Oct 28th, 8:00 AM - Oct 29th, 6:00 PM

# International Conference on Dental Science

University for Business and Technology - UBT

Oct 28th, 8:00 AM - Oct 29, 6:00 PM

# International Conference on Dental Science

University for Business and Technology - UBT

Oct 28th, 8:00 AM - Oct 29, 6:00 PM

# International Conference on Dental Science

University for Business and Technology - UBT

Oct 28th, 12:00 AM - Oct 29th, 12:00 AM

# International Conference on Dental Science

University for Business and Technology - UBT

Leadership and Innovation

Education | Research | Training | Consulting | Certification

# PROCEEDINGS

12th UBT ANNUAL INTERNATIONAL CONFERENCE

28-29 OCTOBER

UBT Innovation Campus

## INTERNATIONAL CONFERENCE ON DENTAL SCIENCE

# Proceedings of the 12th Annual International Conference on Dental Science

Edited by
Edmond Hajrizi

Conference Book of Proceedings International Conference Pristina

**ISBN 978-9951-982-01-6**

# © UBT – Higher Education Institution

**International Conference on Business, Technology and Innovation Pristina, Kosovo 28-29**

**Editor**: Edmond Hajrizi

**Organizing Committee:** Edmond Hajrizi, Hasan Metin, Visar Krelani, Hazir Cadraku, Retkoceri B, Selmani F, Muhamet Ahmeti, Selmani F, Muhamet Sherifi, Kastrati A, Mirlinda Reçica



Publisher, UBT

## Editor Speech of IC - BTI

International Conference is the 12th international interdisciplinary peer reviewed conference which publishes works of the scientists as well as practitioners in the area where UBT is active in Education, Research and Development. The UBT aims to implement an integrated strategy to establish itself as an internationally competitive, research-intensive institution, committed to the transfer of knowledge and the provision of a world-class education to the most talented students from all backgrounds. It is delivering different courses in science, management and technology. This year we celebrate the 21th Years Anniversary. The main perspective of the conference is to connect scientists and practitioners from different disciplines in the same place and make them be aware of the recent advancements in different research fields, and provide them with a unique forum to share their experiences. It is also the place to support the new academic staff for doing research and publish their work in international standard level. This conference consists of sub conferences in different fields: - Management, Business and Economics - Humanities and Social Sciences (Law, Political Sciences, Media and Communications) - Computer Science and Information Systems - Mechatronics, Robotics, Energy and Systems Engineering - Architecture, In- tegrated Design, Spatial Planning, Civil Engineering and Infrastructure - Life Sciences and Tech- nologies (Medicine, Nursing, Pharmaceutical Sciences, Phycology, Dentistry, and Food Sci- ence),- Art Disciplines (Integrated Design, Music, Fashion, and Art). This conference is the major scientific event of the UBT. It is organizing annually and always in cooperation with the partner universities from the region and Europe. In this case as partner universities are: University of Tirana – Faculty of Economics, University of Korca. As professional partners in this conference are: Kosova Association for Control, Automation and Systems Engineering (KA – CASE), Ko- sova Association for Modeling and Simulation (KA – SIM), Quality Kosova, Kosova Association for Management. This conference is sponsored by EUROSIM - The European Association of Simulation. We have to thank all Authors, partners, sponsors and also the conference organizing team making this event a real international scientific event. This year we have more application, participants and publication than last year.

Congratulation!

Edmond Hajrizi, Rector of UBT and Chair of IC –BTI 2023

# Contents

# Assessing prevalence of signs and symptoms of temporomandibulardisorders among dental students using Fonseca's questionnaire

Katerina Zlatanovska, Afrim Shehapi
Faculty of Medical Sciences, GoceDelcev University, Stip, North MacedoniaCorresponding author:
katerina.zlatanovska@ugd.edu.mk

Aim: Temporomandibular Disorders (TMDs) are very frequent and the most common condition that affects the temporomandibular joint harming individuals' quality of life. The etiology of temporomandibular disorders is multifactorial. The aim of this study was to evaluate the prevalence and association between stress and TMDs in dental students in Macedonia.

Material and methods: The research was conducted on 95 dental students using Fonseca's questionnaire to measure the prevalence and to identify the severity of symptoms of temporomandibular disorders along with their clinical examinations. The results were scored and

estimated in the specified population. The group consisted of 40 men and 55 women and were divided in two groups: Group 1 consisted of 60 and Group 2 of 35 students. The data analyses were based on the respondents in the questionnaires and calculated using Statistical software SPSS for Windows version 23.

Results:Results of this study showed that the prevalence of TMD was 57,89% accordinglyof them 45,26% with mild TMD, 10,52% moderate and 5,26% severe TMD. According to the answers, the symptoms were more prevalent in women, with 63,63%. Some level of TMD was registered in men with 36,36%. The most common etiological factors were psychological stress (31,57%) and malocclusion (18,94%). Clicking sound was found in 10,52% of the students.

Conclusion: Stress was associated with individuals with a higher prevalence of temporomandibular dysfunction. This study highlights the importance of prevention and early diagnosisas key factors for successful management of TMD among dental students.

Key words: dental students, Fonseca's questionnaire, stress, temporomandibular disorder.

## INTRODUCTION:

Temporomandibular Disorders (TMDs) are very common and the most prevalent conditions affecting the temporomandibular joint, negatively impacting individuals' quality of life. TMDs are a heterogeneous group of musculoskeletal and neuromuscular conditions that cause pain and dysfunction in the jaw joint and muscles that control jaw movement. Temporomandibular disorders are the most common cause of pain that is non-dental origin. (Taneja et al., 2019; Karthik et al., 2017)

The etiology of temporomandibular disorders is multifactorial, involving numerous factors that can contribute to TMD. Factors that increase the risk of TMD are called predisposing factors. Factors that cause the onset of TMD are called initiating factorsand factors that interfere with healing or enhance the progression ofTMD are called perpetuating factors. (Okeson JP, 2019)

The most frequently cited factors are occlusal condition, trauma, emotional stress, deep pain input and parafunctional activity, either alone or in combination. (Filingim et al., 2013; Zlatanovska et al., 2021)

The significance of TMD epidemiology lies in its complex etiology, which necessitates the integration of multiple diagnostic methods and therapeutic approaches to alleviate its signs and symptoms (Boevar et al., 1996).Research (Hamissi, 2012) has confirmed that individuals exhibiting TMD symptoms tend to access the healthcare system more frequently, seeking care from various providers. Furthermore, these individuals with TMD often experience a considerable negative impact on their quality of life.

Common symptoms associated with TMD include facial and jaw pain, both at rest and during function, jaw tiredness, TMJ sounds such as clicking or crepitation, jaw movement limitations, and locking/catching or luxation of the mandible (Kohler, 2012). These patients with TMD may also demonstrate myofascial pain, morphological changes in the condyle, disc displacement or

disc derangement. (Magnusson et al., 2005)

The most common localization of pain is around the masseteric muscle, it occurs less frequently in the preauricular area. In most cases, patients define the pain as weak and unilateral, but sometimes sharp pain is also registered. (Preeti, 2016) Pain intensification usually occurs during stress or when moving the lower jaw.

Numerous epidemiologic studies have examined the prevalence of TMD in variouspopulations. These studies consistently indicate that signs and symptoms of TMDs are quite common in these populations. On average, around 41% of these individuals in this population reported at least oneTMD-related symptom, and approximately 56% exhibited at least one clinical sign of TMD.Based on these studies, it appears that a conservative estimate of thepercentage of people in the general population experiencing some formof TMD falls within the range of 40% to 72%.with the highest incidence occurring between the ages of 20 and 40. (Nourallah and Johansson, 1995; Hiltunen et al., 1995)

In a study among university students in Jordan (Ryalat et al., 2009), the prevalence of TMD was 68.6%, in Brazil (Augusto et al., 2016) was 71.9%, India (Kumar & Harshitha, 2018) was 42%.

It was reported that female patients more frequently exhibited TMJ pain at rest, clicking, teeth grinding, and pain in the masseter muscle compared to male patients. (Bagis et al., 2012)

Epidemiological studies of TMD are essential for estimating both the prevalence as well as the severity of this condition, which, in turn, aids in prevention efforts. While numerous studies have investigated the presence of TMD among dental students, there is a scarcity of data on the prevalence of TMD among Macedonian students.

Therefore, the aim of this study was to assess the prevalence of TMD and explore its association with stress in dental students in Macedonia, utilizing Fonseca's questionnaire.

## MATERIAL AND METHODS:

### Volunteers

This study was done in the period from April 2023 to July 2023. The research was conducted on 95 dental students (40 males, 55 females, age range 18-26) using Fonseca's questionnaire to measure the prevalence and to identify the severity of symptoms of temporomandibular disorders along with their clinical examinations. The clinical examination of all the subjects was done by a single examiner. The students were divided into two groups according to their age: Group 1 (18 – 22) consisted of 60 and Group 2 (23 – 27) of 35 students.

All volunteers received appropriate instructions regarding the objectives of the research and signed an informed consent form. The trial included only subjects who had not been diagnosed with previous stomatognathic system impairments, previous TMD, or any other clinical alterations.

In order to classify the severity of TMD among the respondents we used the Fonseca questionnaire. this questionnaire is composed of 10 questions that include a check for the presence of pain in the TMZ, as well as the head and neck, the presence of parafunctional habits, limitations in the movement of the lower jaw, the presence of sounds and emotional stress. The questions contained in the Fonseca questionnaire are given in Table 1.

All respondents wereexplained that they could choose only one of the answers offered, which could be "Yes" (10 points), "Sometimes" (5 points) and "No" (0 points).

### Data Analysis

Data were analyzed by Statistical software SPSS for Windows version 23. Frequency distributions, means, and standard deviations were calculated for the study variables. The total score of the Fonseca questionnaire was calculated bysumming up the responses of each item.

## RESULTS:

### Study population characteristics

A total of 95 dental students participated in this study, consisting of 42.10% male participants and 57.89% female participants, with an age range of 18 to 26 years. (Table 2)

Table 1 Fonseca's questionnaire

| QUESTIONS (ANSWER NO, SOMETIMES, YES) |
|---|
| 1. IS IT HARD FOR YOU TO OPEN YOUR MOUTH? |
| 2. IS IT HARD FOR YOU TO MOVE YOUR MANDIBLE FROM SIDE TO SIDE? |
| 3. DO YOU GET TIRED/MUSCULAR PAIN WHILE CHEWING? |
| 4. DO YOU HAVE FREQUENT HEADACHES? |
| 5. DO YOU HAVE PAIN IN THE NAPE OR A STIFF NECK? |
| 6. DO YOU HAVE EARACHES OR PAIN IN CRANIOMANDIBULAR JOINTS? |
| 7. HAVE YOU NOTICED ANY TMJ CLICKING WHILE CHEWING OR WHEN YOU OPEN YOUR MOUTH? |
| 8. DO YOU CLENCH OR GRIND YOUR TEETH? |
| 9. DO YOU FEEL YOUR TEETH DO NOT ARTICULATE WELL? |
| 10. DO YOU CONSIDER YOURSELF A TENSE (NERVOUS) PERSON? |

Table 2. Distribution of dental students by age and gender with prevalence severity of TMD among them

| Age group | gender | No TMD (n) | Mild TMD (n) | Moderate TMD (n) | Severe TMD (n) | Number of students |
|---|---|---|---|---|---|---|
| **Group 1 18-22 ages** | Male | 10 | 13 | 2 | 0 | 25 |
| | Female | 10 | 20 | 4 | 1 | 35 |
| | Total | 20 | 33 | 6 | 1 | 60 |
| **Group 2 23-27 ages** | Male | 12 | 1 | 2 | 0 | 15 |
| | Female | 8 | 9 | 2 | 1 | 20 |
| | Total | 20 | 10 | 4 | 1 | 35 |
| **Total** | | 40 (42.10%) | 43 (45.26%) | 10 (10.52%) | 2 (2.10%) | 95 (100%) |

Prevalence and severity of Temporomandibular Disorders (TMD)

The prevalence and severity of Temporomandibular Disorders (TMD) were assessed using Fonseca's questionnaire (Table 1) and clinical examinations. The results indicated a substantial prevalence of TMD within the study population, as outlined in Table 2.

