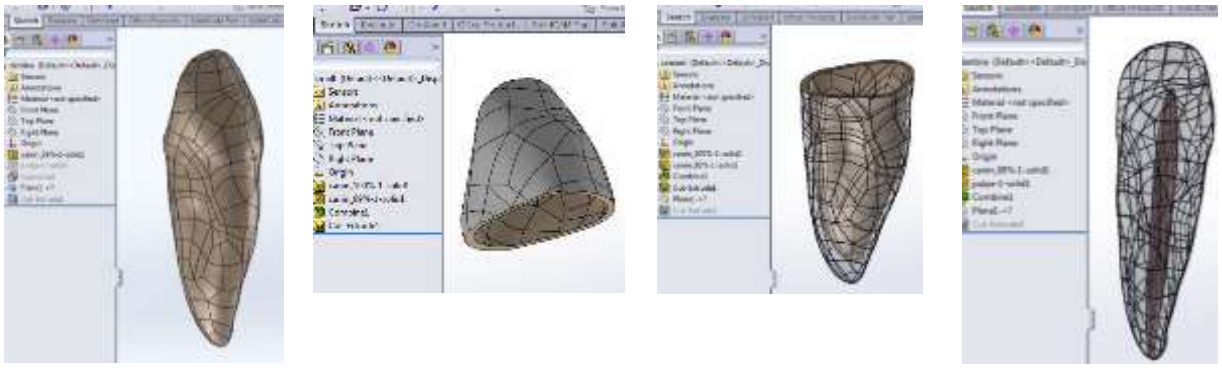


Figure 5. Stages of geometric transformation from dot cloud (surface) to dark (solid)

Figure 5 shows the three main steps required to convert from dot cloud (A) to dark volume (solid C). The intermediate step (B) represents the stage of the surfaces, where the necessary corrections have been applied to ensure an integral form.

Classic geometric modelling. Within the reconstruction process, classical geometric modelling was carried out using the SolidWorks 2013 CAD environment. Boolean operations were performed at this stage by separating the geometric model obtained into 4 conjugated solid volumes, each of them having an anatomical structure:

- Dentine model Fig. 6 A;
- The enamel model Fig. 6 B;
- The cementum model Fig. 6 C;
- Pulp chamber model Fig. 6 D.



A – dentine model B – enamel model C-cementum model D- pulp chamber model

Figure 6. Anatomic volumes obtained by Boolean decrease

Root caries simulation was performed by a cutting operation with a profiled surface. The geometric operation was applied to both the solid dentine and the solid cementum. The shape of the extrusion surface corresponds to the considered root caries section (Figure 7).

a) Outline of the root decay b) Extrusion by profile cutting

Figure 7. Fault generation operation

The restoration element was geometrically performed as a conjugated form of the root decay profile. In this way, it was possible to establish the coincidence relationship between the dentine alveolus, respectively the cementum and the geometry of the root therapy.

The assembling of all elements was accomplished by establishing relationships such as alignments, coincidences, concentricities, parallelism, etc. The result of all CAD operations can be seen in Figure 8. The RG/GR denomination for enamel, dentin and cementum indicates that these two elements were obtained by geometric reconstruction (GR), and MG/CM are objects obtained by classical modeling (CM).

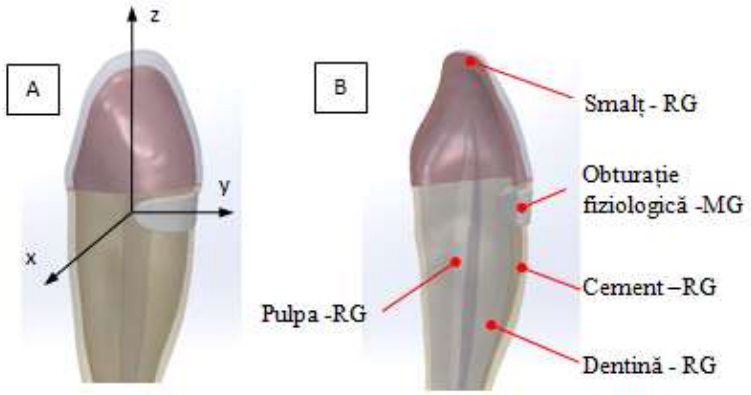


Figure 8. Assembling of all model components: A –isometric view of the assembly; B – longitudinal section of the assembly

In order to perform numerical simulations for four types of bony alveolus geometry, four geometric models were made in which the assembly described above was inserted. The relative positioning characteristics of tooth assembly with the osseous alveolus/ alveolar bone, as well as the established codings are shown in Table I and Figure 9.

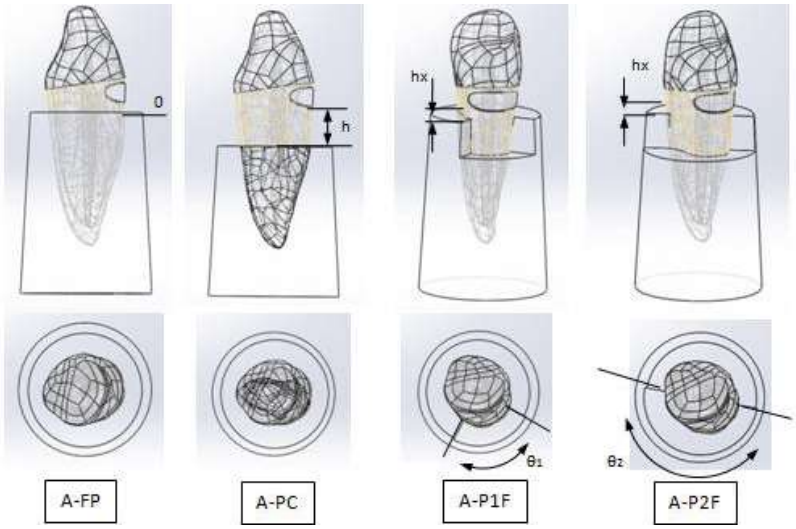


Figure 9. Relative positioning of the tooth against the four types of bone alveoli

Table I. Coding and positioning dimensions

Nr.	Type of bony interface	Coding	Height to root therapy area (h) [mm]	Lost section angle θ [°]
1	Without osseous/bone loss	A-FP	0.0	0
2	With circumferential loss	A-PC	5.0	360
3	With 1-sided radial loss	A-P1F	h_{X1} = 3.5 h_{X2} = 3.0	90
4	With 2-sided radial loss	A-P2F	h_{X1}= 3.5 h_{X2} = 3.0	180

Finite Element Analysis

Finite element analysis was performed with the Ansys 13 software. The 3D exported models from Solidworks were imported into the Geometry module of the program as *.igs files. Prior to establishing the contour conditions and the mutual contacts between the solids that make up the ensemble, the materials to be used have been defined in the analysis database [8-13]. Their mechanical properties were extracted from the literature and presented in Table II.

Table II. Mechanical properties of the materials used in the analysis [4,5,6]

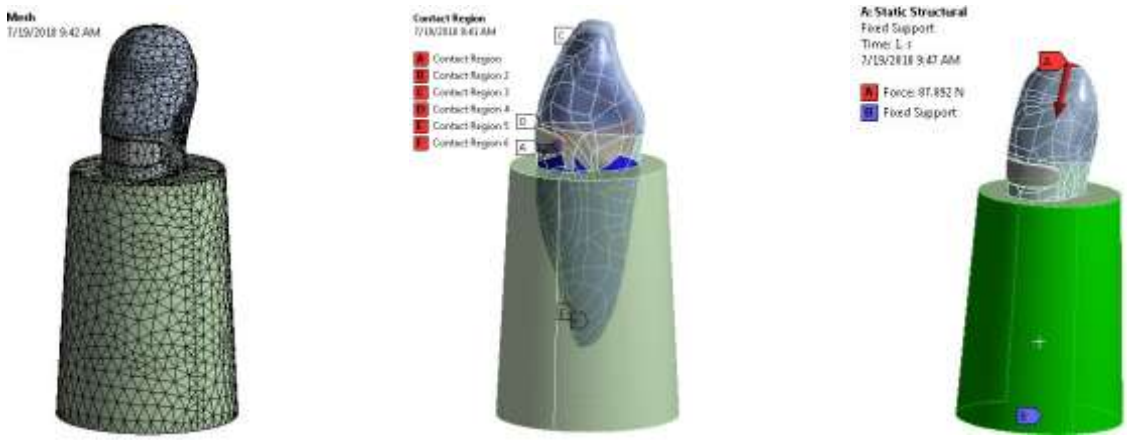
Material/Property	Density [kg/m^3]	Young Module[MPa]	Poisson coefficient [-]	Mechanical strength of adhesion [MPa]
Glass ionomer cement (GIC)	1680	7700	0.26	-with enamel: 2.6-9.6 -with dentine: 1.1-4.1
Tooth enamel	2750	74000	0.23	-
Cementum	1890	3400	0.32	
Dentine	2000	17000	0.30	
Pulp	1200	0.003	0.45	
Alveolar bone	1820	19000	0.35	

The purpose of the finite element analysis was to determine the stress and deformation state of all elements of the four mechanical assemblies under certain loading and fastening conditions of the structure. The structure of the finite element analysis consists of composite material and 4 geometric variables (no bone loss, 1 surface radial loss, 2 surfaces and circumferential loss).

Establishing contour conditions. The operation of making the structure discrete was carried out with the help of the tetrahedral elements of constant dimensions (Figure 10, a). The dimension of the element was chosen in such a way that the results of the analysis would reach convergence. The number of nodes and elements of the structure were: 313946 and 195434 respectively.

The contacts between the individual mechanical elements (alveolus-cementum-dentine-root canal-enamel-dental pulp) were defined in accordance with mutually tangent surfaces (Figure 10, b). The contact type was *bounded*, meaning that it does not allow any movement or sliding at the interfaces.

The loading and fixation manners of the structure were defined according to biomechanical studies in the literature. The values of the applied loading forces and their directions are decisive for the values of the pressures that are born in the studied model. According to the literature, the canine loading during mastication is 130-340N. Of course, biting force values are much higher, of 1250-1300N, and the effect of such a bite will produce higher pressure values at the composites restoration level [7,8,9].



a) Structure mesh b) Contact areas of the assembly elements c) Manner of stressing and fixing

Figure 10. The contour conditions of all models, exemplified on the A-PC model

The loading force used in the study was R = 90 N, defined as components following the 3 directions (Figure 10) of the coordinate system as follows:

$$\begin{cases} \vec{F}_x = 20 \cdot \vec{i} \\ \vec{F}_y = -30 \cdot \vec{j} \\ \vec{F}_z = 83 \cdot \vec{k} \end{cases}$$

$$\vec{R} = \vec{F}_x + \vec{F}_y + \vec{F}_z$$

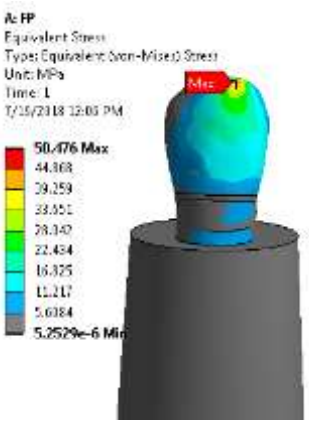
$$|R| = \sqrt{F_x^2 + F_y^2 + F_z^2} = 90.5\ N$$

RESULTS AND DISCUSSIONS

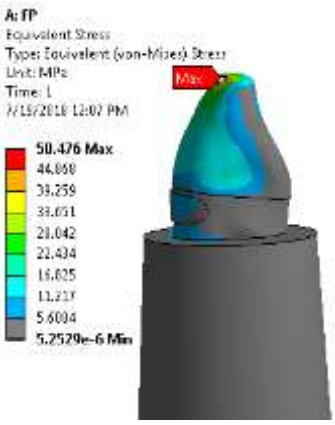
Figure 11 shows the results of the numerical simulation of the biomechanical behavior of the A-FP assembly (without osseous/bone loss). The recorded stresses and deformations are presented as color maps and variation graphs according to their values in the nodes in the most requested area.

The colored maps were presented in front, lateral, longitudinal and transverse sections to highlight the appearance of pressures and displacements both at the surface of the components and in their volume.

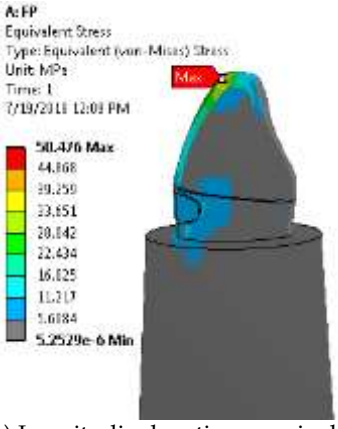
Common to all figures, the highest pressure state belongs to the enamel in the application area. This is partly due to the contact on a small surface and on the other hand to the high modulus of elasticity of the material associated with this type of structure.



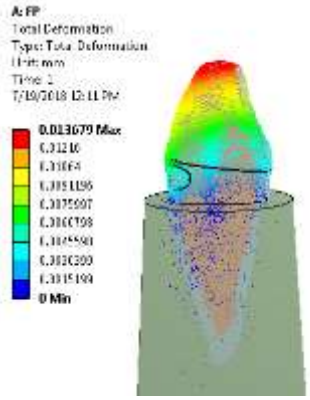
a) Front view - equivalent pressures



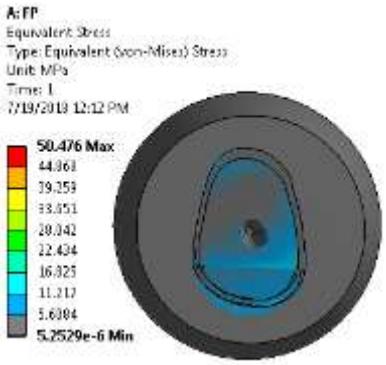
b) Lateral view - equivalent pressures



c) Longitudinal section - equivalent pressures



d) Isometric view - displacements



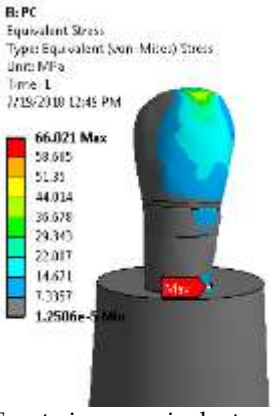
e) Transversal section - equivalent pressures

Figure 11. A-FP model simulation

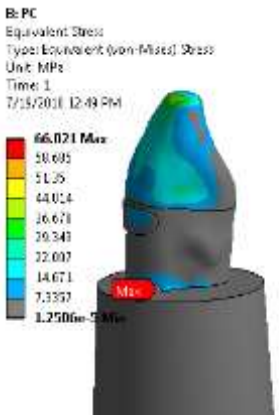
The most stressed area is the deepest one situated nearby the restoration-dentine contact surface, mainly due to its wedge-shaped geometry. Reducing stresses at this level could be achieved by increasing the radius of the deep restoration connection area.

The dental pulp is very low due to its low mechanical properties. The gray colour indicates pressure values below 1-2 MPa.

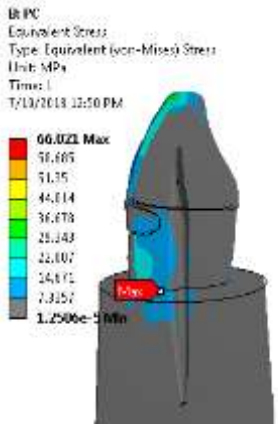
In the case of circumferential loss (Figure 12), a similar distribution of stresses is observed, but much higher in the remaining alveolar bone. This is due to the bending effect that the tooth generates due to the lack of support in the upper half.