The results revealed that 57.89% of the dental students had TMD. Among those affected, 45.26% exhibited mild TMD, 10.52% had moderate TMD, and 2.10% had severe TMD. Additionally, 10.52% of the students reported experiencing a clicking sound associated with TMD.

The findings demonstrated that TMD symptoms were more prevalent among female students, with 63.63% of cases, while male students exhibited some level of TMD in 36.36% of cases.

Etiological factors for TMD

The etiological factors contributing to TMD among dental students are summarized in Table 3.

Table 3. Etiological factors for TMD among dental students

| Age group | gender | Psychological stress (n) | Malocclusion (n) | Other factors (n) | No specific etiological factor (n) | Number of students |
|---|---|---|---|---|---|---|
| **Group 1 18-22 ages** | Male | 3 | 4 | 3 | 15 | 25 |
| | Female | 9 | 8 | 2 | 16 | 35 |
| | Total | 12 | 12 | 5 | 31 | 60 |
| **Group 2 23-27 ages** | Male | 8 | 2 | 2 | 3 | 15 |
| | Female | 10 | 4 | 1 | 5 | 20 |
| | Total | 18 | 6 | 3 | 8 | 35 |
| **Total** | | 30 (31.57%) | 18 (18.94%) | 8 (8.42%) | 39 (40.94%) | 95 (100%) |

The results indicated that psychological stress was the most common etiological factor, reported by 31.57% of the students, followed by malocclusion at 18.94%. A significant proportion (40.94%) did not attribute their TMD to a specific etiological factor.

These findings emphasize the importance of early detection and intervention, particularly among dental students who may face unique stressors and risk factors within their academic environment.

## DISCUSSION

The high prevalence of TMD among dental students, as evidenced by the results of this study, underscores the significance of this condition within the student population. The findings align with previous research conducted in diverse populations, such as adolescents in Haryana, India (Taneja et al., 2019) and university students (Karthik et al., 2017), indicating that TMD is a widespread issue that transcends geographic and demographic boundaries. The TMD prevalence in this study exceeds the prevalence reported in some other studies, possibly due to the specific focus on dental students who may be exposed to unique stressors and risk within their academic environment.

Notably, this research highlighted a significant gender disparity, with a higher prevalence of TMD among female students. The finding is consistent with previous studies, emphasizing the gender-specific nature of TMD, and it may be associated with hormonal and psychosocial factors (Filingim et al., 2013).

Psychological stress emerged as a substantial etiological factor for TMD in this study, which is consistent with existing literature (Boever and Steenks, 1996; Preeti, 2016). The demanding academic environment, along with the rigorous training dental students undergo, likely contributes to elevated stress levels, which, in turn, may increase the susceptibility to TMD. Moreover, malocclusion, another significant etiological factor identified in this study, emphasizes the importance of considering the occlusal aspect of TMD among dental students.

The presence of clicking sounds in a notable percentage of students is an important clinical finding. This symptom can be indicative of joint dysfunction and may warrant further evaluation and management.

## CONCLUSION

In conclusion, this study reveals a considerable prevalence of Temporomandibular Disorders (TMD) among dental students, with more than half of the participants affected to varying degrees. Stress was identified as a key factor associated with a higher prevalence of TMD in this population, which emphasizes the need for stress management strategies and psychological support within dental education programs. Moreover, the gender-based differences in TMD prevalence point to the importance of considering gender-specific risk factors and healthcare interventions.

This study highlights the significance of prevention and early diagnosis as a key factor for successful management of TMD among dental students. These findings should prompt educational institutions to implement preventive measures and support systems that can mitigate the impact of stress and reduce the burden of TMD in this specific population.

Furthermore, continued research and interdisciplinary collaboration are essential for a better understanding of the multifactorial nature of TMD and the development of targeted interventions that can alleviate the burden of this condition on dental students and, more broadly, on the general population.

## REFERENCES

Augusto, V., Perina, B., Penha, D., Santos, D.and Oliveira, V. (2016). Temporomandibular dysfunction,stress and common mental disorders in university students.Acta Ortopedica Brasileira. 24(6):330–333.

Bagis, B., Ayaz, E. A., Turgut, S., Durkan, R., & Özcan, M. (2012). Gender difference in prevalence of signs and symptoms of temporomandibular joint disorders: a retrospective study on 243 consecutive patients. International journal of medical sciences, 9(7), 539–544. https://doi.org/10.7150/ijms.4474

Boever, J.A., Steenks, M.H. (1996). Epidemiology, symptomatology and Etiology of craniomandibular dysfunction. In: Steenks MH, de Wijer A, editors. Temporomandibular joint dysfunctions From the Point of View of Physiotherapy and Dentistry. 1st ed. SaoPaulo, Brazil: LivrariaEditora Santos; p. 35-43

Fillingim, R.B., Ohrbach, R., Greenspan, J.D., et al. (2013). Psychological factors associated with development of TMD: the OPPERA prospective cohort study, J Pain 14(Suppl 12):T75– T90.

Hamissi, J. (2012). The Principles Prevention in Dentistry, Oral Health Care -Pediatric, Research, Epidemiology and Clinical Practices VirdiMandeep, ed., InTech; 2012. ISBN: 978- 953-51-0133-8, available from:http://www.intechopen.com/books/oral-health-care-pediatric- research-epidemiology and clinical practices/the principlesprevention-in-dentistry.

Hiltunen, K., Schmidt-Kaunisaho, K., Nevalainen, J., et al. (1995). Prevalenceof signs of temporomandibular disorders among elderly inhabitantsof Helsinki, Finland, Acta Odontol Scand 53(1):20–23.

Karthik, R., Hafila, M.I., Saravanan, C., Vivek, N., Priyadarsini, P., Ashwath, B. (2017). Assessing prevalence of temporomandibular disorders among university students: A questionnaire study. J Int Soc Prevent Communit Dent. 7:S24-9.

Kohler, A.A. (2012). On temporomandibular disorders Time trends, associatedfactors, treatment need and treatment outcome. Swedish DentalJournal. 227:8

Kumar,M. and Harshitha, C. (2018). Prevalence of temporomandibular disorders among dental undergraduate students,"Drug Invention Today, 10(7).

Magnusson, I.,Egermark, and Carlsson, G.E. (2005). A prospective investigation over two decades on signs and symptoms of temporomandibular disorders and associatedvariables. A final summary," Acta Odontologica Scandinavica. 63(2):99–109

Nourallah, H., Johansson, A. (1995). Prevalence of signs and symptoms of temporomandibular disorders in a young male Saudi population, J Oral Rehabil22(5):343–347.

Okeson, J.P. (2019) Management of Temporomandibular Disorders and Occlusion, 8th Edition. Chicago: Quintessence;

Preeti, D. (2016) Possible etiological factors and clinical features of TMD.J Adv Clin Res Insights. 3:91-3.

Ryalat, Z. H.,Baqain, W. M., Amin, F.,Sawair, O., Samara,O., Badran, D. (2009) Prevalence of temporomandibular jointdisorders among students of the university of Jordan. Journal of Clinical Medicine and Research. 1(3):158–164.

Taneja, P., Nagpal, R., Marya, C.M. et al. (2019) Temporomandibular Disorders among Adolescents of Haryana, India: A Cross-sectional Study. Int J Clin Pediatr Dent. 12(6):500–506.

Zlatanovska, K., Longurova, N., Dimova, C., Zarkova-Atanasova, J., Proseva, Lj. (2021) Classification of temporomandibular disorders. Knowledge - International journal, 49 (4). pp. 693-698.

# Fabrication of upper complete denture combining dental base materials tocover torus palatinus - Case report

Vlora Berisha
UBT – Higher Education Institution, Faculty of Dentistry, Prosthodontics Department,
Kosovovlora.berisha@ubt- uni.net

Abstract

Torus palatinus provides a challenge when restoring an edentulous arch. Because the mucosa is often quite thin, tori may be sensitive to the pressure that comes from a denture basis. . A strong palatal seal is prevented by the tori's propensity for having deep undercuts that occasionally extend to the junction with the soft palate.

Case Report: A 70-year-old edentulous female came to our dental clinic, with a chief complaint of the instability of her maxillary complete dentures, and she requested new denture. The patient had been wearing the dentures for approximately 2 years. Based on the intraoral examination, the patient had a large, unilobular diffuse torus palatinus .It was covered with thin mucosal tissue, and it did not interfere with her speech, her ability to chew, or other oral functions without the dentures. After the problems were thoroughly diagnosed, thermoplastic complete denture was chosen as the appropriate solution for this case. Dual lamination involves combining 2 materials to fabricate a denture base that utilizes the retentive aspects of the torus. The thermoplastic flange provides a measure of flexibility, allowing the denture to seat over the torus and the support for the denture teeth .The resilient liner provides a cushion to diffuse the occlusal load. Using this approach, a very retentive denture was fabricated using torus palatinus as a key element in anchoring the denture.

Keywords: Complete denture, thermoplastic denture, torus palatinus

## Introduction

A torus palatinus (pl. tori palatini), or palatal torus (pl. palatal tori), is a bony protrusion on the palate. Tori palatini are usually present on the midline of the hard palate. Because the mucosa is often quite thin, tori may be sensitive to the pressure that comes from a denture basis.

Denture interference, or denture instability, is the most frequent issue linked to torus palatinus. When a denture is unstable, it negatively impacts the prosthetic device's support and retention, which puts harmful forces on the edentulous ridges while the prosthesis is being used.i Large torus palatinus with an undercut frequently makes it more difficult to situate the tray when taking impressions or putting the dentures in, which lowers the stability and retention of acrylic dentures and increases the risk of inflammation on the mucosa from friction from the prosthesis.ii Gagging, on the other hand, results from the posterior palatal seal being overextended. There are two types of traditional management for torus palatinus: surgical and nonsurgical. Though it may result in a number of consequences such nasal cavity perforation, nerve injury, and palatal bone fracture, some studies only advise surgical removal of the torus palatinus in the direst circumstances.iii

A number of nonsurgical techniques are thought to be a good way to deal with this issue. These include creating a window in the dentures or designing a complete denture with accuracy. Another option is to fabricate complete dentures in the shape of a horseshoe to accommodate the torus palatinus so that stable, comfortable, and retentive dentures can be made.iv

In order to help engage deep soft-tissue undercuts in the front aspect of the maxilla, triple lamination has been modified.v By using a combination of soft flanges and liner, this approach prevents soft tissue trauma and pain when the denture engages the soft-tissue undercut.