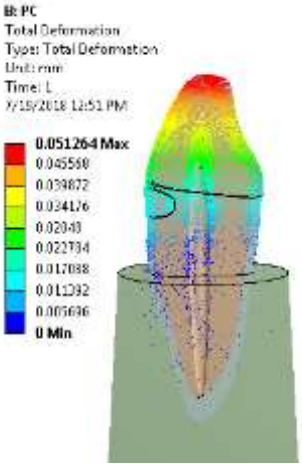
a) Front view - equivalent pressures



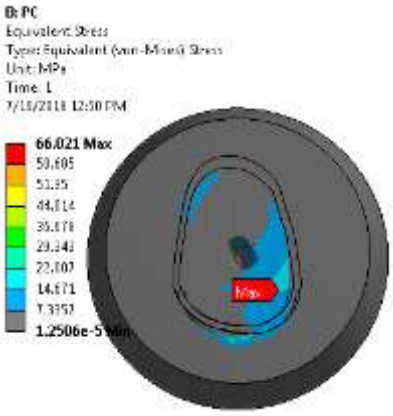
b) Lateral view - equivalent pressures



c) Longitudinal section - equivalent pressures

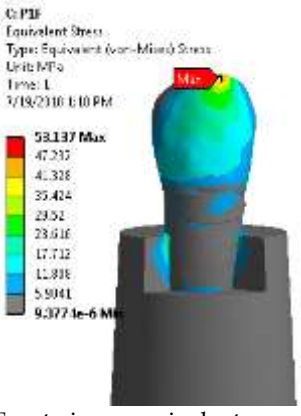


d) Isometric view - displacements

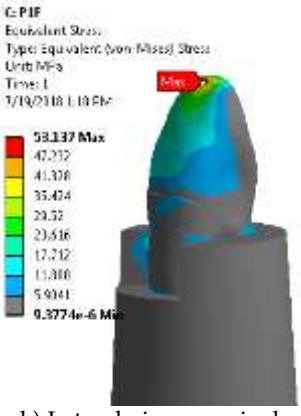


e) Transversal section - equivalent pressures

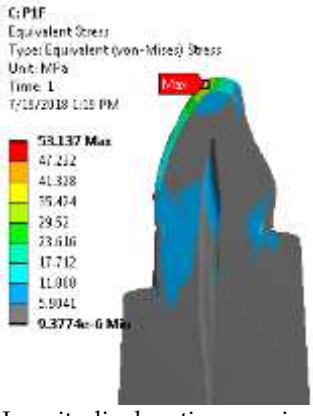
Figure 12. A-PC model simulation



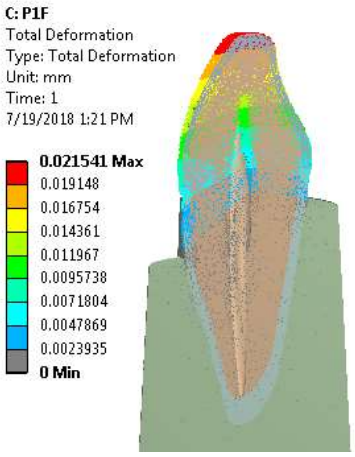
a) Front view - equivalent pressures



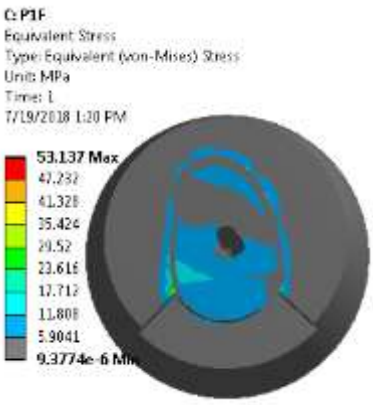
b) Lateral view - equivalent pressures



c) Longitudinal section - equivalent pressures

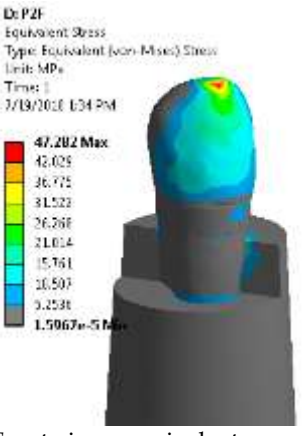


d) Isometric view - displacements

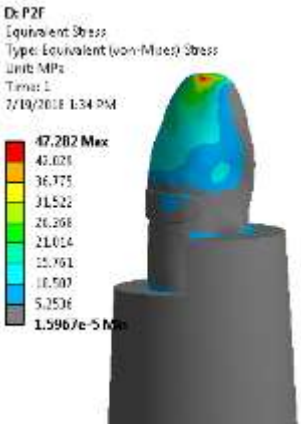


e) Transversal section - equivalent pressures

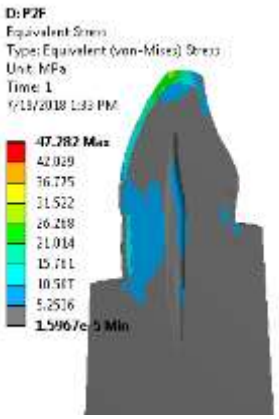
Figure 13. A-P1F model simulation



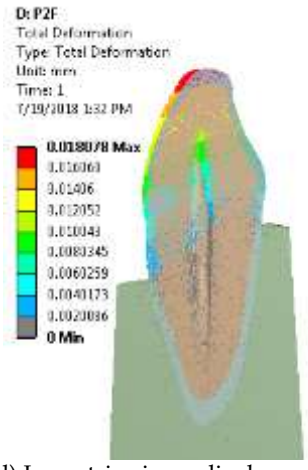
a) Front view - equivalent pressures



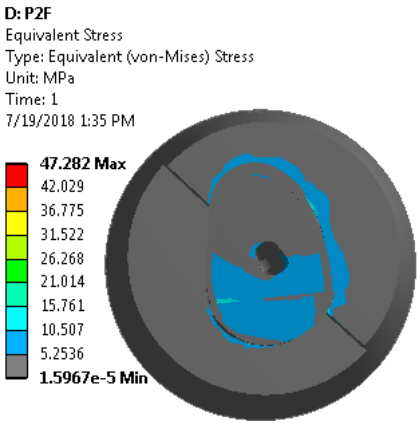
b) Lateral view - equivalent pressures



c) Longitudinal section - equivalent pressures



d) Isometric view - displacements



e) Transversal section - equivalent pressures

Figure 14. A-P2F model simulation

In case of simulation with loss of alveolar bone on one face and on both sides, the pressure distribution in the restoration, dentine and enamel are very similar. Significant stress differences are found in the alveolar bone, which is most strongly stressed in A-P2F (fig. 13,14).

Figure 15 shows some values [4] of the pressures in the most tense areas (according to the colored map), which include the maximum pressure. On this type of representation we can identify the degree of values scattering in relation to the type of bone loss.

According to these, it can be mentioned that in dentine, cementum and alveolar bone there are more pronounced pressure leaps than in restoration and enamel. These pressure leaps can be associated with the production and propagation of cracks.

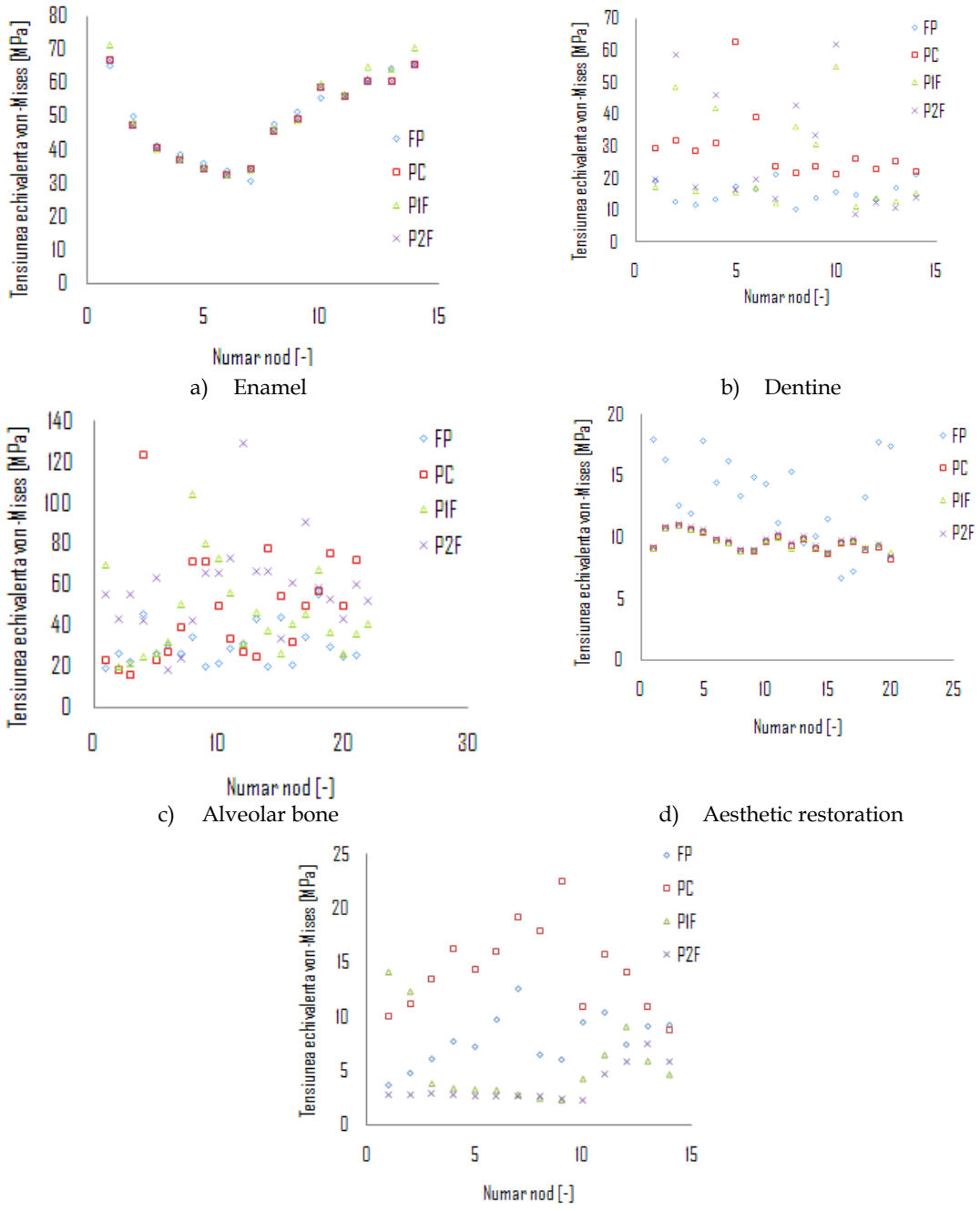


Figure 15. The stresses in the most demanding areas of: a), b), c), d), e) represented according to the node where they manifest

Table III shows the mean and maximum stresses in the most demanding areas for all components of the assembly. Moreover, here the standard deviations were calculated, indicating the dispersion of the pressure values against their average. In this respect, large standard deviations indicate high stress variations in the investigated model.

Table III. Mean and maximum values of the stress in the most demanding areas

Structure type	SIMULATED MODELS				σ [MPa]
	FP	PC	P1F	P2F	
Aesthetic restoration	13.49±3.40	9.53±0.73	9.63±0.66	9.72±0.73	med. ±SD
	22.37	12.77	12.78	13.03	max.
Alveolar bone	29.45±9.70	48.26±22.30	45.02±21.87	57.97±22.19	med. ±SD
	55.51	123.33	121.84	128.94	max.
Dentine	15.71±3.34	29.21±10.79	24.46±14.96	26.73±18.23	med. ±SD
	35.71	69.34	83.82	61.72	max.
Enamel	49.84±12.17	49.29±12.14	50.61±13.90	49.30±12.14	med. ±SD
	113.44	68.06	71.35	68.81	max.
Cementum	7.83±2.38	14.34±3.88	5.57±3.73	3.58±1.68	med. ±SD
	12.54	22.46	14.11	7.53	max.

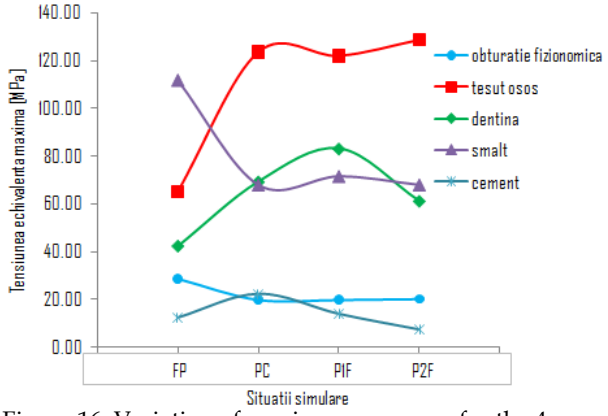


Figure 16. Variation of maximum pressure for the 4 cases

Pressures from restoration are lower in the case of reconstruction using GIC (Figures 16).

The modulus of elasticity of the glass ionomer cement is about 50% lower than the composite, they do not decisively influence the integrity of the tooth in the bone interface due to the relatively small dimensions of the reconstruction as compared with the cross section of the bone.

CONCLUSIONS

Pressures in aesthetic restoration are lower in the case of reconstruction using GICs.

Due the mechanical strength of adhesion of the GIC with dentine (1.1-4.1 MPa), it can be stated that a load of 90 N may cause cracking at interference level in GIC reconstruction.

According to the different adhesion properties with the cementum respectively the dentine, it can be said that the GIC association is favorable in the areas with a thicker layer of cementum.

Independently of the material used for reconstruction, the values of the equivalent stresses are higher when the alveolar bone is complete. Decreasing pressures in aesthetic restoration with alveolar bone loss is due to the increase in the possibility of elastic deformation of the tooth as a whole.

Among the three types of bone loss there are no significant differences in the stresses at the level of the same elements of the assembly (e.g. the mean tensions in the fillings in the A-PC, A-P1F, A-P2F assemblies are very close, with differences 1-2MPa)

The maximum values of the restoration stresses in the case of A-FP simulation, exceed the maximum adhesion strength of GIC. Instead, with bone loss, the stress state in the restoration is reduced due to the deformation suffered by the tooth as a whole.

REFERENCES

1. Dodes JE. The Amalgam Controversy: An Evidence-Based Analysis. Journal of the American Dental Association, 2001; 132: 348-356.
2. Osborne JW, Swift Jr EJ. Safety of Dental Amalgam. Journal of Esthetic and Restorative Dentistry, 2004; 16: 377-388.
3. Horsted-Bindslev P. Amalgam Toxicity - Environmental and Occupational Hazards. Journal of Dentistry, 2004; 32: 359-365.
4. Stavridakis MM, Krejci I, Magne P. Immediate Dentin Sealing of Onlay Preparations: Thickness of Pre-Cured Dentin Bonding Agent and Effect of Surface Cleaning. Operative Dentistry, 2005; 30: 747-757.
5. Mount G.J. Color Atlas of Glass Ionomer Cement. 2nd ed. Martin Dunitz; London, UK: 2002.
6. Sidhu SK, Nicholson JW. A Review of Glass-Ionomer Cements for Clinical Dentistry. Tsoi JK, ed. Journal of Functional Biomaterials. 2016;7(3):16. doi:10.3390/jfb7030016.
7. Nicholson J.W. Chemistry of glass-ionomer cements: A review. Biomaterials. 1998;6:485–494. doi: 10.1016/S0142-9612(97)00128-2.
8. ISO 9917–1: Dental Water Based Cements. International Organization for Standardization; Geneva, Switzerland: 2003
9. McLean J.W., Wilson A.D. Fissure sealing and filling with an adhesive glass-ionomer cement. Brit. Dent. J. 1974;136:269–276. doi: 10.1038/sj.bdj.4803174.

Awareness about denture hygiene: single institution statistical survey analysis among elderly people of Timisoara, Romania

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Abstract

The fastest growing sector of the population is the elderly population, represented of individuals' aged 60 and over. The oral cavity is inspected to be the prime physiological and metabolic significance, and endure diverse changes with the aging process: shrinkage of periodontal tissue due to diminished cellularity; reduction in the consistency of oral mucosae as a result of dehydration; reduction of the papillae; essential changes that have a direct reaction on oral tissues. Removable prosthesis in the oral cavity produces major changes of the oral environment that may have negative effect on the unity of the oral tissues especially when oral hygiene is neglected. A removable restoration makes the practicing of good oral hygiene more difficult, because it covers oral mucosae. Evaluation of the patient's ability to maintain good oral hygiene status is necessary after oral rehabilitation with dentures. Patients should be recalled and monitored depending on the ability to practice and maintain good oral hygiene.

Keywords: *denture hygiene, elderly patients, oral hygiene*

INTRODUCTION

The global population is aging at a remarkable rate [1]. The older people or seniors are expected to make up one-fifth of the world's population by 2050. This change is noticeable, particularly in Japan and in some European countries [1, 2]. Women seem to have benefited more from health care, therefore there are almost twice as many older women then older men because women live longer with average life expectancy 80 years versus 75 years for men [3, 4]. Based on latest statistics Romania has a population of an approximately 20 millions of people, 5 million of them being more then 60 years old. The loss of the teeth is associated with personal income and education level [1].

A dental prosthesis or denture is an intraoral prosthesis indicated to restore intraoral irregularities such as missing teeth and missing soft and hard tissues of the jaw and palate [1, 5]. In short, denture is a set of partial or complete artificial teeth for either the upper or lower jaw [6]. Dental prosthesis can improve mastication, speech, provide support for oral soft tissues, and give support to lips and cheeks to maximize confidence, facial appearance and smile. The overall denture prostheses are total smile makeover with increased function [7].

Dental prostheses improve oral health and quality of life among elderly persons that during years became partial or complete edentulous. Dentures can modify the oral environment and alter the physical and biological characteristics of saliva, usually causing imbalance and diversity in the local microbiota.

Numerous epidemiological studies have been conducted on denture biofilms that contain microorganism that can cause local and systematic infections. Denture biofilms are well known and studied by dentists and dental technicians but less importance is given to this fact and as a consequence not enough indications are transmitted to the patients related to how to take care and control denture biofilms.

All the treatment stages, from planning to final procedure should be done with minimum invasiveness. Preservation of hard and soft tissues, periodontium, pulp and mucosae and temporomandibular joint (TMJ) is crucial. The World Health Organization (WHO) identifies three levels of prevention. The aim of primary prevention is to avoid the development of any disease. The goal of secondary prevention is early detection of the disease and prevention of it. The purpose of the tertiary prevention is to diminish the disease by restoring the function as close to normal as possible.

Once patients get denture their oral hygiene is not the same anymore and the

effort to keep the oral cavity and the denture clean gets harder in accordance with their age. A removable restoration makes the practicing of good oral hygiene more difficult, because it covers oral mucosae. All dental prostheses placed into the mouth for some time become a surface for plaque accumulation. Plaque may collect on the covered tooth surfaces and on the denture, especially if the surface is not well polished, porous and rough. Food trapping is very common in the dental prosthesis so a very attentive design and a perfect polishing is necessary. Fulfillment of the oral hygiene aspects is significant in partially edentulous patients because most of them lost their teeth due to caries or periodontal disease.

Aim and objectives

The aim of this research is to describe the overall hygiene of dentures and oral cavity of elderly people. There were investigated the level of knowledge related to dentures, oral hygiene habits related to the type of denture, material of the denture and their effects on hygiene. Additionally, the history of the patients wearing dentures, the period they worn dentures and the number of dentures they had formerly was registered. In conjunction with the above this study evaluates the way the patients brush their dentures and the oral cavity, if they sleep or not with the denture, how often do they brush, if they are smokers and if they take medication.

MATERIAL AND METHODS

Data collection

The target population of the study were people wearing dentures who were presented for consultation and treatment at the "Faculty of Dental Medicine", Timisoara, between February and April of 2017.

Inclusion criteria: patients wearing removable dentures, over 50 years old, which are residents of Romania. Exclusion criteria: dentures made out of the three main materials metal, polyacrylic and thermoplastic.

Informed consent of each patient included in the study was obtained. A questionnaire consisting of 20 questions was administrated. For each patient the following data were extracted from the questionnaire: demographic data (age, residence urban/rural), history of wearing denture: wearing denture period, last extraction, type of the denture: polyacrylic, skeletal, plastic, the denture cleanliness, daily hygiene habits including type and frequency of toothbrushing and also the presence of smoking and medication. The perception related to the necessity of replacing the existing denture and the performance of cleaning denture were also assessed.

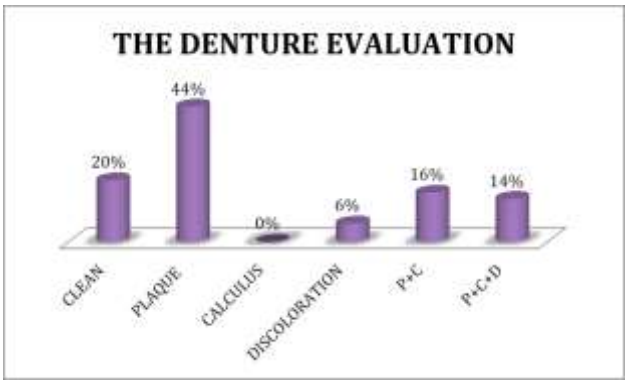
All the answers were counted and converted into percentages for comparative reasons.

In the same session the complete oral examination was performed and denture hygiene was evaluated and noticed in the dental file.

RESULTS

The sample consists of 50 subjects, 66% came from Timisoara (a total of 33 patients), and 34% of the patients came from a rural area nearby (a total of 17 patients). The maximal age of the people that were included in the study was 95 years old, the mean age being 64 years and 8 months and the minimal age was 50 years old.

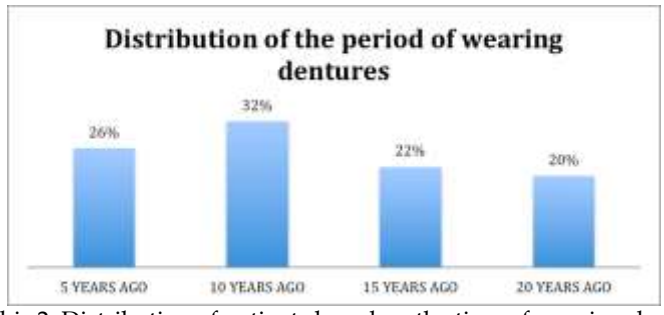
The distribution of patients according to denture classification: 74% of the patients (37 patients) have complete dentures, while only 26% of the patients (13 patients) have partial dentures. 84% of the patients (42 subjects) presented polyacrylic dentures, while 16% of the patients (8 subjects) skeletal based denture.



Graphic 1. Distribution of patients based on denture evaluation: P+C= plaque + calculus, P+C+D= plaque + calculus + discoloration

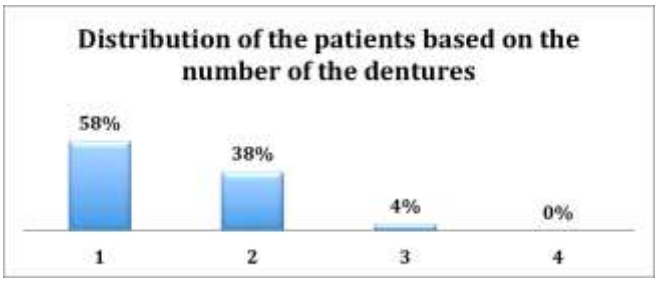
The graphic 1 represents the percentage of patients' dentures distribution based on their cleanliness, as seen above out of 50 patients only 20% (10 patients) of them have clean dentures, 44% (22 patients) of them have plaque in their dentures, no one had just calculus, 6% (3 patients) patients had discolored dentures, 16% (8 patients) patients have plaque compound with calculus and 14% (7 patients) have dentures that contain plaque, calculus and discoloration. The last extraction for 24% of the total number of patients selected was

performed 20 years ago, 38% (19 patients) had their last extraction 5 years ago, 20% (10 patients) – 10 years ago and 18% (9 patients) – 15 years ago.



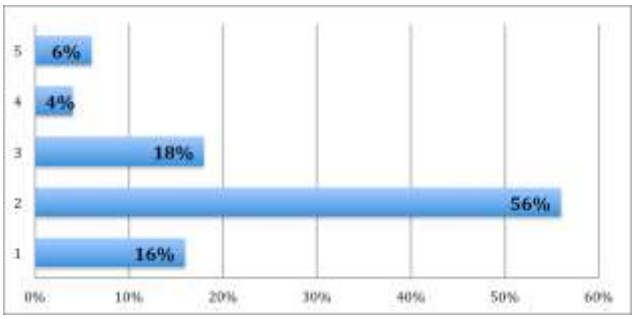
Graphic 2. Distribution of patients based on the time of wearing dentures

The graphic 2 shows the time (years) of wearing the dentures by the patients: 26%(13 patients) since 5 years, 32% (16 patients) since 10 years, 22% (11 patients) since 15 years and 20% (10 patients) since 20 years.



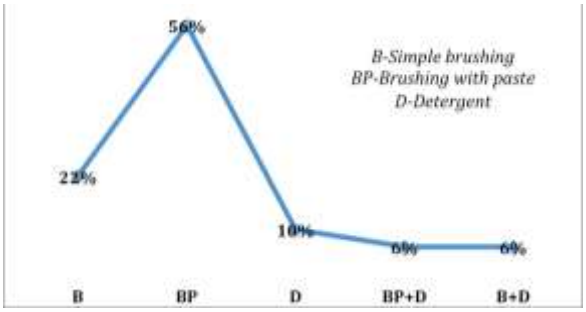
Graphic 3. Distribution of patients based on the number of the dentures

As seen in graphic 3, 58% of the patients (29 patients) had worn just 1 denture in their life, 38% of the patients (19 patients) had worn 2 dentures, 4% of the patients (2 patients) had worn 3 dentures and no one had worn 4 dentures.



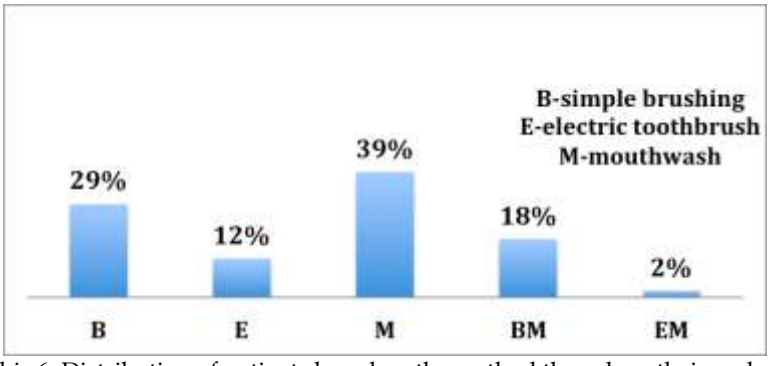
Graphic 4. Distribution of patients based on how many times/day they clean their dentures

The majority of the patients (56%) clean their denture 2 times a day and use paste as the main cleaning agent (graphic 4 and 5). 46% (23 patients) use chemical cleaning for cleaning their dentures, while 54% (27 patients) don't use chemical cleaning.



Graphic 5. Distribution of patients based on the way they clean their dentures

58% (29 patients) remove their dentures while sleeping, in contrary 42% (21 patients) do not remove their dentures while sleeping.



Graphic 6. Distribution of patients based on the method they clean their oral cavity

For the oral cavity hygiene 39% (19 patients) use mouthwash as the main method for cleaning and 62%(31 patients) clean the oral cavity twice/day. Poor oral hygiene and plaque accumulation are the factors that cause both diseases gingivitis and periodontitis. Only a few patients become partially or total edentulous as a consequence of general medical condition or accident. Subsequently, the probability that these patients have poor oral hygiene at the beginning of treatment is high. After professional oral hygiene measurements, evaluation of the patient's ability to maintain good oral hygiene status is necessary. Patients should be recalled and monitored depending on the results of their general oral hygiene. In some cases patients should be seen frequently, in other cases in longer intervals, however, it should be known that regular check-ups and motivation of the patients is mandatory.

DISCUSSIONS

Poor denture hygiene is a common problem experienced by prosthodontics dentists related to their various removable denture patients. Elderly patients, mainly the once with compromised status or physical and mental handicap are not able to maintain good denture hygiene. Nevertheless, the preservation of the denture hygiene is neglected not just by the compromised patients but is frequently seen within healthy denture wearers. This can be associated to the patient's age, lack of motivation, basic knowledge, carelessness or neglect. Denture hygiene and disinfection is crucial for the maintenance of the oral soft tissue health and the removable denture.

Consequently, dentists should educate their patients regarding daily denture cleansing routine to prevent further complications. Almost half of the patients revealed that the dentist who has fabricated the denture had not instructed them previously about denture cleaning methods. This is where the knowledge and the alliance dentist - patient play and important role [8,9].

In this study over 30% patients were wearing removable dentures since 10 years, subsequently leading to these subjects receiving their first removable dentures at their middle 50's. These results counteract slightly with the research paper reported by Canan U. and Yuzbasiogu E. where 145 removable denture wearers had their first denture at their 40's. In a survey among 1545 Turkish subjects were reported that approximately 88% of the patients in the age of 65-74 year old had 10 or more missing teeth [10]. These differences could be related to urban/rural origin and their educational status. The relation between residency area, socioeconomic level and education can highly affect the oral hygiene and the removable denture hygiene [1].

In this paper the majority of the subjects (66%) where coming from urban area, mainly Timisoara city and this fact directly leads to increased socioeconomic status and educational

level meaning higher individual access to dental clinics and increased oral and denture hygiene.

In this study 74% of patients were complete denture wearers. Being a complete denture wearer may lead to many complications related to hygiene, encountered mainly in older and ill-fitting dentures. In order to increase mastication performance, patients use in daily basis denture adhesives, which have great results although these adhesives could promote the growth of Candida albicans on denture material. Polyacrylic dentures provide great nests for microorganisms especially for Candida albicans [11].

This study also revealed that 84% of subjects had polyacrylic dentures that might decrease overall oral and denture hygiene. On the other hand 16% of denture wearers had metal-based dentures, mainly removable partial denture. These dentures are narrower and thinner, metals density is higher so porosity its decreased and the plaque accumulation is slightly reduced.

The results indicated that many subjects used their denture at least 10 years, which is not recommended. As national and international guidelines suggest dentures should be renewed each 5 to 8 years since the bone is resorbed leading to loose denture and tissue inflammation.

In this research brushing with toothpaste was the most elected way of cleaning denture. The toothpaste has an abrasive effect on acrylic resin, is simple and cost effective. As a method of cleaning were distinguished: simple brushing, just soaking or a combination of both methods. These results were in accordance with previous studies [10]. Even though the guidelines of American College of Prosthodontics recommend that dentures should be cleaned meticulously daily by soaking and brushing with a nonabrasive denture cleanser these recommendations are not precisely respected [12].

Cleansing tablets it is an additional way of cleaning and disinfecting the dentures. These tablets contain active oxygen and antimicrobial agents that help remove the plaque and the stains. Such pills used daily into a glass of water will prevent gum irritation. Regardless of its benefits, lower rate of patients use it due to higher costs and lack of information. Based on this study 46% of patients use cleansing tablets regularly [13].

The results of this paper indicated that almost half of the patients sleep (42%) with their dentures during the night. This result is in accordance with other studies but this high percentage has decreased in time as patients and dentists nowadays are more informed related to denture maintenance. Sleeping with denture can lead to slowly, hidden symptoms like bone resorbing, gradual decrease of the bone volume and density. Full or partial dentures should be removed during the night to give to gums and other denture bearing tissues time to rest, recover and receive antibacterial

agents provided by saliva [14].

Based on the results 56% of patients wash their denture twice a day, while 62% wash their oral cavity twice a day. 76% patients think their dentures are enough clean. The denture is more retentive to debris and plaque so auto-cleaning mechanism is lower than in the natural teeth. Patients do not have the opportunity to remove and clean their dentures and teeth after each meal. Overviews to maintain a good oral hygiene are as below: the parts of the denture should be placed far from the marginal gingivae, retentive elements and connectors as few as possible, materials used must be smooth [15].

According to literature different number of views on how many times should the denture been clean, some state at least once a day while some other authors would recommend cleaning the denture after each meal. In addition all the authors came in a common point where dentures should be maintained as clean as possible since they were more retentive to plaque and calculus then healthy teeth.

Daily tooth brushing is the main mechanical way of cleaning the teeth and reduces plaque accumulation and oral tissue inflammations. Manual and electric toothbrushes are not

able to cover all the surfaces of the teeth that is why accessory-cleaning supplements should be used: interdental brushes, flossing and mouthwashes. Occlusal fissures and interdental spaces are the most frequent sites for plaque accumulation, caries development and beginning of the periodontal problems. These areas are harder to be reached mechanically by the toothbrushes and mouthwashes help to reduce the acidity and reduce plaque accumulation.

It is well documented that mouthwashes might generate natural and artificial tooth discolorations. According to the results obtained by this paper 39% of the patients that completed the questionnaire used mouthwash to clean their oral cavity. In contradict this result is higher compared with the publications of Tatiana V.Macfarlane and Michael M.Kawecki where out of 3022 participants of Scotland only 20% of them used mouthwashes in daily bases [16].

The oral health risk of smoking doesn't get much attention since it is not that threatening as neoplasms, but never the less its effects are well documented. Smoking constricts the blood flow of the oral cavity and forms a perfect place to grow bacteria. Smoking also causes halitosis, it increases the healing time of any dental surgery, cause discoloration of the natural teeth and dentures, raise the risk of getting oral cancer. Based on the statistical analysis of this paper 30% of the patients are smokers, being moderate smokers with average 13 cigarettes per day. Elderly patients having a weak physical and psychological status smoking can endanger their general health; so quitting as soon as possible is the excellent solution for a vigorous life [17].

In this study 74%(37 patients) think they need a new denture. Among five and maximum eight years each patient should have a new denture, since after that period of time denture will not fit correctly, will be abraded and it will be a reservoir for plaque and bacteria accumulation. These bacteria do not harm just the oral cavity but also the general health of the patient. The majority of the patients are aware that they need new dentures and this is related to their ill-fitting dentures. In contrary, the larger part thinks that their dentures are clean enough and patients are not aware of the risks that come from bacterial accumulation.

CONCLUSIONS

Based on the questionnaire and the clinical evaluations dentures are not cleaned adequately even though patients think that their dentures are clean enough. Even though a high number of patients think that they need a new denture there is a lack of knowledge related to good oral health practices. The most common way of cleaning the dentures is by brushing with the paste, followed by soaking and simple brushing. The results indicated that almost half of the patients wear dentures while sleeping and half of them don't use cleansing tablets.

Definitely there is necessary to improve the oral health education of patients wearing dentures.