The dual lamination technique is modified in this article to accommodate the positioning of a maxillary full denture over a torus palatinus.

Case Report

A 70-year-old edentulous female came to our dental clinic, with a chief complaint of the instability of her maxillary complete dentures, and she requested new denture. The patient had been wearing the dentures for approximately 2 years. Based on the intraoral examination, the patient had a large, unilobular diffuse torus palatinus .It was covered with thin mucosal tissue, and it did not interfere with her speech, her ability to chew, or other oral functions without the dentures(Figure 1).

After the problems were thoroughly diagnosed, thermoplastic complete denture was chosen as the appropriate solution for this case. Dual lamination involves combining 2 materials to fabricate a denture base that utilizes the retentive aspects of the torus. The thermoplastic flange provides a measure of flexibility, allowing the denture to seat over the torus and the support for the denture teeth .The resilient liner provides a cushion to diffuse the occlusal load. Using this approach, a very retentive denture was fabricated using torus palatinus as a key element in anchoring the denture.

Surgically removing the torus palatinus, followed by the use of an implant prosthesis, was not a recommended treatment plan for the patient due to his economic status and age.

Figure 1. Palatal view of maxillary torus

Figure 2. Preliminary impression with alginate

The primary impression of the edentulous maxilla and mandibular teeth was obtained using an irreversible hydrocolloid impression material taken with a stock tray to produce a diagnostic case made of artificial stone(Figure2). The main concern was the accuracy of the impression due to the existence of torus palatinus. A border-molded (with impression compound) acrylic custom tray was used for the final impression. Adequate relief in the tray was provided to allow seating of the impression tray and capturing of the undercuts. The silicone impression material yielded a very good model of the maxillary torus. The vertical dimension of the occlusion was reestablished by the occlusion rim, which was well constructed and contoured to create adequate lip and cheek support. The anterior artificial teeth were selected and arranged to enhance the esthetics of the outcome, while the posterior teeth were arranged to fulfill the requirements of balanced occlusion. Balanced occlusion preserves the stability of complete dentures and simultaneously facilitates the realization of the tooth contacts at the working side and the balancing side. All the artificial teeth were arranged on the articulator in the centric occlusion position so that the centric relation records could be verified. A try-in of the waxed upper complete dentures was performed to verify the correct occlusion, shade, and mold. Thermoplastic complete denture was chosen as the appropriate solution for this case(Figure 3).

Dual lamination involves combining 2 materials to fabricate a denture base that utilizes the retentive aspects of the torus. A thermoplastic material was used to fabricate the base ,buccal

flange and the external portion of the palatal flange. MOLLOPLAST-B was used to line the entire tissue surface of the denture including the palatal flange . The thermoplastic flange provides a measure of flexibility, allowing the denture to seat over the torus and the support for the denture teeth .The resilient liner provides a cushion to diffuse the occlusal load. Using this approach, a very retentive denture was fabricated using torus palatinus as a key element in anchoring the denture.

Figure 3. Thermoplastic complete denture

Verification of the retention and stability, phonetics, and esthetics of the thermoplastic complete denture was done.The patient was given postinsertion instructions regarding maintenance, nutrition, and hygiene. The patient was seen the next day and was comfortable.Recall appointments the following day and over the next 4 weeks showed no sign of any denture irritation. There were no complaints of irritation of the torus palatinus.

Discussion

Many of the patients with torus palatinus that are seen in everyday clinical practice need total denture treatment, which presents difficulties and hurdles for the fabrication process. The mucosa of torus palatinus is often extremely thin, which results in sensitivity to normal pressure from the denture base. This causes discomfort and irritation when wearing acrylic dentures on a regular basis. To fit over the torus, the thermoplastic denture offers some flexibility.

Versacryl is a thermoplastic polymer that is rather stiff at room temperature but becomes flexible when tempered in hot water. Before polishing or grinding, the denture must be chilled in order to make adjustments. It forms a chemical link with the resilient liner and denture basis by the use of methyl-methacrylate. The end effect is a semi-rigid flange that slides into soft- tissue undercuts in the maxillary anterior region and over the torus palatinus with comfort. Often used as a cushion on the fitting surface of dentures, resilient liners like MOLLOPLAST-B are used to treat ridge atrophy, bruxism, wounded oral mucosa, bony undercuts, and congenital oral abnormalities that need to be obturated.vi Soft lining materials provide an even distribution of the functional load and avoid the concentration of local stress on the soft-tissue surface.vii-viii

This dual lamination of materials allowed the denture to fit onto the torus palatinus and engage the anterior undercut. The resilient liner prevented the thermoplastic material from locking around the torus, decreased the occlusal load on the torus, and acted as a shock absorber to distribute the occlusal load across the edentulous ridge. In the case described, this allowed the undercut to act as an active part of the retentive mechanism for the denture. It also reduced the incidence of sore spots and denture irritation . The semi-rigid exterior of the flange provided support and flexibility to allow the denture to engage the anterior undercut.

References

[i] Preoteasa E, Preoteasa CT, Iosif L, Magureanu CM, Imre M. Denture and overdenture complications. In: Emerging Trends in Oral Health Sciences and Dentistry. London: InTech;

2015. p. 195. Available from: http://www. intechopen.com/books/emerging-trends-in-oral-health-sci ences - and - dentistry/denture - and - overden ture-complications. [Last accessed o 2020 May 17].

[ii] Al Quran FA, Al-Dwairi ZN. Torus palatinus and torus mandibularis in edentulous patients. J Contemp Dent Pract 2006;7:112-9.

[iii] Sathya K, Kanneppady SK, Arishiya T. Prevalence and clinical characteristics of oral tori among outpatients in Northern Malaysia. J Oral Biol Craniofac Res 2012;2:15-9.

[iv] Abrams S, Hellen W. Fabrication of an overdenture covering a torus palatinus using a combination of denture base materials: A case report. Dent Today 2006;25:74-7.

[v] Abrams S. A technique for using maxillary anterior soft-tissue undercuts in denture placement: a case report. *J Can Dent Assoc*. 2002;68:301-304.

[vi] Baysan A, Parker S, Wright PS. Adhesion and tear energy of a long-term soft lining material activated by microwave energy. *J Prosthet Dent*. 1998;79:182-187.

[vii] Wright PS. The success and failure of denture soft-lining materials in clinical use. *J Dent*. 1984;12:319-327.

[viii] Bell DH Jr. Clinical evaluation of a resilient denture liner. *J Prosthet Dent*. 1970;23:394-406.

# ORAL HEALTH IN PATIENTS WITH CHRONIC RENAL FAILURE

Asllani L.1, Minovska A.2, Petrovski M.3, Barani M.4 1 Faculty of dentistry of UBT, Prishtine, KosovaPhD candidate, Faculty of medical sciences, Goce Delcev University, Stip, North Macedonia Eternadent, Skopje, North Macedonia
Faculty of medical sciences, Goce Delcev University, Stip, North MacedoniaFaculty of dentistry of UBT, Prishtine, Kosova

Abstract

Kidneys are visceral organs that are responsible for numerous body functions. About 90% of patients with kidney failure show oral signs and symptoms on both soft and hard dental tissues, some of them are caused by the disease, while others may be caused by the treatment.

The main aim of this paper was to present the oral health changes caused by chronic renal failure.

In order to realize the main aim, adequate literature review was conducted.

The occurrence of gingival hyperplasia due to immunosuppressive therapy is the most studied oral manifestation. It is estimated that 30% of patients who are on cyclosporine therapy show clinically significant gingival enlargement. Decreased kidney function results in an increase in levels of urea in the blood, and thus an increased level of urea in the saliva, where it is the same converts to ammonia. For this reason, uremic individuals have a characteristic halitosis (uremic fetor), which also occurs in about a third of patients on hemodialysis. Hyposalivation occurs as a result of reduced fluid intake, or as a result of secondary effects of drugs (mainly antihypertensives), as a result of the atrophy of the parenchyma of the small salivary glands or due to mouth breathing.

The knowledge of the basic anatomical and pathological characteristics of kidneys, as well as the signs and symptoms of their diseases will allow them to avoid numerous complications in everyday practice that may occur during dental interventions in such patients.

Keywords: Renal failure, chronic renal disease, uremic halitosis, oral changes

## Introduction

Kidneys are visceral organs that are responsible for numerous body functions. One of the most important functions of the kidneys is the regulation of the intravascular volume and the concentration of fluids and electrolytes in the body through the production of urine. The kidneys are also involved in blood pressure regulation, detoxification from toxic substances, the secretion of hormones, the control of the acido-basic homeostasis and the concentration of electrolytes.

Urine is excreted from the kidneys into the renal pelvis through the ureters and it is then collected in the bladder. Bladder with the help of the detrusor structures is capable of loosening or expanding to accept its urine without increasing internal pressure. This means that a large volume of fluid can be collected in the bladder (700-1000 ml) without causing damage to the renal system as a result of high pressure. When urine comes out of the bladder, the urethral sphincter relaxes, the detrusor contracts and urine is excreted through the urethra into the external environment. (Fry & Wu, 1997)

Each kidney contains about 1 million cells called nephrons which represent basic renal units. Each nephron is made up of filtration components called renal capsules and tubules that extend into renal pyramids. The kidney is anatomically composed of a cortex and a medulla. The cortex contains glomerular cells, while the medulla contains the tubules. Each glomerulus is supplied with blood through the afferent arteriole. The glomeruli are protected by a capsule called Bowman's capsule. (Preuss, 1993)

The plasma filtrate first passes through the capillary endothelium, then through the basal membrane and finally between the podocytes. The changes that will occur on the membrane and which will make it more or less permeable to different substances have been detected in many glomerular diseases that lead to the occurrence of proteinuria. After the filtrate passes the three layers or barriers, then enters the renal tubules. These tubules are composed of a single lining of epithelial cells. (Arif & Nihalani, 2013)

The main aim of this paper was to present the oral health changes caused by chronic renal failure.

For the realization of the main goal, an adequate literature review was made using the following keywords "chronic renal failure", "end-stage renal disease", "oral health", "oral changes" and "hemodialysis". Scientific literature data published dominantly in English, in professional and scientific journals from the last two decades were used.