REFERENCES

1. Zarb, George et al.: Proshtodontic Treatment for Edentulous Patients Complete Dentures and Implant – Supported Prostheses.12th ed., Elseveier Mosby, 2003: 123
2. Haider F. Countries with the largest aging Population on the world. Retrieved on 4 Nov 2017 from http://www.worldatlas.com/articles/countries-with-the-largest-aging-population-in-the-world.html
3. Hope J. Why women live longer then men.Retrieved on 4 Nov 2017, from http://www.dailymail.co.uk/health/article-72255/Why-women-live-longer-men.html

4. Scientific American. Why is life expectancy longer for women than it is for men? Scientific American. 2004
5. Miller-Keane Encyclopedia and Dictionary of Medicine.2017 Retrieved on 20 Oct 2017, from https://medical-dictionary.thefreedictionary.com/denture
6. The American Heritage Medical Dictionary 2007.2017 Retrieved on 20 Oct 2017, from https://medical-dictionary.thefreedictionary.com/denture
7. NegrutiuM, Sinescu C, Sandu et al: Complete Denture Technology, Timisoara Marineasa, 2004: 2- 11
8. Cakan U, Yuzbasioglu E, Kurt H, Kara HB, Turunç R, Akbulut A, Aydin KC. Assessment of hygiene habits and attitudes among removable partial denture wearers in a university hospital. Niger J Clin Pract. 2015 Jul-Aug;18(4):511-5
9. Suresan V, Mantri S, Deogade S, Sumathi K, Panday P, Galav A, Mishra K. Denture hygiene knowledge, attitudes, and practices toward patient education in denture care among dental practitioners of Jabalpur city, Madhya Pradesh, India. J Indian Prosthodont Soc. 2016 Jan-Mar;16(1):30-5
10. Cakan U, Yuzbasioglu E, Kurt H, Kara HB, Turunç R, Akbulut A, Aydin KC. Assessment of hygiene habits and attitudes among removable partial denture wearers in a university hospital. Niger J Clin Pract. 2015 Jul-Aug;18(4):511-5
11. Suresan V, Mantri S, Deogade S, Sumathi K, Panday P, Galav A, Mishra K. Denture hygiene knowledge, attitudes, and practices toward patient education in denture care among dental practitioners of Jabalpur city, Madhya Pradesh, India. J Indian Prosthodont Soc. 2016 Jan-Mar;16(1):30-5
12. Felton D, Cooper L, Duqum I et al. Evidence- based guidelines for the care and maintenance of complete dentures: A publication of the American College of Prosthodontists. J Prosthodont. 2011; 20 (Suppl): S1-S2
13. Marchini L, Tamashiro et al. Self- reported denture hygiene of a sample of edentulous attendees at University dental clinic and the relationship to the condition of the oral tissues. Geradontology 2009
14. Dr Kristen Vilardi-Shanley. Sleeping in dentures. Retrieved on 16 May 2018, from http://www.deardoctor.com/inside-the-magazine/issue-30/sleeping-in-dentures/
15. Maille G, Saliba-Serre B, Ferrandez AM, Ruquet M. Use of care and the oral health status of people aged 60 years and older in France: results from the National Health and Disability Survey. Clin Interv Aging. 2017 Jul 31;12:1159-1166
16. Macfarlane TV, Kawecki MM, Cunningham C, Bovaird I, Morgan R, Rhodes K, Watkins R. Mouthwash use in general population: results from adult dental health survey in grampian, Scotland. J Oral Maxillofac Res. 2011 Jan 1;1(4):e2.
17. Maló PS, de Araújo Nobre MA, Ferro AS, Parreira GG. Five-year outcome of a retrospective cohort study comparing smokers vs. nonsmokers with full-arch mandibular implant-supported rehabilitation using the All-on-4 concept. J Oral Sci. 2018 May 10. doi: 10.2334/josnusd.16-0890. [Epub ahead of print] PubMed PMID: 29743383.

In Vitro Evaluation of The Antibacterial Activity of Different Endodontic Irrigants on Specific Cultures of *Enterococcus faecalis* using the Agar diffusion method

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Abstract

The aim of the present study was to evaluate the antimicrobial efficiency of 2% and 5.25% sodium hypochlorite NaOCl, 2% chlorhexidine CHX and 17% EDTA solution against specific Enterococcus faecalis cultures by direct contact with the cultures seeded on two different culture media.

Material and methods. Two plates with culture media, Columbia Blood Agar and MacConkey Agar, were seeded with a strain of Enterococcus faecalis ATCC 29212 and sterile papers impregnated with the above mentioned irrigants were placed on the plates, five papers each. The Agar plates were incubated in aerobic environment at a temperature of 37 °C and after 24 hours, the size of the growth inhibition zone around each impregnated paper was evaluated.

Results. According to the observations of the present study, from of all the tested endodontic irrigants, the most effective are CHX 2% and 5.25% NaOCl, followed by 17% EDTA and 2% NaOCl.

Conclusions. On both culture media, the effects of irrigating solutions on the E. faecalis strain were the same.

Keywords: *Enterococcus faecalis, endodontic irrigants, sodium hypochlorite, chlorhexidine, culture med*

INTRODUCTION

Cell culture studies have demonstrated that the microbiota of endodontically treated teeth with apical periodontitis contains two predominant species: Gram-positive bacteria and Enterococcus faecalis, which is the most common microorganism in persistent and asymptomatic endodontic infections [1,2]. These results can be explained by the varied survival and virulence factors of E. faecalis, who has the ability to compete with various microorganisms, to invade the dentinal tubules and to withstand the lack of nutrients.

Enterococcus faecalis is a persistent microorganism and despite being found in a small percentage in the untreated infected root canal microflora, plays a major role in the etiology of apical periodontitis after endodontic treatment. It is often encountered in a large proportion in cases of failures of endodontic treatment and can survive in root canals as a single organism or as a major component of the microflora [1,2].

Therefore, various irrigating solutions are used during and immediately after root canal preparation to remove debris and necrotic pulpal tissue, and to eliminate microorganisms that cannot be reached by mechanical instrumentation [3]. In consideration of these factors, the purpose of this study was to evaluate the antimicrobial efficiency of 2% and 5.25% sodium hypochlorite NaOCl, 2% chlorhexidine CHX and 17% EDTA solutions against specific Enterococcus faecalis cultures, by direct contact with the cultures seeded on two different culture media.

MATERIAL AND METHODS

The Agar Diffusion Method. The method of Agar diffusion was used, in the same manner as the Antibiogram disk diffusion method, replacing sensitivity paper discs with sterile papers impregnated with the tested irrigating solutions. Antibiogram testing allows the evaluation of the sensitivity of microorganisms to different antibiotic agents. Impregnating sensitivity sterile papers with the testing agent on the culture media causes a halo of microbial growth inhibition. The size of this halo shows how effective is the tested agent.

Two plates with culture media, Columbia Blood Agar and MacConkey Agar (Fig. 1A and 1B), were seeded with a strain of Enterococcus faecalis ATCC 29212 using the inoculation loop. Once seeded, the impregnated papers were placed on the plates, five papers each, as follows:

1 - Paper impregnated with saline solution NaCl 0.9%
2 - Paper impregnated with 2% NaOCl solution (Chloraxid 2%, Cerkamed, Poland)
3 - Paper impregnated with 5.25% NaOCl solution (Chloraxid 5.25%, Cerkamed)
4 - Paper impregnated with 17% EDTA solution (Endo-Solution 17%, Cerkamed)
5 - Paper impregnated with 2% Chlorhexidine (CHX) (Gluco-Chex, Cerkamed)

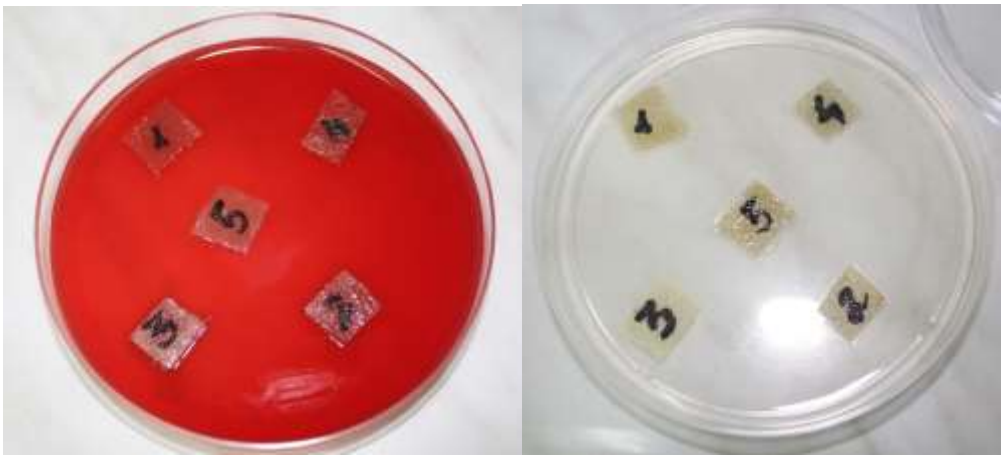

Figure 1. A - Columbia Blood Agar medium; B - MacConkey medium, with papers impregnated with endodontic irrigants before being placed in the incubator at 37 °C.

The Agar plates were incubated in an aerobic enviroment at a temperature of 37 °C and after 24 hours were checked for the development of the E. faecalis. The size of the growth inhibition around each impregnated paper was evaluated.

RESULTS

After the 24 hours incubation, interpretation of the results was made by direct observation, evaluating the size of the halo obtained by inhibiting the growth of the bacterial colony of E. faecalis and its destruction around the impregnated paper with each irrigant. The higher the extension of the bacterial growth inhibition area was, the higher the efficiency of the irrigation solution was considered.

It can be observed that the saline solution (1) had no effect on the E. faecalis (the control group). The halo around the paper impregnated with 5.25% NaOCl (3) is much extended than the one around the same solution at 2% (2), so 5.25% sodium hypochlorite is more effective than 2% (Fig. 2).

The effect of Chlorhexidine 2% (5) is the most potent on E. faecalis, as the halo around the CHX solution is the largest of all five.

A significant halo around the 17% EDTA solution (4) was observed, so the EDTA solution inhibited the bacterial growth, but while the inhibition areas formed around the hypochlorite and chlorhexidine solutions are well delimited by the E. faecalis culture, the one formed around the EDTA solution is more diffuse.

Figure 2. The results of the experiment; the Agar plates after 24 hours of incubation, with the corresponding halo of each irrigant. CHX (5) was the most active, followed by NaOCl 5.25% (3) and EDTA 17% (4)

DISCUSSIONS

The results obtained from the present study showed that both NaOCl and CHX inhibit the growth of E. faecalis on culture plates, with the last one slightly superior. Our study corroborates the findings of Echeverri, D. & Alderete, D. (2015) [4] who demonstrated that 2% CHX inhibits bacterial growth more than NaOCl at different concentrations, using the Agar Diffusion Method.

Findings from in vitro studies must be carefully interpreted and extrapolated to the clinical environment. Additionally, sensitivity of microorganisms to antimicrobial agents in vitro is far greater than in vivo conditions.

Inside the root canal, microorganisms display several mechanisms to increase resistance and survival. For this reason, it is desirable to use irrigants in higher concentrations available to provide an acceptable antimicrobial effect [4]. Furthermore, regardless of the type of the irrigant used, the bacterial population inside the root canal is significantly reduced by the mechanical effects of irrigation [5].

Root canal irrigants should also have other characteristics, such as high detergent power, low surface tension, easiness of handling and high proteolytic and tissue dissolving power. CHX does not possess pulpal tissue dissolving ability unlike NaOCl [6, 7].

CONCLUSIONS

According to the observations of the present study, we concluded that from all the tested irrigants, the most effective are CHX 2% and 5.25% NaOCl, followed by 17% EDTA and 2% NaOCl.

In both culture media, the effects of solutions on the E. faecalis strain were the same.

REFERENCES

1. Evans M, Davies JK, Sundqvist G, Figdor D. Mechanisms involved in the resistance of Enterococcus faecalis to calcium hydroxide. Int Endod J 2002;35:221– 8.
2. Stuart CH, Schwartz SA, Beeson TJ, Owatz CB., Enterococcus faecalis: its role in root canal treatment failure and current concepts in retreatment, J Endod. 2006 Feb;32(2):93-8.
3. Ferraz CC, Gomes BP, Zaia AA, Teixeira FB, Souza –Filho FJ. In vitro assessment of the antimicrobial action and the mechanical ability of chlorhexidine gel as an endodontic irrigant. J Endod. 2001;27:452-5.
4. Echeverri, D. & Alderete, D. In vitro antibacterial effect of 2% chlorhexidine against Enterococcus faecalis in dentin previously irrigated with 5% sodium hypochlorite. Int. J. Odontostomat., 9(1):25-29, 2015.
5. Siqueira JF Jr, Lima KC, Magalhaes FA, Lopes HP, de Uzeda M. Mechanical reduction of the bacterial population in the root canal by three instrumentation techniques. J Endod. 1999;25:332–5.
6. Menezes MM, Valera MC, Jorge AO, Koga-Ito CY, Camargo CH, Mancini MN. In vitro evaluation of the effectiveness of irrigants and intracanal medicaments on microorganisms within root canals. Int Endod J. 2004;37:311-9.
7. Estrela C, Silva JA, de Alencar AH, Leles CR, Decurcio DA. Efficacy of sodium hypochlorite and chlorhexidine against Enterococcus faecalis-a systematic review. J Appl Oral Sci. 2008; 16:364-8.

Technological aspects in manufacturing of an implant supported prosthetic reconstruction with the help of a subtraction technique

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Abstract

The objective of the present paper is the highlighting of technical stages and aesthetic outcome for two types of implant supported zirconium oxide prosthetic. This theme has been chosen because implant supported prosthetic reconstructions are one of the most effective treatment methods nowadays.

Keywords: *implant, implant supported reconstructions, zirconium oxide, layering*

OBJECTIVE

The objective of the present paper is the highlighting of technical stages and aesthetic outcome for two types of implant supported zirconium oxide prosthetic. This theme has been chosen because implant supported prosthetic reconstructions are one of the most effective treatment methods nowadays.

MATERIAL AND METHODS

The design of a fixed partial prosthesis is an essential factor in the success of an implant supported fixed partial denture. The design will be established taking into account the following factors: anatomical structures interested type of reconstruction, the materials to be used, clinical and laboratory steps, functional requirements, aesthetic requirements of the patient (1)

For a long term succes of the implant and its supported reconstructions, basic complience are: the type of used material, implant design, atraumatic implant insertion, congruence form at the bone-implant interface, primary stability, ossteo-integration, physiological loading (2).

RESULTS

Laboratory steps started for case 1 by pouring the alginate impression in order to pour the preliminary cast (Pro Solid Super plaster) for and the custom tray Elite LC tray which was polymerized for 3 minutes in the Ivoclar LUMANAT furnace.

The custom tray was sent to the office to record the silicon impression.

After the functional impression reached the technical laboratory, it is disinfected for 10 minutes by immersing it in the antibacterial solution, (Silosept).

Figure 1. Applying silicone for obtaining the gingival mask; pouring the working cast; obtaining the removable dies; mounting in a semi-adjustable articulator

The analog was positioned onto the transfer abutment, and the Gingi Fast silicone was applied with a dispencer. After setting, Fujirock class 4 extra hard prepared was prepared using the Harnisch-Rieth vacuum mixer. Removable dies were obtained by sectioning of the cast medial and distal to each removable segment. For detaching the the removable parts of the cast from the base made out of Vario Super Sockel plaster class 4, the IZO JET special solution was previously used. Next mounting into Artex Tip C articulator was accomplished. A Mis, standard screwed abutment with a 15 ° angulation was used. The 15-degree abutment is positioned so as to correct the implantation axes.

The abutment has been adjusted to height, the spaces being checked in all directions, in the middle, distal, vestibular and lingual. The margins, cervical limit of the abutment were milled by means of surveyor (F18) up to the cervical margin of the future zirconium copings. A juxta-gingival position of the shoulder of the abutment was established so as to mask the junction between the zirconium coping and the abutment. The marginal fit was checked using a microscope (Microscope Mantis Vision). The zircon reconstruction was milled using Cerec System.

Prior to scanning, the working cast was prepared, any excess or impurity was removed and Helling 3D spray eas used to insure an accurate scanning and to avoid glossy surfaces.

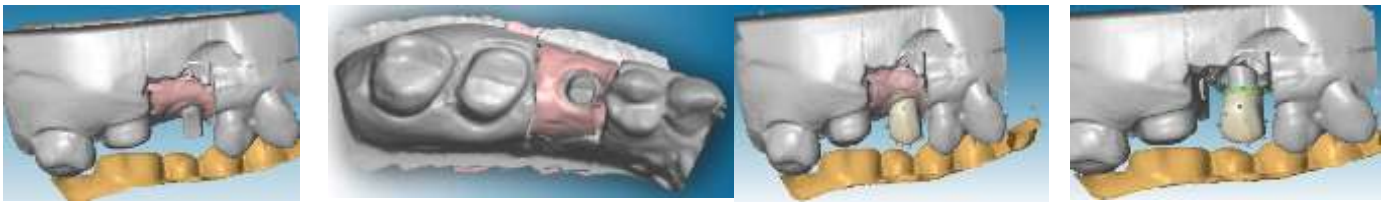

Figure 2. Vitual cast- buccal and occlusal view; correction of buccal convexities improved with the help of the gingival mask; view of the entire crown length when gingival mask is removed

The working cast was positioned into the scanner, fixed onto the scanning support and then the scanning process was started. A 3D view – virtual cast was obtained using the 3D scanning software (3). The area of interest was selected and next the software calculated the position of each element of the future fixed partial denture. Then the virtual cast is checked and opposed arch is also scanned. The design of the future prosthetic reconstruction is established.

With the help of the software, the desired clinical case is selected with specification of the following parameters: the virtual cast image, the removable die and the material to be used. The insertion axis of the future reconstruction as well as the buccal and oral area of the cast, along with the space for the cement film and the cervical limit of the preparation will be determined with the help of the computer. Corrections of the cervical margins were done also manually, by the technician.

The thickness of zirconia copings (0.4 mm) is also set here, which must be consistent with the topography of the restoration. Once the computer design process has been completed, the support rods are attached, the zirconium block is inserted and the data is sent to the milling machine.

Milling process followed (12 minutes each) using Cerec MCXL (4). The rods were cut, the zirconium copings were removed. All angles, marginal edges and remaining irregular surfaces were finished prior to sintering and the milled reconstruction was checked for proper axial wall and connector thickness in accordance with the above-mentioned dimensions. The infrastructure was sanitized with oil free solutions and dried completely before staining.

Figure 3. Milled structures before sintering and after sintering. Sintered copings on the working cast; the wash layer; dentin layer

The structure was immersed in staining liquid for 2 minutes, then dried with a cotton or sponge. The infrastructure is placed on the sintering bed and is further let to dry out in the cold furnace for approximately 2 hours, then sintered at 1450 ° C for about 9 hours. Following thermal treatment, zirconium oxide suffers a contraction of approximately 20% and an important increase of flexural strenght of the zirconium reconstruction occurs, surpassing that of metal. During finishing, to avoid overheating of the infrastructure only light pressure is applied. Noritake ceramic was used for layering (5).

The foundation - the wash layer, to connect the zirconium oxide to the ceramic layers. In this step a foundation layer is applied to the surface of the zirconia. It has the role of creating a better bond between the coping and the layering ceramic. The infrastructure was

covered with a thin layer of glaze, then a thin layer of foundation (wash) was loaded onto the brush and spread on the surface of the infrastructure. The foundation sintering took place at 940 ° under vacuum.

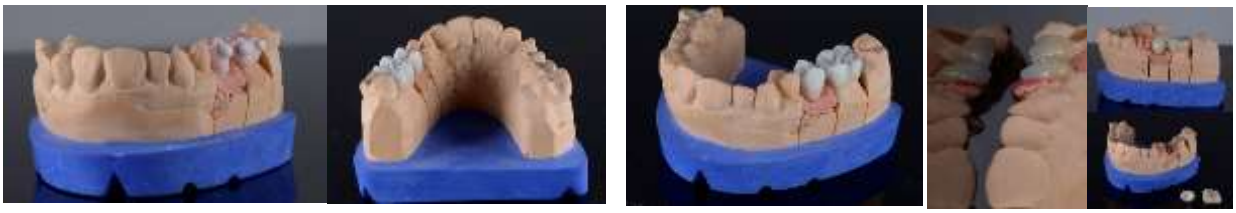

Figure 4. Occlusal third reconstructed with enamel; Enamel layer, distal and buccal view; Finished, glazed restorations

The dentin layer was applied with a Smile Line, a 4, 6, 8 scalpel, on the lingual, a root canal instrument was used for morphological details, a special separator (Noritake Magic Separator) on the proximal faces of the neighboring teeth, and the wipes for the excess of water. At the first firing, two ceramic CV2 and B2 ceramics were mixed in a proportion of 2 to 1. In the cervical third an opaque dentin with the ability to reflect light and enhance the chromaticity. Before the ceramic application was mixed with the special modeling liquid from Noritake, Meister Liquid.

The application of the dentine paste started from cervical towards incisal, aiming to form a thin layer on the entire surface. The anatomy of the teeth was shaped to the final volume and the cutback to make the enamel place (TX mixed with the Blue pigment). The modeling was made oversized to compensate for the contraction of the ceramic at the first sintering at 935 ° with a vacuum.

After checking of the morphological details and occlusion, removed from the cast, follows the completing on the proximal faces respecting the stratification and sintering

For the second layer, E1ceramic material has been used which has the property of reflecting light and providing a brightness and increased natural aspect of the restoration. The second firing was carried out at 930 ° C with vacuum in the Vivadent Ivoclar furnace. At the second burning, the same set of instruments is used as in the application of the dentin layer. Once the E1 layer is applied, as compact as possible and then sintered. After sintering and cooling, the restoration is checked on the cast and processed and finished with diamond burs for obtaining the specific surface texture.

The work is glazed to prevent fluid absorption from the buccal environment and to obtain a glossy surface imitating the enamel of natural teeth. After sintering, the work was verified for need of morphological corrections and final glazing layer was set on the surface of the reconstruction (External Stain glazing kit. Noritake).

DISCUSSIONS

Failures related to the healing of implants result from the micro-deposition of implants subjected to too much stress. Early bone loss in bone may be related to occlusal overload conditions. Fracture may occur in implants or components under stressful stresses. In addition, the manifestation of biomechanical tasks on dental implants controls the long-term health of the bone-implant interface. (6)

Dental implants are subject to occlusal tasks when placed in function. They can vary greatly in size, frequency, and duration depending on patients' para-functional habits (7).

CONCLUSIONS

Both cases of implant supported reconstructions had a good functional integration and very good aesthetic results over a long period now.

Perfect surgical conditions, along with a good bone support and faultless lab manufacturing, insure perfect integration of the implant and prosthetic reconstructions.

REFERENCES

1. Prof. Univ. Dr. Norina Consuela Forn, Ghid de Practică în Protetica Dentară: 2010).
2. Mihaela Baciut, Implantologie orală, editura Medicală Universitară " Iuliu Hatieganu, Cluj-Napoca, 2007, pg 42.
3. https://www.dentsplysirona.com/en/products/cad-cam/dental-practice/scan-with-cerec.html
4. https://www.dentsplysirona.com/en/products/cad-cam/dental-practice/produce-with-cerec.html
5. https://www.ncofi.org/class/basic-training-introduction-of-noritake-czr-porcelain/
6. Carl E. Misch-Dental Implant Prosthetics-Editura Elsevier, 2005
7. Adrian Petrea- Echilibrul gnatologic în implantologia orală modernă, editura ALFA, Iaşi 2008

Technical aspects in the restoration of arches in the front area by layering of pressed structures

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Abstract

The present paper aims to show the advantages from a technical point of view of pressed technique in manufacturing ceramic restorations, highlighting at the same time the versatiliy of two different systems, that enhance the obtaining of excellent esthetic results, using different layering techniques.

Keywords: *pressed ceramic, coping, layering, esthetic*

INTRODUCTION

In the current prosthetic treatments, fixed ceramic restorations (veneers, inlay, onlay, jacket crowns) hold an important place, being more and more demanded by patients, for they very well meet both the aesthetic and functional needs.

Objectives

The present paper aims to show the advantages from a technical point of view of pressed technique in manufacturing ceramic restorations, highlighting at the same time the versatiliy of two different systems, that enhance the obtaining of excellent esthetic results, using different layering techniques.

MATERIAL AND METHODS

Among the additive techniques, pressing techniques are wide-spread today, due to the features of the technologic process and the benefits it offers (1)(2). The principle is based on the obtaining of either a full contour wax pattern or a coping, sprueing, investing and pressing.

The lost wax technique- a technique within reach of all technicians, along with the inexpensive laboratory equipment, and the versatility of the current systems covering all types of prosthetic reconstructions make pressed technology to be extremely used today.

The Ivoclar company has developed and improved the pressing systems as follows (3): Empress 1-monochrome full contour leucit reinforced ceramic, external painting and then sintering, Empress 2 - a coping of 0.8 mm thick glass ceramic reinforced with lithium disilicate to be coated with fluorapatite ceramic layers, IPS e.max - lithium disilicated glass ceramic for small restorations and high strength zirconium oxide for extended prosthetic restorations (4).

Emax provides for the construction of structures - copings or full contour reconstructions – the pressing and milling system, the latter technique using the IPS e.max lithium disilicate blocks or the zirconia emax ZirCAD zirconia blocks, depending on the clincal case requirements. For the pressing technique, a lithium disilicate glass ceramic IPS e.max is used, whilst for the overpress technique, the pressed cast ingot is a fluor-apatite glass-ceramics (IPS e.max ZirPress) (5).

IPS e.max press is suitable for: table tops, veneers, inlays, onlays, partial crowns, crowns in the front / lateral area, bridges of 3 elements in the anterior area, bridges of 3 elements in the premolars area up to the second premolar such as implant supported crowns and bridges. IPS e.max Press, the system used for prosthetic treatment of cases in the present study comprises lithium disilicated glass ceramic casting for the pressing technique. The industrial production process creates absolutely homogeneous ingots of different translucency levels with a flexural strength of 400MPa. By pressing ingots of different translucency/opacity aesthetic restorations result, which are individually then glazed with IPS e.max Ceram

Two cases of reconstructions in the frontal area were carried out using fully pressed ceramic crowns using the e.max system (Ivoclar): case 1 - female patient with need of tooth restoration of 1.2, 1.1, 2.1, 2.2. discromic teeth, so that the chosen solution was medium-opaque-shaped restorations, llayerd with lithium-disilicate and fluorapatite ceramics; The case of 2-teeth 1.1, 1.2 without discromy, reconstructed by 2 full-anatomic ceramic crowns, through the IPS e.max Press press system and IPS emax Ceram from Ivoclar Vivadent.

RESULTS

After scaling and proofessional cleaning, the color of the tooth has been determined as well as the colour of the adjacent teeth by means of the color keys. Individual features should be considered.

The impression used 2 silicones with different consistencies. After being hygienized and disinfected, it was sent to the laboratory.

Figure 1. Silicone and alginate impressions for case 1 (A,B,C) and impression of the arc with prepared teeth case 2 (D)

Also, the color of the prepared abutment using the IPS Natural Die Material color key was established. This has enabled the technician to manufacture a composite resin die similar as color to the patient's prepared tooth adapted to the working cast. Shade maping was done in the daylight, without the patient wearing intensely colored, contrasting clothes or lipstick. For the 4 ceramic reconstructions, the base color A1 was selected from the A-D color key whilst for the second case, the color was A2.

Figure 2. Shade selection case 1

The cast with removable dies was made out of GC Fujirock Class IV gypsum. An insulating coat and then a 2-layer spacer up to 1 mm from the edge of the preparation were applied. The mounting into a simulator was done using the facial arc in the BioArt semi-adaptable articulator.

Figure 3. Working cast and mounting Case 1(A,B) and case 2 (C-L)

After isolation of the removable dies, the copings using organic wax were obtained, taking into account the available space, the design being set to follow the morphology resulting from grinding and to support the cusps ensuring a uniform thickness of the ceramic layer. [Ivoclar Vivadent technical, IPS E.max Press Monolithic Solution, 2014;1] The dipping technique used and the excessive wax below the shoulder preparation was removed. To ensure resistance during pressing and to prefigure the shape of the crowns, wax was applied to the incisal edges, observing the minimum thickness indicated at 1 mm at the margins of the preparation, 1.2 mm in the middle third and 1.5 mm at the incisal marginal.

Sprueing was performed using a 3 mm wax rods and a 5 mm length positioned in the direction of flow of the ceramic material. Patterns attached to the sprueformer of the investment ring base, have complied with the following requirements: a 45-60 degree, at least11 mm between the ring and wax pattern.

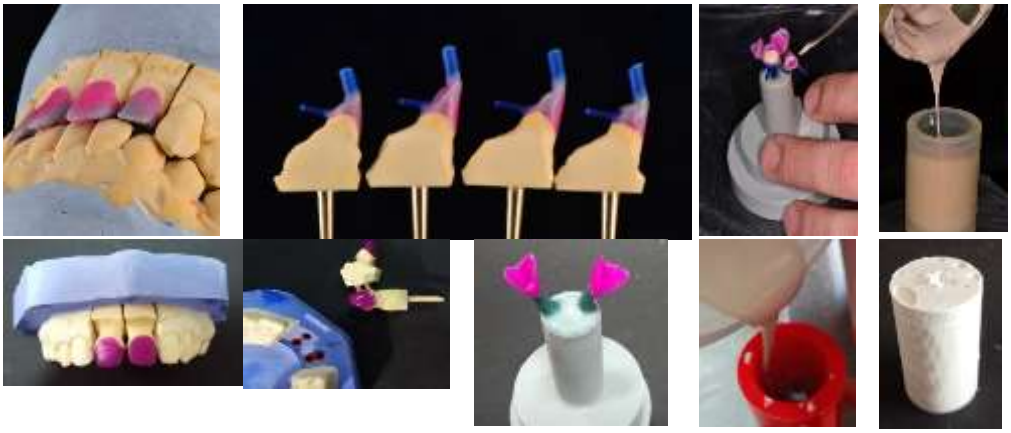

Figure 4. Wax patterns (copings), sprueing, investing for case 1(A-D) and 2 (E-I)

The copings were invested using IPS PressVest Premium (100 g powder / 16 ml liquid and 11 ml distilled water) manually homogenized in a vacuum mixer and then mechanically for 2'50 ''. The filling of the silicone ring was performed on the vibratory table.

Preheating was done at 850 ° C for 45 minutes. For pressing, the Ivoclar Programmed EP 5010(case1) program the MO 0 press /Zubler pressing furnace(case2) was used. Pre set temperature, vacuum and pre-set time parameters were used. Preparation of the Ilo Alox plunger and IPS e.max Press Icy was done in the desired color. The furnace was maintained at 700 ° C prior to mold insertion with the MO 0 ingot and the plunger previously immersed in the Plunger Separator (885° C). After pressing, the following steps were performed: complete gradual cooling of the investment and the pressed object, tracing the length of the plunger, unpacking, sandblasting at a pressure of 2 bar, and removing the reaction layer formed on the surface of the ceramic pressed by the ultrasonic bath.

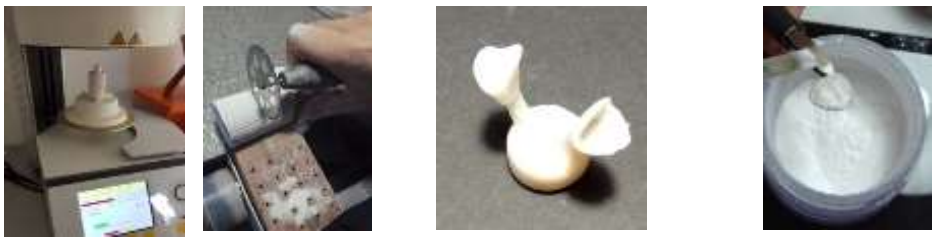

Figure 5. Used ingots, investment, pressed objects, pressed copings on the working cast- case1 (A-E). Pressing furnace, preparation for devesting, pressed objects and preparing for layering: Glaze 750º C, 14 minutes–case 2 (F-I)

The copings were grinded with diamond burs and abrasive stones for pressed ceramics, and in order to reduce a uniform thickness of the copings, guide lines were drawn on the dies. Prior to the actual stratification, a wash firing was performed to provide the bond between the pressed and layered ceramics using IPS e.max Ceram Shade and Essence. Layering is then to be carried out with dentin, incisal, effects and finishing with glazing. [Ivoclar Vivadent technical, IPS E.max Ceram, 2009]

Figure 6. Case1: Reducing the thickness of the copings by grinding; Aspect of the copings after wash foundation sintering;applying Aplicare Power Dentin A1 şi Cervical Transpa orange-pink

The layering began with the application of the Cervical Transpa Orange-Pink mixture in a ratio of 1: 1 in the cervical third of Power Dentin A1 and Cervical Transpa. Power Dentin ceramics provide brightness to the work, being applied over the head with increased opacity, and Cervical Transpa has a deep effect in the third cervical. The primary shape of the restoration was achieved using Power Dentin A1, which helps to reproduce lightly and securely the shade over which a 1: 1 Dentin A1 and Transpa Neutral blend, giving transparency regardless of substrate and imitating

enamel of natural teeth (case1). In case 2, layering of ceramics begins with the application of the first layer of dentin, in this case Deep Dentin A2 and Dentin A2. The layered material was made by mixing the ceramic powder with the special liquid from Ivoclar. This mixture produced a homogeneous paste, easy to apply on the pressed copings.

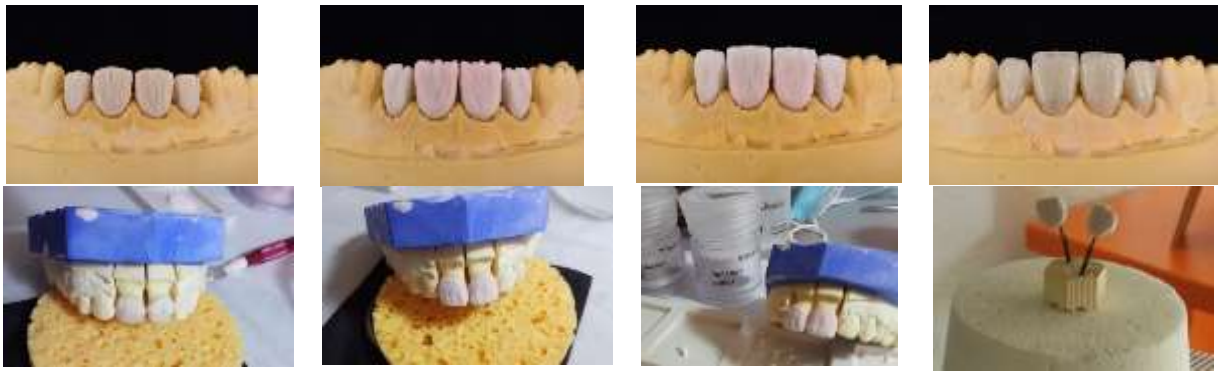

Figure 6. Powder dentine, IPS e.max Ceram Transpa neutral, IPS e.max Ceram Dentin A1, aspect after first firing case1 (A-D). Case 2: Deep dentine, dentine, Opal effect and transpa Incisal(E-H)

Figure 8. Case 1 Applying Dentin, Mamelon Light, Mamelon Salmon cu Visual Eyes Drawing lines for enhancing volume and morphology characteristics. Coloring for highlighting texture.(A-C) Case 2 –aspect after correction; aspect after grinding; aspect after glaze firing D-F)

In case 1 using the cut back technique, place for Opal Effect 1 was created that will provide translucency, opalescence and increased brightness. After removing the shiny, glaze like aspect

by grinding, layering was continued by completing the cervical third with Dentin A1 and individualizing with Mamelon Light (medial and distal) and Mamelon Salmon (middle third). These were mixed with a liquid called Visual Eyes that offers visualization of the chromatic result before the ceramic sintering.