Functions of kidneys

As aforementioned, the kidney contains numerous functional units called nephrons that produce urine through consecutive processes: 1) glomerular filtration; 2) tubular reabsorption and 3) tubular secretion. The transport system in the renal tubules has a limit in terms of substances which he can transport in one time. The transport system involves almost all natural organic and some inorganic substances. These substances are usually glucose, amino acids, small peptides and proteins, ketone bodies, calcium, phosphate. Exception regarding natural organics substances is urea. The second mechanism or mechanism based on pressure gradient refers to the filtration or control of the following electrolytes that are ions - sodium, potassium, chlorides and water. The most important substances that are secreted by tubules are hydrogen ions, sodium, creatinine, as well as some drugs such as penicillin. Renal clearance of any substance is the plasma volume from which that same substance is completely removed by the kidneys for a unit of time. In clinical practice, creatinine clearance is a measure of the glomerular filtration rate. (Roy et al, 2015; Bhaskar & Oommen, 2018)

Aldosterone is a corticosteroid hormone that is synthesized in the adrenal gland, increases potassium reabsorption and potassium secretion. Also, the antidiuretic hormone that is produced in the hypothalamus increases permeability to water through direct influence on water channels around the principal cells. (Arroyoet al, 2011)

The concentration of extracellular calcium under normal conditions is constant. The regulation of calcium in the plasma takes place through the gastro- intestinal tract, bones and kidneys. Regulation is predominantly dependent from hormones, mainly parathyroid hormones and the active form of vitamin D3. Parathyroid hormone stimulates the reabsorption of this ion in the kidney's tubules, namely the reabsorption of calcium, as well as the release of calcium from bones and affects the intestinal absorption of calcium. Vitamin D is formed in the skin or is ingested and then by hydroxylation passes into liver and kidneys. (Gallagher et al, 1979)

Metabolic reactions that occur in the body are extremely sensitive to the concentration of hydrogen ions. Small changes in the pH value can cause significant protein changes. There are numerous buffering mechanisms responsible for reducing changes in the pH value in the body. The most significant extracellular buffer system is the bicarbonate buffer system, which includes carbon dioxide and HCO3 ion, and the main intracellular buffers are proteins and phosphates. (Bobulescu & Moe, 2006).

The kidneys maintain a stable concentration of hydrogen ions in the plasma through excretion of hydrogen ions which are actually temporarily regulated by the bicarbonate concentration in the plasma. The kidneys excrete excess bicarbonate when the body is in a state of alkalosis or increase and create new bicarbonate when the body is in a state of acidosis. (Adamczak &

Surma, 2021)

Acid-base disorders occur most often as complications, which arise as a result of various pathological processes. The body has an acute response in order to correct the existing pathological change that led to these states, using the bicarbonate system. There is also a chronic response in which includes renal and respiratory mechanisms. (Rajkumar & Pluznick, 2018)

Erythrocyte production is directly controlled by secretion of the hormone called erythropoietin. Erythropoietin is secreted in blood from a group of cells located in the kidneys. This hormone affects the bone marrow and it is stimulating- it acts on the proliferation of erythrocyte progenitor cells and their differentiation into erythrocytes. The secretion of erythropoietin increases by certain situations, like heart failure, respiratory failure, anemia, etc. Without this hormone patients develop certain types of anemia that are observed in the end-stage renal failure. (Bhoopalan et al, 2020)

Gluconeogenesis is the dominant task of the liver, but anyway the kidneys also participate in this function. The importance of the kidney's role in the function of gluconeogenesis is still unexplained, but it is concluded that the kidneys can act on homeostasis of glucose and may lead to hypoglycemia. (Kaneko et al, 2018)

Chronic renal failure

Unlike acute renal failure, chronic renal insufficiency is a slowly progressive condition characterized by an irreversible reduction of the glomerular filtration rate. As chronic renal failure progresses it actually begins with asymptomatic increased kidney function, which leads to end-stage kidney failure. Until the moment of manifestation of symptoms and reduction renal function, other systems can be affected by changes. The patients develop symptoms that are directly related to kidney dysfunction. End-stage kidney failure, also known as uremic syndrome, is the ultimate stage of chronic renal failure. Uremia is defined as asymptomatic renal failure followed by metabolic changes and complications.

There are three modalities in the treatment of renal failure, the first step of treatment is essentially conservative therapy. The second type of treatment is actually dialysis, which is intended for the terminal stage of renal failure. And the third option is transplantation of kidneys.

Conservative medical treatment consists of dietary changes which refer to restriction of salt and water intake, restriction of protein intake to reduce uremia, then sodium restriction- chloride and potassium chloride as well as avoiding magnesium, phosphorus and aluminum. These patients are usually prescribed loop diuretics as well as thiazide diuretics in order to be able to maintain an adequate balance of fluids and calcium-carbonate in order to control serum calcium and phosphate levels. It is sodium bicarbonate reserved for control of metabolic acidosis and administered intravenously. (Kim & Jung, 2020)

If an adequate therapeutic response is not achieved, these patients are referred to dialysis. Dialysis is actually a mechanism through which they are removed. The liquid is the waste products as well as electrolytes, acids and bases by way of diffusion and osmosis across a semipermeable membrane. There are two forms of dialysis - hemodialysis and peritoneal dialysis. The complications that are associated with hemodialysis are thrombosis, infections, hypotension, dyspnea, hemorrhage, hepatitis B and C, as well as hypertrophic cardiomyopathy which represents one of the most common causes of death in dialysis patients. (Vadakkedath & Kandi, 2017)

Complications such as thrombosis, hypotension, dyspnea and hemorrhage that may occur can also affect the dental interventions, so they represent risk factors for deterioration of the patient's condition. In these patients it is necessary to decide on this condition and to take preventive measures in order not to disturb the general health condition in this person. The appearance of hepatitis B and C, as infectious diseases, also belong to the group of diseases with dental risk, due to the need to take appropriate measures to prevent the potential risk of spreading the infection. (Bello et al, 2017)

Complications in end-stage renal failure patients

1. Volume

Patients in the end stage of renal failure do not produce urine, which means that fluid balance in these patients depends on dialysis and from fluid restriction. If these patients develop hypervolemia then they can serious complications such as pulmonary edema, hypertension, congestive heart failure and peripheral edema. Also, if there is too much liquid removed during dialysis then hypovolemia, hypotension, orthostasis and syncope can occur. Ideally patients should be normovolemic. During dental treatment, continuous monitoring of blood pressure is necessary if possible. The pressure should be measured on the arm where it is not placed in the arteriovenous fistula. (Claure-Del Granado & Mehta, 2016)

2. Electrolytes

In patients in the terminal stage of kidney disease, changes in potassium, magnesium, phosphorus and calcium levels. Because of this they are checked for basal metabolism during dialysis. Because hyperkalemia can cause arrhythmias and heart blocks, hyperkalemia is one of the indications for emergency dialysis. Hypomagnesemia is manifested as generalized muscle weakness, which can lead to respiratory collapse, hypotension and bradycardia. Hypokalemia and hyperphosphatemia are common in patients with renal failure, as a result of increased excretion of phosphates and vitamin D production. (Yamada & Inaba, 2021)

Patients who are in the end stage of renal failure are under high risk of developing metabolic acidosis, because their organism is not capable of clearance of accumulated hydrogen ions. The organism compensates for this through hyperventilation. When the compensatory mechanism will no longer function patients develop lethargy, confusion, nausea and vomiting. This can lead to cardiovascular collapse, coma and death. (Kim, 2021)

3. Anemia

Anemia is common in end-stage renal insufficiency and occurs as a result of hemolysis, which is associated with hemodialysis and also due to the lack of erythropoietin production. These patients should have a blood test before any dental intervention in order to check the status of hemoglobin and hematocrit. A lot of patients with renal failure also have comorbid diseases such as coronary disease and diabetes. Anemia combined with stressful clinical treatment (like dental treatment) may increase myocardial oxygen demand that can cause cardiac arrest. Medicines for reducing stress such as nitric oxide or oxygen, as well as local anesthesia should be administered even for minor procedures. Any kind of major dental procedure imposes the need for sedation or with receiving sedatives. However, before these drugs are administered, it is must be done consultation with anesthesiologist. (Babitt & Lin, 2012)

4. Hemorrhage (bleeding)

Hemorrhage most often occurs as a result of the use of heparin during dialysis or as a result of kidney dysfunction associated with lack of coagulation factors as a result of uremia. The half- life of heparin is approximately 3-4 hours. For these reasons any dental treatment should be coordinated on days when the dialysis is not performed. This will reduce the side effects of heparin. The patients who are on hemodialysis, with kidney failure before they are undergoing any surgical procedure or dental intervention should have their prothrombin time, partial thromboplastin time, uremia and creatinine status checked. (Shen & Winkelmayer, 2012; Ribic & Crowther, 2016)

5. Infections

In patients with end-stage renal failure, the possibility of the occurrence of infections is high, especially in those patients who have kidney transplant as response to immunosuppressive drugs. If infection occurs, these patients should be hospitalized, they should be treated with surgical drainage of the abscess, to remove the source of infection and anyway to administer intravenous antibiotics. Dentists should avoid treating these infections with oral antibiotics

because the infections can be expanded very quickly. Many authors recommend using them prophylactically antibiotics to prevent infection in dialysis patients before a routine dental procedure. (Cawcutt, & Zimmer, 2019)

6. Clearance of drugs

Since many drugs are metabolized and excreted by the kidneys, dosing of these drugs is based on the half-life of the drug and their active metabolites. Potassium should be avoided to prevent hyperkalemia. Other medicines such as clindamycin or erythromycin that are metabolized in the liver may be administered to these patients. Non-steroidal anti-inflammatory drugs because of their nephrotoxic effect should be avoided in renal insufficiency. Local anesthetics may be used in these patients. (Hartmann et al, 2010)

Vasoconstrictors should be used with caution due to hypertension associated with renal failure. Many narcotics can be administered to patients with end-stage renal disease, but should be used carefully. (Domi et al, 2016)

Influence of end-stage renal insufficiency on oral health

About 90% of patients with kidney failure show oral signs and symptoms on both soft and hard dental tissues, some of them are caused by the disease, while others may be caused by the treatment. (Oyetola et al, 2015) Decreased kidney function results in an increase in levels of urea in the blood, and thus an increased level of urea in the saliva, where it is the same converts to ammonia. For this reason, uremic individuals have a characteristic halitosis (uremic fetor), which also occurs in about a third of patients on hemodialysis. This halitosis is manifested as perception of an unpleasant, metallic taste in the mouth. Apart from urea, there can be other changes in the composition of saliva such as an increase in the concentration of phosphates and proteins and changes in the pH of saliva. Also, these patients can also have sensory disturbances, such as changes in taste perception, especially for sweet and sour. (Lasisi, et al, 2016). These phenomena are due to high levels of urea, the presence of dimethyl- and trimethyl- amines or low levels of zinc (due to malabsorption resulting from gastrointestinal disorders. There may also be burning sensation on the lips and tongue, of neuropathic origin. (Gardeitchik et al, 2012)

Hyposalivation occurs as a result of reduced fluid intake or as a result of secondary effects of drugs (mainly antihypertensives), as a result of the atrophy of the parenchyma of the small salivary glands or due to mouth breathing. The present anemia that occurs as a consequence of reduced synthesis of erythropoietin, which can be clinically observed skin and the mucous membrane. Uremic stomatitis is clinically characterized by the presence of erythematous lesions that may be localized or generalized. Special therapeutic modalities are not required, all that is required is that normalizes blood urea. Also patients should use mild antiseptics or hydrogen peroxide. (Laheij et al.(2022)

Regarding the dental anomalies in these patients, the eruption delayed teeth in children. Another sign that is often found in children is the presence of hypoplasia of enamel, due to changes in the metabolism of calcium and phosphates. In adults reduction of the pulp chamber is often observed. In patients with kidney diseases, non-carious loss of dental tissues occurs much more often. This is due to the presence of nausea, esophageal regurgitation or bulimia nerviosa (in patients who do not like the restrictive diet, which is part of the treatment).(Nrmala, 2019)

In patients with kidney diseases, there is a higher incidence of periodontal disease, bone loss, gingival recession and deep periodontal pockets. Osteodystrophy occurs in these patients. This is a late sign of renal failure disease and because of these changes occur in the metabolism of calcium and phosphorus, abnormal metabolism of vitamin D and the compensatory hyperactivity of parathyroid glands (that is, due to secondary hyperparathyroidism). This condition is characterized by the following signs: bone demineralization, decreased trabeculation, reduced cortical bone thickness, metastatic calcifications of soft tissues, fibrocystic lesions or giant lesions cells, osteolytic areas of bones, fracture of the jaws

(spontaneous or after dental procedures), abnormal healing of the alveolus and bone in completeness after tooth extraction, as well as increased tooth mobility as a consequence of loss in alveolar bone. (Jain & Kabi, 2013)

Bleeding tendency in these patients may to be due to factors in depending on the disease, as well as changes in platelet aggregation or because of the renal anemia (which occurs secondary to deficient erythropoiesis) or in turn, as a result of dialysis, which leads to a decrease in the number of platelets due to mechanical damage or due to the use of heparin. Because of these, frequent occurrence of ecchymoses occurs in hemodialysis patients, such as petechiae and hemorrhage of the oral mucosa. Oral hygiene in patients who are on hemodialysis is usually poor, so that calculus deposits and dental plaque are increased. (Kaw & Malhotra, 2006)

To kidney transplant patients immunosuppressive therapy is prescribed and thus they become more susceptible to infections and development of malignant neoplasms. Furthermore, they often face the secondary effects of immunosuppressive drugs - excessive obesity.

The fungal infections, the lesions are mainly associated with Candida albicans. The most common clinical manifestation is angular cheilitis, although other forms of candidiasis: pseudomembranous, erythematous and chronic atrophic candidiasis. However, such conditions are rare due to the fact that in these patients antimycotic drugs are prescribed systemically. Herpes group of viruses, in particular cytomegalovirus (CMV) and herpes simplex virus (HSV), are often associated with immunosuppressive patients after organ transplantation. Because of this immunosuppression, HSV reactivation occurs quite often, and the condition is characterized by the onset of recurrent, severe and long-lasting infections. In case of recurrent HSV infections in these patients, doses of 400 mg of Acyclovir may be administered orally, 3 times a day for 10 or more days (usually more than 2 weeks). (de la Rosa García, et al, 2006)

The occurrence of gingival hyperplasia due to immunosuppressive therapy is the most studied oral manifestation. It is estimated that 30% of patients who are on cyclosporine therapy show clinically significant gingival enlargement. When patients are treated with a combination of cyclosporine and nifedipine the prevalence of gingival enlargement increases to 50%. This effect occurs within 3 months of treatment. Age is an important factor in the occurrence of this side effect, because children are more susceptible than adults. The gingival enlargement usually affects the attached gingiva, but it can also extend occlusally, interfering with occlusion and mastication. This type of increase, which usually starts at the level of the interdental papillae, is more common in the frontal regions. (Rapone et al, 2019)

The most important characteristics in these patients are the existence of a tendency to bleeding, hypertension, anemia, drug intolerance, increased susceptibility to infections and the presence of several manifestations related to the disease or the treatment of the disease. There is also an increased susceptibility to infection endocarditis and vascular infections caused by bacteria of oral origin in patients undergoing hemodialysis. Valvulopathies, especially cardiac valvular calcifications as a consequence of hyperparathyroidism are common in this case population. Antibiotic prophylaxis is suggested in this condition. A lot of antibiotics are actively metabolized in the kidneys, so adaptation to dose by amount or by frequency is needed. Penicillin (and its derivatives, such as amoxicillin), and cephalosporins are the preferred antibiotics for these patients. In the case of non-narcotic analgesics, paracetamol is the best choice. It is desirable to avoid remaining non-steroidal anti-inflammatory drugs, because they cause hypertension. Benzodiazepines may be prescribed without dose adjustment. (Rajani & Klein, 2020)

In the presence of gingival enlargement, especially if it is extreme, it is necessary to perform surgical treatment (gingivectomy). The clinical decision to perform the intervention is based mainly if there is a presence of functional discomfort and esthetic change. The change in immunosuppressive therapy is an alternative to surgical treatment, but this is not always possible. (Agrawal, 2015).

In case of need dental treatment in patients on conservative renal treatment adequate communication with a nephrologist is recommended, in order for dentists to be aware of the stage of the disease and its treatment. Before any invasive dental procedure an examination should be done for the existence of any hematological problems. The possibility of any secondary infection should also be carried. Recommendation for the use of drugs, those that are nephrotoxic must be avoided (tetracyclines, aminoglycosides), while some of them need to be adjusted the dose.

In cases of peritoneal dialysis, a catheter is placed in the abdominal wall and inserted into the peritoneum through which access is gained to the body, in order to remove the nitrogen and other metabolic toxic products. This type of dialysis can be done at home, but it must be done every day. No special measures are required for these patient's dental treatment, in addition to the above mentioned. (Constantinidis et al, 2018)

A patient with kidney disease during hemodialysis. In hemodialysis, the process filtering is done with a machine (dialyzer), outside the patient's body. This procedure is done three times a week. In order to remove the blood from the body and to doors, it is necessary to have vascular access. Permanent vascular access is obtained by surgically connecting an artery and a vein, with the help of a blood vessel (arteriovenous shunt) or through a synthetic bridge (arteriovenous graft). In the hemodialysis process, the patient's blood is anticoagulated with heparin. For this reason, when performing dental treatment there is a risk of bleeding and they must not be performed on the day of hemodialysis. If it is necessary to perform an emergency dental intervention, protamine sulfate is used (which is a heparin antagonist) to block the anticoagulant effect. In these patients there is also a risk of infection due to the vascular access and transmission of HBV, HCV and HIV. (Sulejmanagić et al, 2005)

As it is known, these patients are immunosuppressed with drugs. Maintaining proper oral health is especially important because oral infections in transplant patients can affect the acceptance of the transplanted organ. They usually receive corticosteroids, calcineurin inhibitors and lymphocytes proliferation inhibitors. Long-term treatment with high doses of corticosteroids leads to suppression of adrenal functions, which can lead to an acute complication, referred to as adrenal crisis, when exposed to stressful situations (illness, infection, surgical and dental interventions). Also, this chronic excess of corticosteroids can cause Cushing's syndrome. To minimize the risk of adrenal crisis in patients receiving highdoses of corticosteroids who are exposed to a surgical and dental procedure, they should take double doses of corticosteroids on the day of intervention. This procedure is not necessary if the patient is treated with low doses (less than 7.5 mg of prednisolone) or if the patient is on conservative treatment. However, the risk of developing an adrenal crisis while oral surgery under local anesthesia is done is very low and a larger part of the dental treatments can be performed without the addition of corticosteroids. (Roberts & Fishman, 2021)

## Conclusion

The knowledge of the basic anatomical characteristics and pathological changes of kidneys, as well as the signs and symptoms of their diseases allow them to avoid numerous complications in everyday practice that may occur during dental interventions in such patients.

## References


Adamczak, M., & Surma, S. (2021). Metabolic Acidosis in Patients with CKD: Epidemiology, Pathogenesis, and Treatment. Kidney diseases (Basel, Switzerland), 7(6), 452–467. https://doi.org/10.1159/000516371

Agrawal A. A. (2015). Gingival enlargements: Differential diagnosis and review of literature. World journal of clinical cases, 3(9), 779–788. https://doi.org/10.12998/wjcc.v3.i9.779

Arif, E., & Nihalani, D. (2013). Glomerular Filtration Barrier Assembly: An insight. Postdoc journal : a journal of postdoctoral research and postdoctoral affairs, 1(4), 33–45

Arroyo, J. P., Ronzaud, C., Lagnaz, D., Staub, O., & Gamba, G. (2011). Aldosterone paradox: differential regulation of ion transport in distal nephron. Physiology (Bethesda, Md.), 26(2), 115–123. https://doi.org/10.1152/physiol.00049.2010

Babitt, J. L., & Lin, H. Y. (2012). Mechanisms of anemia in CKD. Journal of the American Society of Nephrology : JASN, 23(10), 1631–1634. https://doi.org/10.1681/ASN.2011111078

Bello, A. K., Alrukhaimi, M., Ashuntantang, G. E., Basnet, S., Rotter, R. C., Douthat, W. G., Kazancioglu, R., Köttgen, A., Nangaku, M., Powe, N. R., White, S. L., Wheeler, D. C., & Moe, O. (2017). Complications of chronic kidney disease: current state, knowledge gaps, and strategy for action. Kidney international supplements, 7(2), 122–129. https://doi.org/10.1016/j.kisu.2017.07.007

Bhaskar, A., & Oommen, V. (2018). A simple model for demonstrating the factors affecting glomerular filtration rate. Advances in physiology education, 42(2), 380–382. https://doi.org/10.1152/advan.00195.201

Bhoopalan, S. V., Huang, L. J., & Weiss, M. J. (2020). Erythropoietin regulation of red blood cell production: from bench to bedside and back. F1000Research, 9, F1000 Faculty Rev-1153. https://doi.org/10.12688/f1000research.26648.1

Cawcutt, K. A., & Zimmer, A. (2019). Management of Infection in Patients With Kidney Transplant. Critical Care Nephrology, 552–560.e1. https://doi.org/10.1016/B978-0-323-44942-7.00095-9

Claure-Del Granado, R., & Mehta, R. L. (2016). Fluid overload in the ICU: evaluation and management. BMC nephrology, 17(1), 109. https://doi.org/10.1186/s12882-016-0323-6

Constantinides, F., Castronovo, G., Vettori, E., Frattini, C., Artero, M. L., Bevilacqua, L., Berton, F., Nicolin, V., & Di Lenarda, R. (2018). Dental Care for Patients with End-Stage Renal Disease and Undergoing Hemodialysis. International journal of dentistry, 2018, 9610892. https://doi.org/10.1155/2018/9610892

de la Rosa García, E., Mondragón Padilla, A., Aranda Romo, S., & Bustamante Ramírez, M. A. (2006). Oral mucosa symptoms, signs and lesions, in end stage renal disease and non-end stage renal disease diabetic patients.

Domi, R., Huti, G., Sula, H., Baftiu, N., Kaci, M., Bodeci, A., & Pesha, A. (2016). From Pre-Existing Renal Failure to Perioperative Renal Protection: The Anesthesiologist's Dilemmas. Anesthesiology and pain medicine, 6(3), e32386. https://doi.org/10.5812/aapm.32386

Fry, C. H., & Wu, C. (1997). Initiation of contraction in detrusor smooth muscle. Scandinavian journal of urology and nephrology. Supplementum, 184, 7–14.

Gallagher, J. C., Riggs, B. L., Eisman, J., Hamstra, A., Arnaud, S. B., & DeLuca, H. F. (1979). Intestinal calcium absorption and serum vitamin D metabolites in normal subjects and osteoporotic patients: effect of age and dietary calcium. The Journal of clinical investigation, 64(3), 729–736. https://doi.org/10.1172/JCI109516

Gardeitchik, T., Humphrey, M., Nation, J., & Boneh, A. (2012). Early clinical manifestations and eating patterns in patients with urea cycle disorders. The Journal of pediatrics, 161(2), 328–332. https://doi.org/10.1016/j.jpeds.2012.02.006

Jain, A., & Kabi, D. (2013). Severe periodontitis associated with chronic kidney disease. Journal of Indian Society of Periodontology, 17(1), 128–130. https://doi.org/10.4103/0972- 124X.107489

Kaneko, K., Soty, M., Zitoun, C., Duchampt, A., Silva, M., Philippe, E., Gautier-Stein, A., Rajas, F., & Mithieux, G. (2018). The role of the kidney in the inter-organ coordination of endogenous glucose production during fasting. Molecular metabolism, 16, 203–212. https://doi.org/10.1016/j.molmet.2018.06.010

Kaw, D., & Malhotra, D. (2006, July). Hematology: issues in the dialysis patient: platelet dysfunction and end-stage renal disease. In Seminars in dialysis (Vol. 19, No. 4, pp. 317-322). Malden, USA: Blackwell Publishing Inc.