After the second sintering finishing accomplished, and the surface texture was obtained with the help of the cutters, being thus prepared for the glaze layer. The surface of the restoration was colored with the use of articulating paper and thus the surface texture was analyzed.

In case 2, minimal corrections were made in the incisal third, thus applying a thin layer of Transpa Incisal. After the application of the ceramics, the reconstructions were reintroduced into the sinter furnace.

Figure 9. Intraoral aspect of finished pressed crowns case1 (A-D) . Case 2 Final aspect of completed crowns on the working cast (E,F)

CONCLUSIONS

The characteristics of the pressed reconstructions have led to rising percentage of replacement of the metal-ceramic reconstructions, especially in the frontal area but also in the lateral segments of the arch. Very good tinting possibilities; preservation of color in time(chromatic stability), hardness close to that of dental tissues without inducing abrasion of antagonists(6); High flexural strenght (7); Excellent biocompatibility through the surface density of the material and the smooth and glossy appearance of glazed ceramics that prevent adherence of the bacterial plaque, low thermal conductivity that does not transmit the

thermal variations to the abutment, juxta- and supra gingival placement of preparation that implicitly determines the integrity of marginal periodontal tissues, exact impression techniques and the possibility of checking under direct visual control of the limit of preparation both during the intra-oral checking and during the periodic appointments, and last but not least, controlled cementation are all the factors that make both the the dentist and the technician, to be encouraged to use the pressed in current dental treatments.

REFERENCES

1. Kracek F. The binary system Li2O - SiO2. PhysChem 1930:2641-2650.
2. Albakry M, Guazzato M, Swain MV. Biaxial flexural strength, elastic moduli, and x-ray diffraction characterization of three pressable all-ceramic materials. J Prosthet Dent 2003; 89:374-380.
3. Albakry M, Guazzato M, Swain MV. Fracture toughness and hardness evaluation of three pressable all-ceramic dental materials. J Dent 2003; 31:181-188.
4. Ivoclar Vivadent technical, IPS E.max Press Monolithic Solution, 2014;
5. Ivoclar Vivadent technical, IPS E.max Ceram, 2009;
6. Berge HX, Sorensen JA, Edelhoff D. Split energy factor theory in fracture analysis of dental ceramics. J Dent Res 2001; 80:57.
7. Guazzato M, Albakry M, Ringer SP, Swain MV. Strength, fracture toughness and microstructure of a selection of all-ceramic materials. Part I. Pressable and alumina glass-infiltrated ceramics. Dent Mater 2004; 20:441-448.

Technical aspects in single-unit restoration manufacturing using heat-pressed ceramic – a comparison between to press techniques

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Abstract

The purpose of the current study consists in the comparison of two crystalline-reinforced glass based pressable ceramic systems: Willi Geller Creation CP and Ivoclar Vivadent IPS e.max Press. Differences regarding both ceramic system technology and technique particularities were assessed, using two distinct cases: an inlay reconstruction employing full-contour heat-press, followed by external staining (Willi Geller CP) and a crown employing a framework followed by ceramic layering (IPS e.max).

Keywords: *heat-pressed ceramic, framework structure, ceramic layering, external staining, classic veneering technique*

INTRODUCTION

The last decade has known a substantial grow in the interest regarding the applications of all-ceramic systems in dentistry. All-ceramic materials are known to substantially improve the aesthetics of a restoration, bringing the restorations' both shade and texture closer to those of the natural teeth [1-4]. Although initially used only for single-unit restorations, all-ceramic systems can also be employed nowadays for whole-arch restorations [5][6].

Objectives

The purpose of the current study consists in the comparison of two crystalline-reinforced glass based pressable ceramic systems: Willi Geller Creation CP and Ivoclar Vivadent IPS e.max Press. Differences regarding both ceramic system technology and technique particularities were assessed, using two distinct cases: an inlay reconstruction employing full-contour heat-press, followed by external staining (Willi Geller CP) and a crown employing a framework followed by ceramic layering (IPS e.max).

MATERIAL AND METHODS

The Willi Geller Creation CP ceramic system presents the following chemical structure: 60-68% SiO2 (silicone dioxide), 14-18% Al2O3 (aluminium oxide), a small percent of K2O (potassium oxide) and Na2O (sodium oxide) resulting an amorphous glass ceramic [7][8].

The IPS e.max concept comprises both an innovative lithium disilicate glass-ceramic (LS_2) – suitable mainly for single-tooth restorations – and a high-strength zirconium oxide for long-span bridges [9-14].

Figure 1. Case 1: imprsesions of prepared teeth, occlusion ad opposing arch; pouring cast- Zeiser technique (A-F)
Case 2: imprsesions of prepared teeth, occlusion ad opposing arch; pouring cast- Accu trac system (G-I)

Models have been obtained based on the impressions. Mounting into the articulators was performed using the semi-adjustable Artex TK articulator A Yeti Dental die spacer, with both isolating and spacing function, has been applied as following: 1 mm from the preparation limit, in order to ensure a proper marginal sealing; and from 1 to 3 layers for the following locations: layers for the cavity base, pulpal wall; layers axial walls; gingival seat 1 layer). Spacing was performed also previous to modelling the copings, 1 mm from the preparation limit.

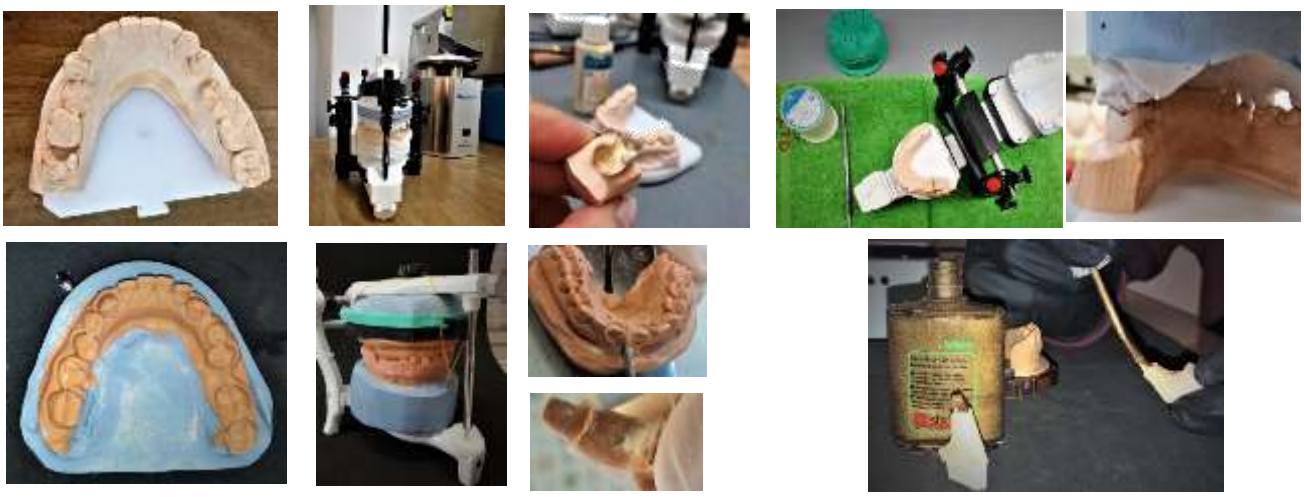

Figure 2. Case 1: working cast; cast mounted into Artex articulator; insulating the die; wax pattern on the working cast
Case 2: working cast; cast mounted into articulator: sectioning the cast; removable die

Organic wax was used for the inlay wax pattern, allowing thus a residuum-free burn-out.

The additive waxing technique respected an anatomic modelling, leading to a correct morphology for the inlay wax pattern. Articulating paper was used for verifying both the occlusal and proximal contacts.

A complete morphological wax pattern modelling enables, after the ceramic pressing, the final custom staining of the restoration, together with proper glazing.

For the restorations which will be pressed using the e.ma system, wax copings (without anatomical contour) were obtained.

Investing was performed using a silicone 200g conformer, employing a Shera Fina investment material powder, together with the Shera Liquid –case 1 and Press Speed West material for case 2. Before investing, the internal part of the conformer and the investment ring base were isolated using vaseline, for a better dethatching of the mold, after the setting of the investment material. The casting sprue has been mounted on the crucible former at a 45-60 degree angle, accordingly to the flowing of the ceramic. The height of the wax pattern, together with the height of the casting sprue respected the value of 16 mm; the distance between the margins of the wax pattern and the walls of the casting ring was over 10 mm.

Figre 3. Case 1: inlay wax pattern (full contour) on the cast; sprued wax pattern attached to the sprueformer; wax pattern centered into the silicone ring; investment material detached from the silicone ring(A-F)
Case2: wax pattern- copings on the etached dies and positioned in the workin cast; sprues attachet to the wax copings; wax copings attached on the sprueformer; investing; set investing material (G-P).

The investment material was prepared, accordingly to the producers indications, in the vacuum mixer; consecutively, the casting ring was filled with 200g of investment material. After the setting of the investing material, the silicone ring was removed and the casting canal was inspected for debris and its base was perfectly levelled. The mold is obtained through the wax evaporation out of the investment mass, by heating intro the oven, at a temperature of 850 degrees for 1 hour. Following the complete elimination of the wax, the pressable ceramic was introduced intro the mold, without previous preheating of the ingot or of the plunger.

Figure 4. Case 1: heating of the investment for obtaining the mold; pressing furnace; devesting; sandblasting of pressed object; cleaned pressed object
Case 2: preheating and heating of the investment for obtaining the mold; pressing furnace; devesting; sandblasting of pressed object; cleaned pressed object

Ceramic pressing was performed using the Gemini2Press (Shenpaz)/ Multimat 2 Touch&Press (Dentsply furnace. The transfer of the mold, from the preheating furnace to the pressing furnace, was done in a shorter than 30 seconds time span, in order to prevent the cooling of the mold. A Willi Geller Creation CP A3 shade ingot (case1)/LT A2 (case2) was introduced into the heated mold, having the non-marked side orientated towards the casting canal, followed by the cold plunger. Afterwards, the pressing process was started, at a temperature of 800 degrees, which gradually rose to reach the final 1050 degrees pressing temperature. The mold was cut with a disc, and the plunger was removed. Sandblasting at a pressure of 4 bar/2 bar was employed in order to remove the investment material from the pressed ceramic crown. The mechanical finishing implied the cutting of the ceramic casting sprue, using a disc. The inlay and the pressed copings were fitted on the model, by finishing both the margins and the casting sprue placement area.

Figure 5. Case 1: Pressed inlay during and after finishing; Make Up Neo kit -Willi Geller; final aspect after staining distal, occlusal and buccal view(A-F).
Case 2: sectioning of the sprues, finishing, copings before wash foundation sintering-first layer of dentin (G-K)

After the try in in the oral cavity, the restoration was degreased, in order to avoid any surface debris or surface impurities. External staining and glazing followed. The custom staining employed the Willi Geller Make Up Neo set, the sintering time being 15 minutes. After the finalising of the sintering program, the inlay was progressively cooled, and was consecutively glazed using the Willi Geller CC Clear glaze. The sintering program was repeated. For the second case wash foundation and then sintering was carried out, then the first dentin layer was modelled and sintering followed again. Cut back was achieved by use of diamond burs, creating thus space for Transpa Incisal. Occlusion and proximal contact points were checked using articulating paper, and buccal face was finished by grinding, obtaining thus its characterisation. Final Glaze layer was sntered at 725^0 C.

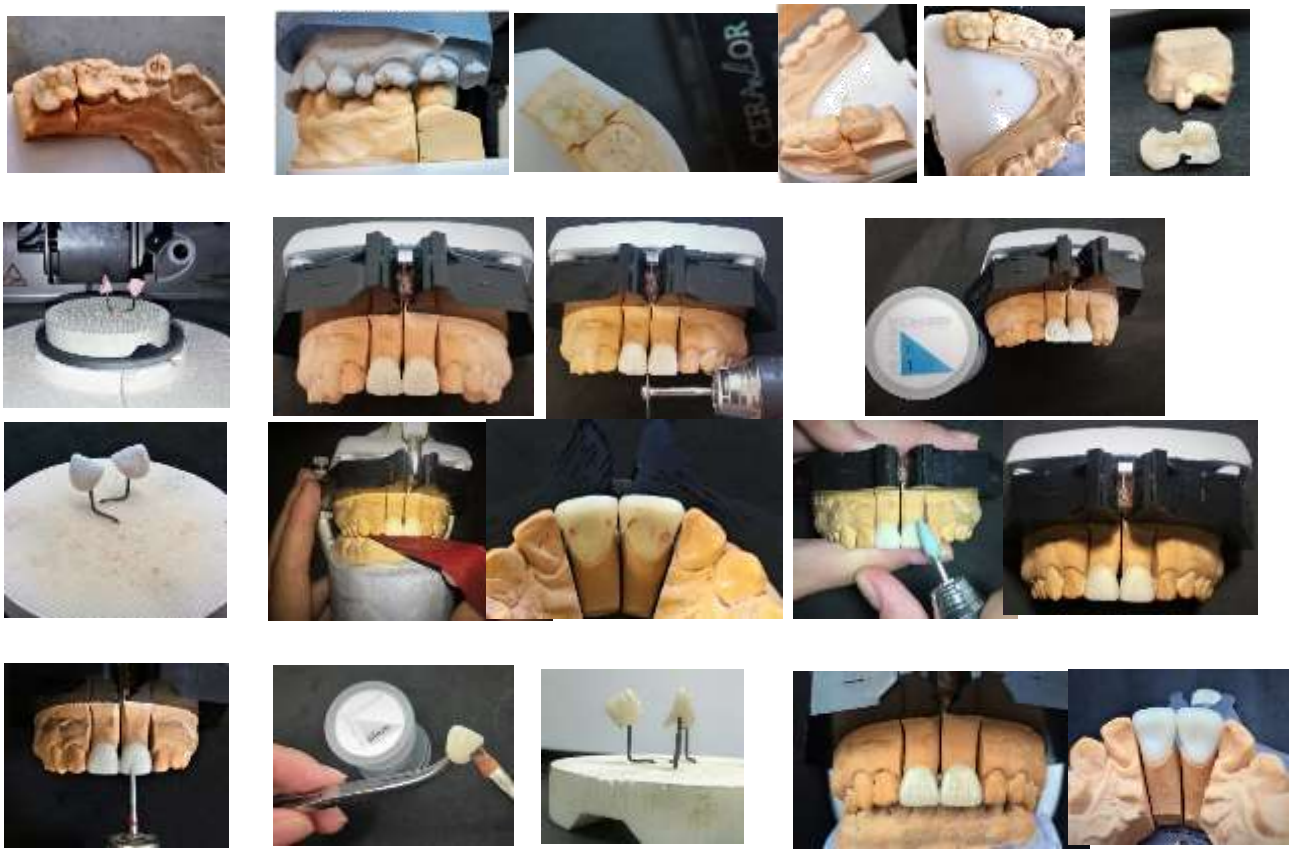

Figure 6. Case 1

Case2: Restorations placed in the pressing furnace before sintering; restoration after sintering and cooling; interdental grinding; layering of Transpa Incisal; restorations whit Transpa Incisal layered before sintering; checking of the occlusal contacts; finishing; buccal view of the restorations; buccal characterisation by finishing; applying glaze layer; aspect of restorations after glaze sintering, final aspect of the buccal, oral and proximal view.

CONCLUSIONS

Both Press system contain a pressible ceramic, suitable for manufacturing of inlays, onlays, venners and single-unit crowns. Having a high pressing temperature), and a perfect coordination between the termin expansion coefficients of the ressed structure and the expansion coefficient of the layering materials, the systems cand be used together with the custom stain or ceramic layering techniques. The system presents high versatility, and is indicated, thus, for various single-unit reconstructions, presenting a very high dimensional stability and a superior aesthetics, due to the individual colour effects provided by the Stain and Build-UP techniques.