Kim H. J. (2021). Metabolic Acidosis in Chronic Kidney Disease: Pathogenesis, Clinical Consequences, and Treatment. Electrolyte & blood pressure : E & BP, 19(2), 29–37. https://doi.org/10.5049/EBP.2021.19.2.29

Kim, S. M., & Jung, J. Y. (2020). Nutritional management in patients with chronic kidney disease. The Korean journal of internal medicine, 35(6), 1279–1290. https://doi.org/10.3904/kjim.2020.408

Lasisi, T. J., Raji, Y. R., & Salako, B. L. (2016). Salivary creatinine and urea analysis in patients with chronic kidney disease: a case control study. BMC nephrology, 17, 10. https://doi.org/10.1186/s12882-016-0222-x

Nrmala, S. V. S. G. (2019). Oral health and dental care of children with renal diseases—a narrative review. Journal of Dental Health Oral Disorders & Therapy.— 2019, 10(2), 132-138.

Oyetola, E. O., Owotade, F. J., Agbelusi, G. A., Fatusi, O. A., & Sanusi, A. A. (2015). Oral findings in chronic kidney disease: implications for management in developing countries. BMC oral health, 15, 24. https://doi.org/10.1186/s12903-015-0004-z

Preuss H. G. (1993). Basics of renal anatomy and physiology. Clinics in laboratory medicine, 13(1), 1–11.

Rajani, R., & Klein, J. L. (2020). Infective endocarditis: A contemporary update. Clinical medicine (London, England), 20(1), 31–35. https://doi.org/10.7861/clinmed.cme.20.1.1

Rajkumar, P., & Pluznick, J. L. (2018). Acid-base regulation in the renal proximal tubules: using novel pH sensors to maintain homeostasis. American journal of physiology. Renal physiology, 315(5), F1187–F1190. https://doi.org/10.1152/ajprenal.00185.2018

Rapone, B., Ferrara, E., Santacroce, L., Cesarano, F., Arazzi, M., Liberato, L. D., Scacco, S., Grassi, R., Grassi, F. R., Gnoni, A., & Nardi, G. M. (2019). Periodontal Microbiological Status Influences the Occurrence of Cyclosporine-A and Tacrolimus-Induced Gingival Overgrowth. Antibiotics (Basel, Switzerland), 8(3), 124. https://doi.org/10.3390/antibiotics8030124

Ribic, C., & Crowther, M. (2016). Thrombosis and anticoagulation in the setting of renal or liver disease. Hematology. American Society of Hematology. Education Program, 2016(1), 188–195. https://doi.org/10.1182/asheducation-2016.1.188

Roberts, M. B., & Fishman, J. A. (2021). Immunosuppressive Agents and Infectious Risk in Transplantation: Managing the "Net State of Immunosuppression". Clinical infectious diseases : an official publication of the Infectious Diseases Society of America, 73(7), e1302–e1317. https://doi.org/10.1093/cid/ciaa1189

Roy, A., Al-bataineh, M. M., & Pastor-Soler, N. M. (2015). Collecting duct intercalated cell function and regulation. Clinical journal of the American Society of Nephrology : CJASN, 10(2), 305–324. https://doi.org/10.2215/CJN.08880914

Shen, J. I., & Winkelmayer, W. C. (2012). Use and safety of unfractionated heparin for anticoagulation during maintenance hemodialysis. American journal of kidney diseases : the official journal of the National Kidney Foundation, 60(3), 473–486. https://doi.org/10.1053/j.ajkd.2012.03.017

Sulejmanagić, H., Sulejmanagić, N., Prohić, S., Secić, S., & Miseljić, S. (2005). Dental treatment of patients with kidney diseases-review. Bosnian journal of basic medical sciences, 5(1), 52–56. https://doi.org/10.17305/bjbms.2005.3335

Yamada, S., & Inaba, M. (2021). Potassium Metabolism and Management in Patients with CKD. Nutrients, 13(6), 1751. https://doi.org/10.3390/nu13061751

# BENEFITS FROM DENTAL LASERS IN PERIODONTAL TREATMENT

Mihajlo Petrovski
Faculty of medical sciences, Goce Delcev University, Stip, North Macedonia

Abstract
To overcome the numerous limitations of curettes and ultrasound devices during periodontal therapy, many researchers have investigated the effects of lasers as an adjunct or alternativeof conventional mechanical periodontal therapy. Lasers are one of the most promising modalities for non-surgical periodontal treatment, as they can achieve excellent tissue ablation with strong antimicrobial effects and root surface detoxification. Starting from the abovementioned, we set the main goal of this research - to present the benefits andadvantages from dental lasers in periodontal treatment. This article presents an adequate literature review for the contemporary aspects of laser assisted periodontal therapy. All of the used literature data were published in peer-reviewed publications and journals. Most of the articles were in English language, published in the last ten years from 2013 until 2023. Various types of lasers can be used in periodontology, including Carbon Dioxide laser (CO2laser), Neodymium: Yttrium Aluminum Garnet laser (Nd: YAG laser), Erbium: Yttrium Aluminum Garnet laser (Er: YAG) and Erbium Chromium: Yttrium Scandium Gallium Garnet laser (Er, Cr: YSGG). Most often, lasers containing the YAG group are more suitablein periodontology, due to their high absorption by water and hydroxyapatite, which is the highest compared to other wavelengths. Evidence shows that the laser provides better clinical and microbiological results compared to the use of hand instruments and sonic and ultrasound instruments and devices.
**Keywords**: dental lasers, periodontology, periodontal treatment, Er:YAG laser in periodontology.

## INTRODUCTION

The numerous advantages of using laser light can hardly be ignored, such asprecision, ease of usage and greater success in therapy compared to conventional therapy procedures. However, complete knowledge of this therapeutic tool is imperative to avoid side effects and obtain the full desired benefits. Laser interventions provide numerous benefits for patients such as: reduction of postoperative complications, shortening of the postoperative discomfort, less trauma during the performance of the interventions, and in most cases there is no need to use anesthetic agents.

Because on the variety of wavelengths available, the careful and highly skilled clinician must first determine the specific goals of the treatment before choosing the technology (whether laser will be used or not). Only in this way will it be possible to reach the desired end point/s in the course of the therapy procedure in the easiest, best and most efficient way.

Manual periodontal instruments have some advantages, such as better control over the instrument, a sense of touch that can easily recognize surface roughness, and obtaininga smooth surface. There are also several disadvantages such as the duration of the intervention, the need for a high degree of physical strength to remove the calculus, the

presence of bleeding, which limits the visualization and access to the operating site, the presence of pain, the lack of accessibility to the distal regions, as well as difficulties in furcations treatment and subsequent roughness of the root surface. (Oda et al, 2004)

Compared to manual instruments, ultrasonic instruments leave more contaminated root cementum on the surface of the teeth after treatment, but still represent an ideal adjunctto the manual instrumentation of the tooth root surface. When ultrasound devices and instruments are used appropriately, postoperative discomfort for the patients is reduced. However, when use of ultrasound instruments there are also numerous disadvantages, apart from the release of contaminating aerosols, such as the possibility of potential injury to the structures of the teeth or surrounding parts, the formation of microcracks in the tooth enamelor on the surfaces of porcelain crowns and bridges, the creation of roughness on the surface,risk of interference in patients with cardiac pacemakers and leaving a softened layer after the treatment of periodontal pockets. (Wilson, 1958; Chen et al, 1994; Dibart et al, 2004)

Manual plaque removal and root planing and scaling are demanding procedures during non-surgical periodontal therapy. Therefore, more and more attention is directed towards the use of various instruments and devices that will increase the efficiency of periodontal therapy.

The need to use modern methods and techniques, which will minimize or completely exclude the appearance of the smear layer is bigger nowadays. One of those modern methodsand techniques is the usage of the laser as an innovative tool and its effect on the root surface.

The main aim of this research was to describe the benefits and advantages of new therapeutic modality in periodontology-laser assisted periodontal therapy.

Adequate researched on PubMed for articles relevant to our topic- benefits from laser assisted periodontal treatement of studies activating limits like date range (1993-2026), the type of articles (Clinical Trial, Journal Article, Randomized Controlled Trial, Review, Comparative study) and English was chosen as the language.

BENEFITS FROM LASERS IN PERIODONTAL TREATMENT

The use of laser technology in dentistry dates back to the mid-eighties of the last century. In 1985, Myers and Myers published a paper describing in vivo removal of dental caries using a modified ophthalmic Nd: YAG laser. Four years later, it was proposed that thesame Nd:YAG laser could be used for oral soft tissue surgery, ultimately representing the modern link between the use of lasers and clinical periodontology.

To overcome the numerous limitations of different periodontal instruments such as periodontal instruments and ultrasound devices during periodontal therapy, manyresearchers have investigated the effects of lasers as an adjunct or alternative to conventionalmechanical periodontal therapy. Lasers are one of the most promising modalities for non- surgical periodontal treatment, as they can achieve excellent tissue ablation with strong antimicrobial effects and root surface detoxification.

Therefore, the question arises whether the application of laser light for treatment of periodontal pockets would result in a less rough surface and less chemical changes comparedto the remaining methods of treatment of periodontal pockets. Also, the roughness of the resulting root surface, as well as the chemical changes that occur on it after the application of the laser light can vary to a large extent and depend on the type of laser (wavelength andpower) as well as on the energy that is applied on the tissues.

Regarding the previously mentioned disadvantages of both hand instruments and ultrasound devices, their replacement with more appropriate and efficient methods has always been considered in modern dental practice. From here begins the application of laserswith different wavelengths to remove deposits from the root surfaces. It must be mentionedthat various types of lasers can be used in periodontology, including the carbon dioxide laser($CO_2$ laser), the neodymium yttrium aluminum garnet laser (Nd: YAG laser), the erbium

yttrium aluminum garnet laser (Er: YAG) and erbium chromium: yttrium scandium gallium garnet laser (Er, Cr: YSGG). Most often, lasers containing the YAG group are more suitablein periodontology, due to their high absorption by water and hydroxyapatite, which is the highest compared to other wavelengths. Evidence shows that the laser provides better clinical and microbiological results compared to the use of manual instruments and sonic and ultrasound instruments and devices. (Derdilopoulou et al, 2007; Lopes et al, 2008; Hakkiet al, 2010; Yaghini et al, 2015)

In the field of periodontology, the application of the Er: YAG laser for the treatmentof periodontal hard tissue begins with studies by Japanese and German researchers. The following section presents data from numerous studies performed in vitro conditions, as wellas clinical studies that demonstrated the effective application of the Er: YAG laser for the removal of supra and subgingival concrements and decontamination of the diseased root surface during periodontal non-surgical and surgical therapy procedures.

The Er: YAG laser is a laser that contains a medium in a solid aggregate state, it is a crystal laser that works in the infrared wavelength field (2,940 nm).

Stimulated emission of $Er^{3+}$ ions in yttrium, aluminum and garnet crystals was first demonstrated back in 1975, paving the way to this, for that time, new type of laser - the Er:YAG laser. (Zharikov et al, 1975) Its emitted wavelength of 2940 nm that corresponds exactly to the maximum absorption in water, which is about 15 times higher than the absorption of the $CO_2$ laser and 20 000 times higher than that of the Nd: YAG laser. (Walsh& Cummings, 1994) Also, this type of laser light is well absorbed by hydroxyapatite, so it can be concluded that this type of laser is manufactured to effectively remove dentin and enamel, with only few and mild side effects, such as thermal damage to the dental pulp. (Bader & Krejci, 2006).

Due to its good absorption in water and hydroxyapatite, several studies have shownthe efficiency of this laser in the ablation of hard and soft tissues and its bactericidal effectswith less or no painful sensations in clinical application confirm the numerous advantages that this laser has. The variety of potential applications for this laser is being studied to thisday and interest in its use in dental practice has increased among dental practitioners.

The latest scientific evidence indicates that the use of the Er: YAG laser in the treatment of chronic periodontal disease is equivalent to the mechanical treatment ofperiodontal pockets primarily in terms of reducing the depth of periodontal pockets determined clinically through the probing procedure and by reducing the bacterial populationof subgingival dental plaque.(Padmanabhan, 2019) However, if achieving the clinicalattachment level is considered as gold standard in non-surgical periodontal therapy, then theevidence supporting laser- assisted periodontal treatment over traditional therapy is minimal(at least). Today, in modern dental medicine, there is a growing number of publications thatincreasingly support the laser-assisted treatment method as a significant additional tool in achieving the desired effect of the therapy.(Jassim, 2019; Jaryal et al, 2021)

The main advantages of the Erbium laser family according to Schwarz et al. (2003) are the following:

- Higher absorption in water compared to carbon dioxide lasers, as well as compared to neodymium yttrium aluminum garnet (Nd: YAG) lasers.
- Good absorption in hydroxyapatite.
- Minimal thermal damage to the surrounding soft tissue and hard tissue structures, thus excluding numerous side effects that may occur.

What must be remembered is that when using the laser, the degree of damage is directly related to the increase in energy density delivered per unit area, and such thermal damage is graduated from simple surface cracking of the cement to complete cracking and

melting with deep ablation of the cementum from the root surface of the tooth exposing the dentin.

Although the wavelength of light and its other physical characteristics determine the degree of energy absorption by the target tissue, the optical properties of the tissue must alsobe known. The optical properties of the tissue largely dictate the interaction with specific laser wavelengths. In this way, it will be possible to determine the desired effects that are needed during the therapeutic procedure, and of course to predict and prevent the side effectsthat may occur on the target tissue itself or in its environment.

For example, the optical properties of the tissues that make up the periodontium include numerous tissue factors such as pigmentation, water content, mineral content, heat capacity, which is affected by the thermal conductivity and density of the tissues and latent transformation changes (this group includes the processes of protein denaturation, water evaporation and mineral dissolution).

Each wavelength of laser energy is absorbed to a greater or lesser extent in water, pigment or hydroxyapatite, all of these chromatophores present in each part of the periodontal tissues. $CO_2$ laser whose wavelength is 10,600 nm has a high absorptioncoefficient in water and is therefore suitable for soft tissue surgery, but currently there is noscientifically proven clinical application for mineralized tissues. In contrast, the Nd: YAG laser with a wavelength of 1,064 nm and diode or semiconductor lasers whose wavelength ranges from 800 to 950 nm have lower absorption coefficients in water than $CO_2$ lasers, butare therefore better absorbed in pigmented tissues, while Er, Cr: YSGG lasers with a wavelength of 2780 nm and Er: YAG lasers with a wavelength of 2,940 nm are highly absorbed in both water and hydroxyapatite.

The basic physical characteristics, apart from the wavelength, which characterize the laser light, and are a function of the effects it will cause in the tissue, are the delivered energyin the tissue, power and energy density.

Energy as a characteristic of the output laser light is used only in pulsed lasers. In that case, the energy is described as the total energy contained in one pulse and is measuredin joules (J). Its values can range from nanojoules ($10^{-9}$J) in microlasers to megajoules ($10^{6}$J)characteristic of macrolaser systems.

The effect that the laser light will cause in the tissues depends not only on the amountof energy delivered to the tissue, but also on the time for which it will be delivered in a certain volume or part of the tissue. The transmitted energy in a unit of time is expressed through the physical characteristic - power and is measured in watts (W).

Considering the entire possible interval of generated energies from $10^{-9}$J to $10^{6}$J and possible pulse durations from $10^{-15}$ s to $10^{-3}$ s, it is easy to say physically that laser devices can generate light with power in the range from the minimum few microwatts ($10^{-6}$ W) to the maximum terawatts ($10^{12}$ W).

In addition to the duration of the pulse, the duration between pulses also plays a significant role in the way energy is transmitted to the tissue. Therefore, each output signal is also characterized by a pulse repetition frequency. Frequency is expressed in Hertz, and isdefined as the number of emitted pulses in one second. Depending on the methods of creatingthe pulse, the type of active medium, the pumping of electrons, etc., the repetition frequencyof the pulses can be in the range of several Hz up to 109 Hz. With this in mind, in addition to the impulse power, an average power is also defined. In pulsed lasers, the mean power isthe pulse energy multiplied by the pulse repetition frequency.

In contrast to the above, with lasers in continuous mode of operation, the output light energy is characterized by power (output energy in one second), while with lasers in pulsedmode of operation, the laser light is described through two reference values and that throughthe power on the impulse and through the mean power.

Apart from the numerous positive effects that lasers possess for the non-surgical therapy of periodontal disease, in addition, when lasers are used appropriately during periodontal therapy, they can have other benefits such as reduced bleeding, swelling and patient discomfort during the intervention. However, it must be mentioned that each laser has different wavelengths and power levels that can be safely used during different periodontal procedures. Damage to the periodontal tissues can only occur if an inappropriatewavelength or inadequate power level is used during therapy procedures.

The family of Erbium lasers which as mentioned includes Erbium:YAG (yttrium aluminum garnet) and Erbium,chromium:YSGG (yttrium scandium gallium garnet). Based on the wavelength, it can be noted that the Erbium: YAG laser belongs to the near-infrared part of the light spectrum, and it has been proven that, in addition to soft tissues, this laser iseffective in the ablation of hard dental structures as well. (Paghdiwala, 1991; Lavu et al, 2015)

The surface modification of tooth root cementum has been studied using different laser wavelengths (CO2, Nd: YAG, Er: YAG and the diode laser). The main conceptual consideration in the biomodification of the root surface is the selection of an appropriate wavelength that will effectively remove the calculus, simultaneously preventing thermal damage to the dental pulp and unwanted removal of healthy tissue substance from the surfaceof the root itself. Achieving these goals requires a wavelength characterized by minimal penetration depth in mineralized tissues such as dental cementum.

The mineral phase of cementum and dentin in the human population is represented by oxidized hydroxyapatite which has intense absorption bands in the mid-infrared region. Consequently, if an examination of laser wavelengths is made, it can be concluded that the Er:YAG laser is the instrument of choice for effective calculus removal, for the creation of an adequate root surface and for the creation of a biocompatible surface for reattachment and proliferation of cells or tissues. (Aoki et al, 1994).

CONCLUSSION

Er:YAG and Er,Cr:YSGG lasers perform ablation of soft and hard tissues with minimal adverse effects on the surrounding tissues caused by heat. Erbium lasers are also effective in removing calculus and subgingival concrements and reducing the depth of periodontal pockets, root surface treatment, bone debridement, as well as in performing bone resective and regenerative surgery and probably they are considered the most suitable periodontal laser therapy. For these reasons, it is considered that this group of lasers will become an inevitable part of modern non-surgical periodontal therapy in the near future.

BIBIOLOGRAPHY

Aoki, A., Ando, Y., Watanabe, H., & Ishikawa, I. (1994). In vitro studies on laser scalingof subgingival calculus with an erbium:YAG laser. Journal of periodontology, 65(12), 1097–1106. https://doi.org/10.1902/jop.1994.65.12.1097

Bader, C., & Krejci, I. (2006). Indications and limitations of Er:YAG laser applications in dentistry. American journal of dentistry, 19(3), 178–186.

Chen, S. K., Vesley, D., Brosseau, L. M., & Vincent, J. H. (1994). Evaluation of single-usemasks and respirators for protection of health care workers against mycobacterial aerosols. American journal of infection control, 22(2), 65–74. https://doi.org/10.1016/0196-6553(94)90116-3

Derdilopoulou, F.V., Nonhoff, J., Neumann, K., & Kielbassa AM. (2007). Microbiologicalfindings after periodontal therapy using curettes, Er: YAG laser, sonic, and ultrasonic scalers. J Clin Periodontol. , 34 (7), 588– 98.

Dibart, S., Capri, D., Casavecchia, P., Nunn, M., & Skobe, Z. (2004). Comparison of theeffectiveness of scaling and root planing in vivo using hand vs rotary

instruments. The International journal of periodontics & restorativedentistry, 24(4), 370–377.

Hakki, S. S., Berk, G., Dundar, N., Saglam, M., & Berk, N. (2010). Effects of root planing procedures with hand instrument or erbium, chromium:yttrium-scandium-gallium-garnet laser irradiation on the root surfaces: a comparative scanning electron microscopy study. Lasers in medical science, 25(3), 345–353. https://doi.org/10.1007/s10103-009-0643-x

Jaryal, S., Chhina, J., Kaur, G., & Mann, S. (2021). LASER IN PERIODONTOLOGY-A REVIEW. *International Journal of Medical Science And DiagnosisResearch*, *5*(5).

Jassim, S. D. (2019). Laser Applications in Periodontology. In *Public Health inDeveloping Countries-Challenges and Opportunities*. IntechOpen.

Lavu, V., Sundaram, S., Sabarish, R., & Rao, S. R. (2015). Root Surface Bio-modificationwith Erbium Lasers- A Myth or a Reality??. The open dentistry journal, 9, 79–86.https://doi.org/10.2174/1874210601509010079

Lopes, B. M., Marcantonio, R. A., Thompson, G. M., Neves, L. H., & Theodoro, L. H. (2008). Short-term clinical and immunologic effects of scaling and root planing with Er:YAG laser in chronic periodontitis. Journal of periodontology, 79(7), 1158–1167. https://doi.org/10.1902/jop.2008.070600

Oda, S., Nitta, H., Setoguchi, T., Izumi, Y., & Ishikawa, I. (2004). Current concepts and advances in manual and power-driven instrumentation. Periodontology 2000, 36,45–58. https://doi.org/10.1111/j.1600-0757.2004.03674.x

Padmanabhan, P. (2019). Lasers and its Application in Periodontology: A Review. *IndianJournal of Public Health Research & Development*, *10*(11).

Paghdiwala A. F. (1991). Does the laser work on hard dental tissue?. Journal of theAmerican Dental Association (1939), 122(1), 79–80.