REFERENCES

1. Florin Lăzărescu, Incursiune în estetica dentara. Bucureşti 2013
2. Petre A., Constantinescu M., Pătroi D., (2007), Ceramica Integrală: Un pas înainte în estetica dentară, Revista Română De Stomatologie-vol. III
3. Kenneth J., Chiayi S., Rawls R., (2013), Phillips' Science of Dental Materials, ediţia 12, Elsevier, Singapore
4. Goldstein R., (1998), Esthetics in Dentistry, Second ed., vol.1, B.C. Decker Inc. Hamilton, Ontario
5. Touati B., Miara P., Nathanson D., (1999), Esthetic Dentistry and Ceramic Restorations, Martin Dunitz Ltd., Londra
6. Freedman G., (2012), Contemporary Esthetic Dentistry, Elsevier Inc., St. Louis, Missouri
7. http://www.creation-willigeller.com/en/products/ceramic/pressable-ceramic/classic/cp/
8. Creation Willi Geller International-Instructions for Use-Creation Press Ceramics
9. IPS e.max lithium disilicate, The Future of All-Ceramic Dentistry, accesat în mai 2018 la adresa:[http://glidewelldental.com/wp-content/uploads/2016/02/all-ceramic-emax-system-guide.pdf]
10. IPS e.max Press Scientific Documentation, accesat în mai 2018 la adresa: [http://www.roedentallab.com/downloads/emaxpressdata.pdf]
11. IPS e.max System Overview, accesat în iunie 2018 la adresa: [https://www.makeitemax.com/all-ceramics/ips-emax-system/]
12. IPS e.max Press Monolithic Solutions, accesat în iunie 2018 la adresa: [http://www.ivoclarvivadent.ro/ro/instructiuni-de-utilizare-pentru-tehnicieni-dentari/]
13. IPS e.max Press, accesat în iunie 2018 la adresa: [http://www.ivoclarvivadent.ro/ro/productcategories/ips-emax-system-technicians/ips-emax-press]
14. IPS e.max Press Ingot Selection, accesat în iunie 2018 la adresa: [http://www.ivoclarvivadent.ro/ro/productcategories/ips-emax-system-technicians/ips-emax-press]

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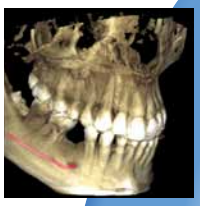

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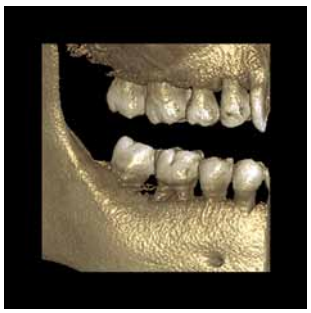

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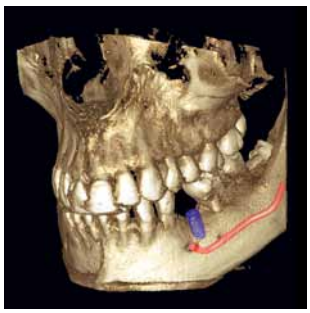

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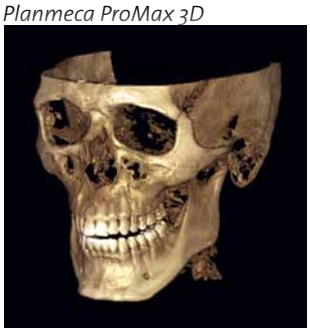

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Synthesis and characterization of different nanoemulsions containing birch bark extracts

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Abstract

The plants are used to cure diseases for many centuries. Even today, the plants are a source of therapy and healing for many diseases. It is known that the bark, the leaves, the buds and the sap of birch are magical for the health. The main aim of this study was to synthesize and to characterize some polymer nanoemulsions containing different birch bark extracts. Interfacial polymerizations combined with a simultaneous emulsification were used as the procedure to obtain the nanoemulsions, which were analyzed by pH, DSC, and Zetasizer measurements; the bioevaluation of the new products was assessed by non-invasive techniques using tests on human skin. The results indicate that the obtained products are safe for humans.

Keywords: *betulin, drug carrier, mexametry, polymer, tewametry*

INTRODUCTION

The species of birch are part of the *Betulaceae* family. It is a tree that requires a lot of light; it grows rapidly reaching a height of up to 15-20 meters. The young trees have a white bark, rare leaves, while the older trees have the branches left down. The leaves present long petioles and elongated peaks. The stamens flowers are grouped together three and they appear during the springtime (April - May), before the apparition of leaves. The pistillated flowers have shorter rod and are at the end of the young branches [1].

The birch is very common throughout Europe. The spreading area extends to 70 degrees North latitude but also to Asia and North Africa. In our country it prefers acidic soils, hill and mountain areas [1, 2].

The peoples from North Europe used it very frequently because of its healing properties. The Amerindians used birch sap for blood purification, leaves to treat joints and kidney problems, and the bark for skin diseases. Hildegard von Bingen was the first person who mentions the beneficial effects of the aft in the wound healing. An Italian description dating from 1565 mentions that birch dissolves kidney stones [3].

All species of birch contain a substance that has a dark-gray colour and it is known as "birch sap". It occurs when the action of betulose is favoured by wetting the bark. The sap of birch is recognized due to its therapeutic properties that have been tested in numerous medical studies and it can be used both internally and externally. For example, the external application of the birch sap helps to treat many skin diseases such as psoriasis, eczema, dermatitis etc. [4].

Both birch leaves and bark are used to prepare various natural remedies. It is recommended that the leaves be harvested at the end of the springtime and at the beginning of summer in order to preserve as many curative properties as possible. The birch leaves are a very good natural remedy for treating urinary tract infections such as cystitis.

The birch bark has diuretic, anti-inflammatory, antiseptic, laxative, analgesic and febrifuge properties, while the birch leaves have antiseptic, diuretic, choleretic, disinfectant, healing, cleansing, and astringent action.

The birch extracts contain vitamin C, phenolic, nicotinic and acetylsalicylic acids, tannins, carotenes and bitter principles, mucilages, resins, sugars, saponins, betulin, flavonoids, and essential oils [5, 6].

Modern phytotherapy studies the chemical composition of plants in pharmaceutical laboratories and it scientifically argues the traditional uses of plants. Herbal treatment gives very good results in mild, functional or early disease conditions. Different preparation processes, such as infusion, decoction, maceration, can be used to obtain the maximum effect of the substances found in medicinal plants. The technique is based on the extraction of the principle or group of active principles using solvents such as water, wine, alcohol, vinegar or oil. Together with the active principle of the plant, some secondary substances, which have the property to increase the therapeutic effect of plants, are also extracted [7].

One of the most important applications of the nanotechnology in the phytotherapy domain is represented by the encapsulation of herbal extracts inside different nanoparticles, nanocapsules and nanoemulsions used as phyto-pharmaceutical and/or cosmetic products [8].

Aim and objectives

The main aim of this study is the obtaining and the characterization of some different nanoemulsions containing birch bark extracts. Polyurethane nanoemulsions were chosen as the drug delivery system used to transfer the active principles of birch through different human membranes.

MATERIAL AND METHODS

The raw materials used for the nanoemulsions are the following: mono-ethylene glycol from Lach-Ner (Czech Republic), while the poly-ethylene glycol, with an average molecular mass around 200, Polysorbate 80 (used as emulsifier), acetone (as solvent) and isophorone-diisocyanate were achieved from Merck (Germany).

The procedure used to obtain the birch bark extracts were already presented in our previous papers [9, 10].

A non-ionic emulsifier (Polysorbate 80 or Tween® 80) and water were used to formulate different samples of nanoemulsions containing some of the birch bark extracts. This emulsifier was preferred to be used as the synthesis surfactant because it has a high hydrophilic and high lipophilic value, equal to 15. It is a non-ionic compound and it sterically stabilizes the emulsion droplets. Also, being an emulsifier with a low molecular mass, it is effective in reducing droplet size better than other polymer emulsifiers. 1% (v/v) was the extracts concentration which was chosen for all the obtained nanoemulsions. The coarse emulsion was subjected to an ultrasonic procedure using a 20 kHz ultrasonic sonicator (Hielscher, Model UP 200S) with a maximum power of 750 W. The input energy was given by a sonotrode containing a piezoelectric crystal with a maximum probe diameter of 13 mm. It generates intense, disturbing forces to minimize droplet diameter. The sonicator probe was symmetrically clogged into the coarse nanoemulsion, and the sonication process was performed for different periods of emulsification. The temperature difference between the coarse initial emulsions and the final nanoemulsion was less than 10 degrees. Subsequently, the characterization of the formulated nanoemulsions was performed.

The pH or the H_3O^+ ions' concentration in the experimental samples is a very important parameter due to the differences which can appear in some physico-chemical, *in vitro* and/or *in vivo* evaluations and due to the safety administration in humans. The determination of pH was done using diluted aqueous solutions of the synthesized formulations at the same concentration (1 mg / ml); a portable pH Meter Checker® probe (Hanna Instruments, USA) was first calibrated with standard pH solutions and after that, all the measurements were done in triplicate at 25 °C.

The Zetasizer measurements are based on a process called Dynamic Light Scattering, DLS, or Photon Correlation Spectroscopy, PCS, which evaluate the particles' Brownian motion and relates this parameter to their size and surface charge. A Zetasizer module (Cordouan Technologies, France) was used for the size and surface charge measurements. The module contains a Particle Size Analyzer (input values: temperature, 25 °C; measuring range, 35 µs; channel number, 450; laser power, 80 %; data acquisition: continuously; data analysis, Pade-Laplace method), and a Zeta potential Analyzer (input values: wavelength range, 380-780 nm; temperature, 25 °C; laser power, 80 %; applied field, automatic; resolution, mean; measurements number / sequence, 3).

The thermal behaviour of chemical samples indicates the compatibility between the active pharmaceutical compound and its drug delivery system and can be used to estimate the shelf-life of a medicine. A DSC1 module from Mettler-Toledo (Switzerland) was used to evaluate the thermal degradation of the synthesized samples. Very small amounts of sample (between 3.6 - 4.1 mg) were placed in aluminum crucibles with perforated lids and they were heated between 20 and 350 °C in an inert atmosphere with a heating rate of 5 degrees / minute. A similar blank crucible was used as reference material using the same time / temperature program.

The encapsulation efficacy was monitored by plotting the total concentration of betulinol from the samples, which was determined by the dissolution of samples in isopropanol followed by an ultrasonication with a Hielscher UP 200S having the following characteristics set: complete cycles, 55% oscillator average amplitude, standard probe (micro type 3, S3), period: 30 minutes. The encapsulation yield was calculated by plotting the two

concentrations. To determine the amount of free betulinol, assay analysis was performed by detection in the UV-Viz domain using an SI Analytics UViLine 9100 at a length of 210 nm. A calibration curve for betulinol samples of known concentrations was first drawn and used in the calculations.

Human volunteers were used for the bioevaluation of products; skin tests are usual done in order to find any irritation effect of a new synthesized compound. Six young subjects (1 man and 5 women, between 21 and 23 years old) were recruited in this research. All principles of Helsinki Declaration and national jurisdiction have been respected, and the study was first approved by the Ethics Committee of our university; the volunteers have signed informed consents. The determinations of skin parameters were done with a Multiprobe Adapter System from Courage&Khazaka (Germany) containing a Tewameter® probe, a Mexameter® probe, and a Corneometer® probe.

Analysis of variance was used to find any significant differences between the values' groups; the following notation was used on graphs: ** for $P \leq 0.01$.

RESULTS

The dwarf particles' technology, known as nanotechnology because "nano" means dwarf in Greek, is the science and the engineering that work on an extremely small scale, practically at the molecular level (1 nanometer is a billionth of a meter). This science is very young - the idea behind it was issued by the Nobel laureate physicist Richard Feynman in 1959. The nanotechnology research has progressed rapidly and announces revolutionary changes in many areas, including medicine in the last decade of the 20th century. A very large field of application will be that of supplying pharmaceutical drugs at the therapeutic targets; such a method will greatly reduce the amount of used drug, increasing - at the same time - the effectiveness of therapy and reducing the action of drugs on normal cells, in regions and organs where the drug is not needed [11].

It is necessary to take into account that the stability of colloidal systems (nanocapsules, nanoparticles, nanotubes, nanoemulsions) is influenced by different factors such as pH, temperature, ionic strength, particle size etc. Table I presents the nanoemulsions' pH, size, and surface charge.

Table I. The physico-chemical characteristics of the synthesized nanoemulsions

Sample	pH	Particle size, nm	Polydispersity index	Zeta potential, mV
BBE0	5.61 ± 0.14	-	-	-
BBE5	5.49 ± 0.21	-	-	-
BET	5.17 ± 0.19	-	-	-
NE	6.72 ± 0.11	90 ± 3	0.2	+26.1 ± 1.7
BBE0_NE	6.78 ± 0.15	96 ± 1	0.5	+21.4 ± 2.1
BBE5_NE	6.87 ± 0.17	97 ± 6	0.4	+25.6 ± 2.3
BET_NE	6.85 ± 0.16	92 ± 2	0.2	+25.4 ± 1.9

The polymer nanoemulsions present higher pH values, much closer to a neutral medium and this is another argument to use polyurethane drug delivery systems to increase the transmembrane transfer of the bioactive natural substances.

The particles' size is very close in all the cases; no influence of the entrapped extracts was observed. The value of the polydispersity index (between 0.1 and 0.9) reflects the homogeneity of the samples: good homogeneity with PI = 0.2 in the case of empty nanoemulsion and for the nanoemulsion with betulin, while medium homogeneity was observed in the case of nanoemulsions with BBE0 and BBE5 extracts. The values of Zeta

potentials were very close too and this indicates that the polyurethane structures have a medium stability against the tendency to form clusters.

Table II presents the thermal events revealed by the nanoemulsions' DSC curves.

Table II. The DSC data obtained for nanoemulsions

Sample	Thermal events		
	T_{onset} (°C)	T_{peak} (°C)	T_{offset} (°C)
NE	Not relevant		
BBE0_NE	Not relevant		
BBE5_NE	249	258	264
BET_NE	282	286	299

The very good stability of the polyurethane materials was found once again; no important peaks were found on the DSC curves of samples containing nanoemulsions between 20 and 350 °C; the thermal event around 258 °C is due to the traces of un-trapped betulin (its melting point is around 256 °C), while the event at 286 °C is probably due to the betulin dimer.

The encapsulation efficacy is a parameter very useful in the nanotechnology and it give an idea about the amount of the active biosubstance that was entrapped or absorbed inside the nanocapsules, nanoparticles or nanoemulsions. The efficiency of the encapsulation process is presented in Table III and the values are very close and satisfactory.

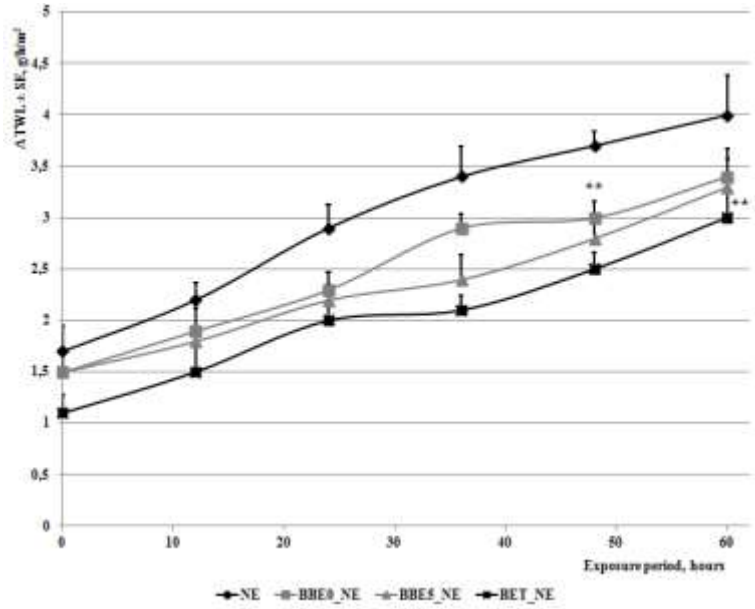
Table III. The encapsulation efficacy of nanoemulsions

Sample	Encapsulation efficacy, %
NE	-
BBE0_NE	68.1 ± 2.7
BBE5_NE	67.4 ± 3.6
BET_NE	65.2 ± 3.3

The toxicological behavior of the new nanoemulsions was assessed by modern and non-invasive procedures such as skin parameters' tests (the evolutions of the transepidermal water loss (TWL), skin hydration and erythema. The modifications of these parameters were observed for 60 hours and they are shown in Figure 1 a-c.

It can be seen that the transepidermal water loss increased for all the tested samples, but it is important to mention that any modification below 5 $g/h/m^2$ are not considered relevant and dangerous for humans and such changes appear in any skin experiment. However, the smallest changes were recorded for samples BB0_NE, BBE5_NE and BET_NE.

Similar changes were recorded about the skin erythema. It is important to mention that the scale of the instrument is between 0 and 999 arbitrary units. In our study the maximum modification of skin redness was just around 40 units; this is the reason why we consider that these compounds are safe for humans.



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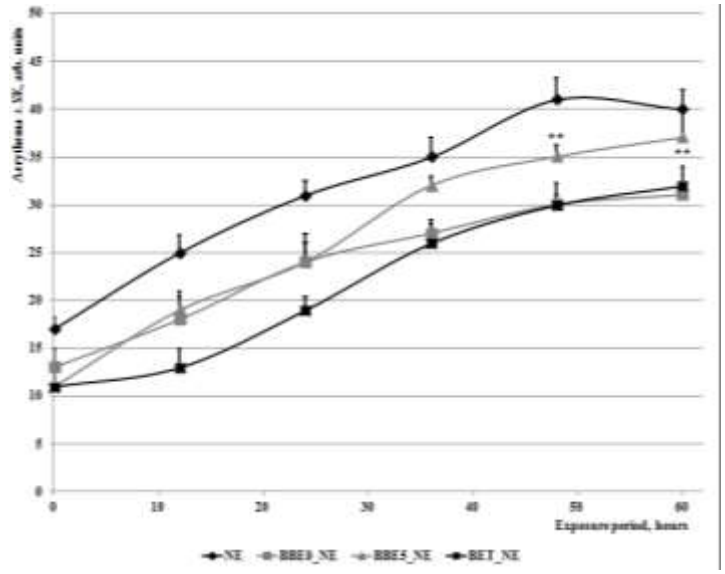

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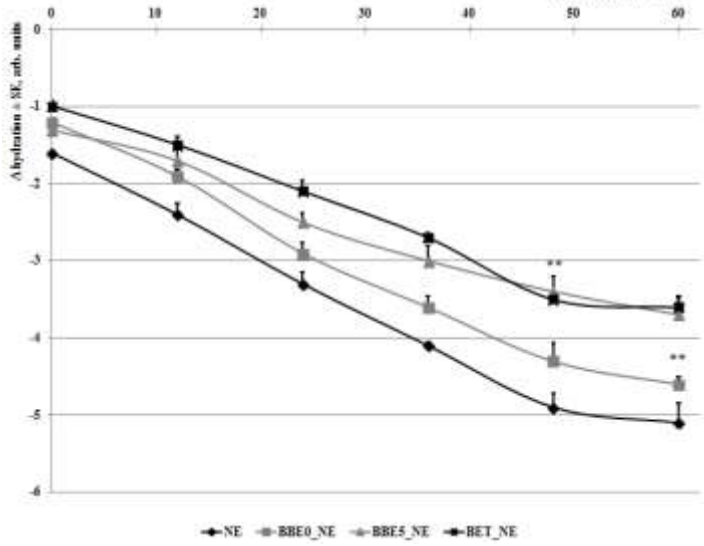

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Figure 1. Evolution of skin parameters: (a) TWL, (b) erythema and (c) hydration

The hydration of *stratum corneum* often indicates the skin health; it is normal that skin hydration decrease in all experiments, but it is important to record how much it is modified. It can be seen that in the case of samples containing birch bark extracts the values decrease inside a narrow range, between 1 and 5 arbitrary units, while in the case of the nanoemulsion without any extract, used as blank, the decrease of skin hydration is more than 5 units.

DISCUSSIONS

People have always used plants for healing and almost as soon as they have learned to write, they recorded the descriptions of their curative properties in different herbal handbooks. In Western Europe there were two traditions about the phytotherapy. One was the superstitious: some plants were part of the popular remedies because it was believed to resemble parts of the human body. For example, the grass of the lung has lung-shaped leaves and was used to treat coughing. The other natural tradition was based on scientific experiments and was initially carried out by monks in the gardens of the monasteries [12].

The birch is a particular tree, which was considered in many cultures as the most important tree of the surrounding nature. *Betula papyrifera* and other varieties of *Betula* were considered the most important trees especially by the peoples who lived in the Northern area of the planet. It seems that after the last ice age, the birch was one of the first vegetal species to have repopulated the rocky and lifeless landscape after the melting of the glaciers. And it is no surprise that this particular tree was adored by humans, because it has increased the quality of their lives for thousands of years... [13].

The birch is a deciduous tree, which was used both as a decorative and as a medicinal plant. There are two main varieties of birch: white or silver birch with botanical name *Betula pendula*, formerly known as *Betula alba*, and black or sweet birch called *Betula lenta*. In Romanian, the name of birch comes from the Latin "mastichinus", translated as "which belongs to mastic", where the mastic is a mixture of vegetal and mineral resins used as a glue.

The birch bark extract contains pentacyclic triterpenes such as betulin and betulinic acid, active agents against cancer, multiple forms of herpes and even AIDS. They have anti-inflammatory and anti-malarian effects as well as cytotoxicity to an important number of tumor cell lines [14, 15].

Our study presents the obtaining and the characterization of different nanoemulsions containing birch bark extracts. The polyurethane drug delivery systems are often used to entrapped different herbal extracts because the encapsulation efficacy is high (around 65-70%) and this polymer was found biocompatible and biodegradable in other human applications.

CONCLUSIONS

Aromatic and medicinal plants are not just a pleasant look, they are also useful in every home. Different polyurethane nanoemulsions containing birch bark extracts were synthesized and characterized in this study. This paper presents the obtaining protocol used for nanoemulsions synthesis, their good pH values (between 6.7-6.9) and encapsulation efficacy (between 65-68%), their thermal stability, the average size (90-97 nm) and the medium stability against clusters' formation (Zeta potentials between 21-26 mV). Human skin tests such as transepidermal water loss, erythema and *stratum corneum* hydration reveal the non-irritation potential of these pharmaceutical products, which are safe for humans.

REFERENCES

1. Shaw K, Stritch L, Rivers M, Roy S, Wilson B, Govaerts R. The Red List of Betulaceae. Richmond - UK: USDA Forest Service; 2014. p. 5-9.

2. Liamine N. Biogeographical regions in Europe. The Alpine region - mountains of Europe. Sweden: European Environment Agency; 2006. p. 1-52.
3. Crombie AC. The History of Science A.D. 400-1650. https://epdf.tips/the-history-of-science-from-augustine-to-galileo.html [October, 2; 2018].
4. Oltean M, Negrean G, Popescu A, Roman N, Dihoru Gh, Sanda V, Mihailescu S. Lista rosie a plantelor superioare din Romania (Red List of higher plants of Romania). Stud. Sint. Docum. Ecol 1994; 1: 51.
5. Popova A, Mihaylova D. A review of the medicinal plants in Bulgaria – collection, storage, and extraction techniques. Asian J Pharm Clin Res 2018; 11(3): 28-35.
6. Schafer PD. A manual of Cherokee herbal remedies: history, information, identification, medicinal healing. Master's Thesis. Indiana State University; 1993. p. 11-27.
7. Bussmann RW, Sahron D. Medicinal plants of the Andes and the Amazon. Trujilo - Peru: Graficart SRL; 2015. p. 7-23.
8. Bonifácio BV, Silva PB, Ramos MA, Negri KM, Bauab TM, Chorilli M. Nanotechnology-based drug delivery systems and herbal medicines: a review. Int J Nanomedicine. 2013; 9: 1-15.
9. Dehelean CA, Soica C, Ledeti I, Aluas M, Zupko I, Galuscan A, Cinta-Pinzaru S, Munteanu M. Chem. Cent. J. 2012; 6(1): 137.
10. Borcan F, Preda M, Borcan LC, Pinzaru I, Florescu S, Sisu E, Poenaru M. Comparative Characterization of Birch Bark Extracts Encapsulated Inside Polyurethane Microstructures. Mater. Plast. 2018; 55(3): 385-388.
11. Martin SM. Nanotehnologia si medicina. http://www.viata-medicala.ro/*articleID_8802-dArt.html [October, 2; 2018].
12. Denham AM. Herbal Medicine in Nineteenth Century England: the Career of John Skelton (Doctoral dissertation, University of York); 2013. p. 7-15.
13. Anamthawat-Jónsson K. Hybridisation, introgression and phylogeography of Icelandic birch. In: Curr. topics in phylogenetics and phylogeography of terrestrial and aquatic systems. Rijeka - Croatia: InTech Europe; 2012. p. 117-144.
14. Zyryanova OA, Terazawa M, Koike T, Zyryanov VI. White Birch Trees as Resource Species of Russia: Their Distribution, Ecophysiological Features, Multiple Utilizations. Eurasian J. For. Res. 2010; 13(1): 25-40.
15. USDA NRCS National Plant Data Center. Gray birch. https://plants.usda.gov/plantguide/pdf/pg_bepo.pdf [October, 2; 2018].

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- general reviews: 6-8 pages
- studies and researches: 5-7 pages
- case presentations: 2-4 pages
- reviews, scientific and technical state-of-the-art articles, medical informations and opinions: 1-2 pages.

The paper will be edited according to international editing rules for manuscripts. The title will be written in capital characters and it will be followed by the name and surname of the author (authors), followed by their place of work (place where the paper has been elaborated). Studies and researches will be followed by a brief abstract, followed by 3-4 key-words.

The body of the paper will be structured on the following chapters: introduction, aim, objectives, material and method, results and discussions, conclusions. The references will be presented alphabetically and in conformity to the Vancouver Convention, including:

- for articles: name of the authors and surname initials, title of the article in the original language, title of the journal according to the international abreviation system, year of issue, volume, number, pages;
- for books: name of the authors and surname initials, volume, publisher (editors), city of publishing, year of issue.

Citation of references inside the body of the paper will be put between brackets, Harward style (author, year) or Vancouver style (number in square brackets or superscript). Cited reference titles will be selected, maximum 6 for studies and case presentations and 12 for general reviews. Acceptance, rejection or the need of alterations in sent materials, or in inconography, will be comunicated to the authors in due time. For this, the authors will indicate the person and address for corespondence (phone number, e-mail address). Given the less pleasant experience of the editorial board with some articles being rejected because they did not meet publishing criteria, we decided to support those who intend to publish in this journal by detailing the way such a paper should be elaborated, as well as our requirements.

Except some particular aspects concerning this journal, the following details are general requirements asked or imposed by other journals as well. Conditions to be met in order to propose a paper for publishing. The main author has the responsability to make sure the article has been approved by all the other authors. The journal will have copyright

for papers accepted for publishing. The editorial board reservs the right to change the style and dimensions of an article (major changes will be discussed with the main author) and to decide the date of issue.

2. FIRST PUBLICATION

The editorial board will not consider a paper already reported in a published general review or described in a paper proposed to or accepted by another journal. This does not exclude papers which have been rejected by other journals. Also, papers which have been presented at a scientific meeting will be accepted for discussion if they have not been entirely or partially published in a similar publication. „Multiple" publishing of the same study is seldom justified. One of the possible justifications is publishing in a second language but only if the following conditions are met:

- Editors of both journals involved are fully informed;
- Priority of the initial publication will be respected by a minimum publishing interval of two weeks;
- For the second publication, a shortened version will suffice;
- The second version strictly reflects data and interpretations in the first;
- A footnote may state: „This article is based upon a study initially published in [title of the journal]".

3. PATERNITY

Paternity must reflect the common decision of the coauthors. Each author must have participated enough to take public responsability for the content. A paper with collective paternity must have a key person responsable for the article.

4. COPYRIGHT

In order to reproduce materials from other sources, written agreement from the copyright owner must be obtained:

- photographer – for unpublished photographs;
- hospital where the photographer (physician) is employed – for unpublished photographs performed during the employment period;
- initial publisher – for a table, picture or text which have previously been published elsewhere.

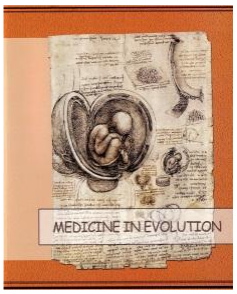
5. ETHICAL ASPECTS

Do not use name of patients, initials or hospital observation charts numbers. If a photograph of a body part which could allow direct or deductive recognition of the patient needs publishing, then the paper must be accompanied by the written consent of the patient and clinician, as well.

6. PRESENTING THE MANUSCRIPT

6.1. CONTENT OF THE PAPER - INDICATIONS FOR ORIGINAL ARTICLES

Paper title [Book Antiqua 20, bold, left alignment]



Surname N.[1], Surname N.[2] [Book Antiqua, 14, bold]

[1] *Author Affiliation (DEPARTMENT, FACULTY, UNIVERSITY, CITY/COMPANY) [10, italic]*
[2] *Author Affiliation (DEPARTMENT, FACULTY, UNIVERSITY, CITY/COMPANY) [10, italic]*

Correspondence to:
Surname Name: [10, italic]
Address: [10, italic]
Phone: +40 [10, italic]
E-mail address: [10, italic]

Abstract [Book Antiqua, 12, bold, justify alignment]

Recommendations for original studies

Original studies must include a structured abstarct of maximum 150 words, containing the following titles and informations: Aim and objectives; Material and methods; Results; Conclusions; Key words: give 3-5 key words; The abstract will be translated into an international circulation language.

Keywords: Innovation, technology, research projects, etc. [Book Antiqua 9].

INTRODUCTION [Book Antiqua, 11, bold, left alignment]

Introduction presentation of general aspects, in the context of the approached theme.

Introduction include **Aim and objectives –** Define the aim of the article. Briefly expose the rationale of the presented study or observation. Make strictly pertinent referals and do not exhaustively review the subject. Do not include data or conclusions from the paper.

There is a limitation of 4/6 pages. All pages size should be A4 (21 x 29,7cm). The top margins should be 2 cm, the bottom, right, margins should be 2cm and left margins should be 2,85 cm. All the text must be in one column and Book Antiqua font, including figures and tables, with single-spaced 10-point interline spacing.

Aim and objectives [Book Antiqua 11, bold italic, left alignment]

The text included in the sections or subsections must begin one line after the section or subsection title. Do not use hard tabs and limit the use of hard returns to one return at the end of a paragraph. Please, do not number manually the sections and subsections; the template will do it automatically.

[Book Antiqua, 11 point, normal, justified alignment].

MATERIAL AND METHODS [Book Antiqua, 11, bold, left alignment]

Describe the selection of observations or subjects for the experiment (including controls). Identify methods, equipments (with the name and address of the manufacturer in brackets) and give sufficient details on procedures. Give references for the selected methods, including statistical methods; offer details and brief descriptions for previously published methods which are not well known; describe new or substantially modified methods, justify their use and assess their limitations. Precisely identify all used drugs and chemicals, including generic names, dosage and administration ways. Describe statistical methods with sufficient details for reported results to be verified. Whenever possible, quantify discovered aspects and present them with appropriate measurement indicators for the uncertainty or error of measurement (such as confidence intervals). [Book Antiqua, 11 point, normal, justified alignment].

RESULTS [Book Antiqua, 11, bold, left alignment]

Present results in a logical succession as text, tables and illustrations. Emphasize or briefly describe only important observations. [Book Antiqua, 11 point, normal, justified alignment].

DISCUSSIONS [Book Antiqua, 11, bold, left alignment]

Underline new, important aspects of the study. Do not repeat in detail data which have been presented in previous sections. Include implications of revealed aspects and their limitations, including implications for future studies. Connect your observations to other relevant studies. Relate the results to the aim proposed for the study. [Book Antiqua, 11 point, normal, justified alignment].

CONCLUSIONS [Book Antiqua, 11, bold, left alignment]

Organize conclusions which emerge from the study. In the end state: a) contributions to be acknowledged but which do not justify paternity right; b) thanks for technical support;

c) thanks for financial or material support. [Book Antiqua, 11 point, normal, justified alignment].

REFERENCES [Book Antiqua, 11, bold, left alignment]

A numbered list of references must be provided at the end of the paper. The list should be arranged in the order of citation in the text of the publication, assignment or essay, not in alphabetical order(according to the Vancouver rules). List only one reference per reference number. It is very important that you use the correct punctuation and that the order of details in the references is also correct.

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Internet Documents - Standard format - #. Author A, Author B. Document title. Webpage name [format]. Source/production information; Date of internet publication [cited year month day]. Available from: URL. [Book Antiqua, 10 point, normal, justified alignment].

[1] _____
[2] _____
[3] _____

6.2. CONTENT OF THE PAPER - INDICATIONS FOR CASE REPORTS

Content of the paper for case report will respect indications for original articles.

Themes may be selected from all medical fields. Manuscripts which offer a special gain for daily activity will have priority. The title must be clearly, precisely stated. It may be completed by a subtitle. It is advisable to include in the key words of the title the main message, the special element which may be observed from the case evolution. The content of a case report must be divided into three parts:

Introduction – It must include a maximum of 15 typed rows (half page). Here, the main medical problem is summarized in order to place the case in a specific domain.

Case report – It contains essential specific information on the case. In order to make a logical, chronological and didactical case report the following 5 chapters are needed:

I. Anamnesis;
II. Clinical examination data;
III. Laboratory data;
IV. Additional paraclinical investigations;
V. Treatment and evolution.

Discussions – The reason for the case report must be stated. The report must be patient-centered. Occasional deviations from typical (characteristic) evolutions, nosologically important facts must be presented in such a manner to expose the clinical picture as completely as possible. The case report must not appear as an appendix of a general review. Dimensions of a case report: maximum 6-8 typed pages, 30 rows of 60 characters/page.

6.3. MEASUREMENT UNITS, SYMBOLS, ABREVIATIONS

All measurements must be expressed in International System (IS) units. Abreviations must be fully explained when first used.

6.4. TABLES

Tables are noted with Roman figures and they will have a brief and concise title, concordant with their content.

6.5. ILLUSTRATIONS

Number all illustrations in Arabic figures in a single succession. Apply a label on the back side of every illustration, containing its number and an arrow indicating the upper side. Coloured illustrations may be accepted but it is the choice of the editors, according to particular technical abilities of each journal issue, or it may involve a fee in special cases.

6.6. EXPLANATIONS FOR DRAWINGS AND GRAPHS

Explanation for drawings and graphs must be clear and in readable dimensions, considering the necessary publishing shrinkage.

6.7. PHOTOGRAPHS

Offer glossy, good quality photographs. Any annotation, inscription, etc. must contrast with the ground. Microphotographs must include a scale marker.

6.8. ILLUSTRATION LEGENDS

Include explanations for each used symbol, etc. Identify the printing method for microphotographs.

7. COPIES FOR PUBLISHING

In order to accelerate publishing, the main author will send a set of printed sheets presenting the final version of the paper, as it will appear in the journal. It is really helpful that texts to be also sent on electronic support, diacritic characters mandatory.

8. REJECTION OF PAPERS

If a paper does not meet publishing conditions, whatever these may be, the editors will notify the first author on this fact, without the obligation of returning the material. Original photographs or the whole material will be returned only if the author comes to the editor and takes them.

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