Walsh, J. T., Jr, & Cummings, J. P. (1994). Effect of the dynamic optical properties of water on midinfrared laser ablation. Lasers in surgery and medicine, 15(3), 295–305. https://doi.org/10.1002/lsm.1900150310

Wilson, J. R. (1958). The use of ultrasonics in periodontal treatment. The Journal ofProsthetic Dentistry, 8(1), 161-166.

Yaghini J, Naghsh N, Attaei E, Birang R, Birang E. (2015). Root Surface Roughness AfterScaling and Root Planing with Er:YAG Laser Compared to Hand and Ultrasonic Instruments by Profilometry. J Dent (Tehran), 12(12), 899-905.

Zharikov, E.V., Zhekov, V.I., Kulevskii, L.R., Murina, T.M., Osiko, W., Prokhorov, A.M.,Smirnov, W., Starikov, B.P., & Timoshehkin, M.I. (1975). Stimulated emission from Er3+ ions in yttrium aluminum garnet crystals at $\lambda$ = 2.94 μm. Sov J Quantum Electron , 4, 1039-1040.

# Oral Habits of Patients as Indicators of Occlusal Dysfunction: A Comprehensive Review

Dugagjin Sokoli, Burim Kiseri, Genc Demjaha, Vlora Berisha, Teuta Komoni, Arta Gjikolli, UBT – Higher Education Institution, Faculty of Dentistry, Prosthodontics Department, Kosovodugagjin.sokoli@ubt-uni.net

Abstract:

This research paper provides a comprehensive discussion on the pivotal role of patient habits as indicators of occlusal dysfunction. The reviewed resources collectively underscore the significance of habits such as bruxism, dietary choices, oral piercings, stress-induced behaviors, and tongue thrusting influencing occlusion and oral health. Understanding the intricate interplay between these habits and occlusal function is vital for early diagnosis, prevention, and effective management of occlusal problems.

The findings strongly advocate for proactive measures in recognizing and addressing these habits, as they can have far-reaching consequences on oral health and occlusion. Early diagnosis and tailored interventions are emphasized as essential components of preserving occlusal health in individuals prone to bruxism behaviors.

Moreover, the critical review by Manfredini et al. (2003) challenges clinicians to adopt a multidisciplinary approach in addressing occlusal issues within the realm of clinical practice. Additionally, the exploration of the effects of tongue piercings by Kieser et al. (2010) serves as a reminder that patient choices, while expressions of style, can bring about tangible consequences for dental health and function.

This research paper provides valuable insights into the multifaceted relationship between patient habits and occlusal dysfunction, emphasizing the importance of recognizing and addressing these habits to enhance the quality of oral care and promote optimal occlusal health. Further research is encouraged to deepen our understanding of this complex interplay.

Keywords: Oral habits, occlusal dysfunction, bruxism, orofacial pain, tongue thrusting, dental erosion,

## 1. Introduction

Occlusal dysfunction, defined as any deviation from the ideal alignment and functioning of the teeth and jaws, can lead to a wide range of oral health problems. Patient habits play a critical role in the development, progression, and management of occlusal dysfunction. This research paper aims to provide a comprehensive examination of patient habits as valuable indicators of occlusal dysfunction. It reviews 10 key resources, published between 1986 and 2022, to offer a thorough understanding of this relationship.

Occlusal dysfunction refers to anomalies in the alignment and functioning of the teeth and jaws. It can result from a variety of factors, including bruxism, dietary habits, oral piercings, and stress-induced behaviors. Recognizing patient habits that contribute to occlusal dysfunction is essential for both prevention and treatment. This literature review assesses relevant studies to provide insights into the relationship between patient habits and occlusal dysfunction.

## 2. Methodology

To conduct this comprehensive review, a systematic search was performed across academic databases, including PubMed, Scopus, and Google Scholar. The selected 10 resources, comprising peer-reviewed articles, reviews, and studies, were assessed based on their relevance, quality, and contribution to the topic. Each resource underwent a critical analysis, considering its methodology, results, and implications for clinical practice.

A systematic search of academic databases was conducted to identify resources related to habits of patients and occlusal dysfunction. The selected 10 resources, published between 1986 and 2022, cover various aspects of this topic, including bruxism, dietary habits, oral piercings, and stress. Each resource was critically reviewed to extract key findings and insights.

## 3. Review of Selected Resources

When assessing patients for occlusal dysfunction, dentists and orthodontists often inquire about these habits and behaviors as part of their diagnostic process. Identifying and addressing these habits can be essential in preventing or managing occlusal dysfunction and its associated complications. Additionally, early intervention and patient education can play a crucial role in maintaining proper occlusion and oral health.

When it comes to studying occlusal dysfunction, understanding the habits of patients can be a valuable indicator. Occlusal dysfunction refers to any problems or irregularities in the way the upper and lower teeth fit together when the jaw is closed. Here are some key points to consider when analyzing about how the habits of patients can serve as indicators of occlusal dysfunction.

### 3.1. Bruxism

Manfredini, Winocur, Guarda-Nardini, and Paesani (2010) conducted a comprehensive and meticulously detailed review of bruxism, delving deep into various aspects of this prevalent oral habit. The authors examined the prevalence, etiology, and the far-reaching clinical implications of bruxism, offering a comprehensive insight into its role as a significant indicator of occlusal dysfunction.

#### 3.1.1. Prevalence of Bruxism

Manfredini et al. (2010) began their literature review by addressing the widespread prevalence of bruxism, emphasizing its noteworthiness in both children and adults. They meticulously compiled and analyzed data from various studies, revealing that bruxism affects a substantial portion of the population. This prevalence extends to both awake (awake bruxism) and sleep (sleep bruxism) contexts, each with distinct characteristics.

#### 3.1.2. Etiology and Risk Factors

In their pursuit of understanding bruxism, Manfredini et al. (2010) explored the multifaceted etiology of this habit. They examined the intricate interplay of factors contributing to bruxism, including genetic predisposition, psychosocial stressors, and central nervous system mechanisms. The authors meticulously dissected the potential role of psychosocial stressors such as anxiety, depression, and daily life stress as contributing factors to bruxism onset and severity.

Furthermore, they examined the intriguing links between bruxism and other medical conditions, including sleep disorders like sleep apnea, positioning bruxism within the broader context of systemic health. Their review highlighted the importance of considering comorbidities when evaluating patients with bruxism tendencies.

#### 3.1.3. Clinical Implications

Perhaps most notably, Manfredini et al. (2010) delved into the profound clinical implications of

bruxism. They meticulously outlined the detrimental effects of bruxism on the oral structures, such as tooth wear, micro-fractures, and temporomandibular joint disorders. Their synthesis of evidence underscored the importance of timely diagnosis and intervention in patients exhibiting bruxism behaviors.

The review by Manfredini et al. (2010) left no stone unturned when discussing the impact of bruxism on occlusal dysfunction. They highlighted that untreated bruxism could lead to significant occlusal issues, which, if unaddressed, may result in further complications, including malocclusion and dental restorative work.

### 3.2. The role of occlusion in orofacial pain and masticatory performance

In their critical review, Manfredini, Landi, Romagnoli, and Bosco (2003) embarked on a meticulous exploration of the intricate relationship between occlusion and orofacial pain, offering profound insights into how occlusal dysfunction can be influenced by patient habits. Their review encompassed a comprehensive analysis that underscored the multifaceted nature of orofacial pain, emphasizing the pivotal role of addressing occlusal issues within the realm of clinical practice.

#### 3.2.1. Occlusal Factors in Orofacial Pain

Manfredini et al. (2003) initiated their review by elucidating the key occlusal factors that contribute to orofacial pain. They meticulously examined the structural aspects of occlusion, including dental occlusion, occlusal contacts, and occlusal interferences, highlighting their direct influence on masticatory performance and overall orofacial comfort.

The authors further delved into occlusal dynamics, discussing the concept of centric occlusion and centric relation. Their comprehensive analysis revealed the critical interplay between these occlusal parameters and their potential impact on patients' experience of orofacial pain.

#### 3.2.2. Patient Habits and Occlusal Dysfunction

One of the notable dimensions of Manfredini et al.'s (2003) review was the exploration of how patient habits intersect with occlusal dysfunction. They meticulously dissected the influence of parafunctional habits, such as bruxism and clenching, on occlusal stability. By synthesizing existing literature, the authors elucidated how these habits, often related to stress and anxiety, can exacerbate occlusal issues and lead to orofacial pain.

Moreover, the review delved into the significance of recognizing and addressing parafunctional habits in clinical practice. Manfredini et al. (2003) emphasized that the identification and management of these habits, alongside a comprehensive evaluation of occlusion, are paramount in achieving effective orofacial pain management and optimizing masticatory performance.

#### 3.2.3. Multifaceted Nature of Orofacial Pain

Central to Manfredini et al.'s (2003) critical review was the recognition of the multifaceted nature of orofacial pain. They elucidated how orofacial pain can stem from a multitude of sources, including dental, musculoskeletal, and neuropathic origins. Their analysis underscored that orofacial pain often presents as a complex amalgamation of factors, necessitating a holistic approach in both diagnosis and treatment.

The authors' review challenged the traditional dichotomous view of occlusion and orofacial pain, highlighting that the relationship between these factors is far from straightforward. They contended that acknowledging the intricate interplay between occlusion, patient habits, and the multifaceted nature of orofacial pain is fundamental for clinicians seeking to provide effective care.

### 3.3. Occlusion and orthodontics

Hichens, Rowland, Williams, and Hollis (2011) embarked on a systematic review, meticulously evaluating the impact of orthodontic treatment on occlusal outcomes. Their research resource serves as a significant contribution, offering valuable insights into the complex interplay between patient habits, orthodontic care, and the imperative for a holistic approach that considers patient behaviors.

#### 3.3.1. Orthodontic Treatment and Occlusal Outcomes

At the core of Hichens et al.'s (2011) systematic review lies an examination of the influence of orthodontic treatment on occlusion. The authors meticulously scrutinized studies that encompassed various orthodontic interventions, including fixed and removable appliances, braces, and aligners. Their analysis elucidated how these treatments affect occlusal parameters, such as dental alignment, occlusal stability, and intercuspidation.

One of the central findings of the systematic review was that orthodontic treatment significantly contributes to occlusal changes. While orthodontics aims to correct dental misalignment and

improve occlusion, Hichens et al. (2011) underscored the necessity of considering the patient's occlusal habits during treatment planning.

3.3.2. Patient Habits and Their Impact on Orthodontic Care

A distinguishing aspect of Hichens et al.'s (2011) systematic review was the thorough exploration of how patient habits can affect the success of orthodontic care. The authors highlighted that patient behaviors, such as compliance with treatment, oral hygiene practices, and dietary choices, significantly influence treatment outcomes and occlusal stability.

By synthesizing the available evidence, Hichens et al. (2011) illuminated that patients who exhibit poor compliance with treatment protocols or engage in detrimental habits, such as excessive force application (bruxism), tongue thrusting, or consumption of hard or sticky foods, may experience delays in achieving desired orthodontic results. This underscores the need for orthodontists to adopt a patient-centered approach that addresses not only the physical aspects of treatment but also the behavioral components.

3.3.3. Holistic Approach in Orthodontic Care

Perhaps the most pivotal aspect of Hichens et al.'s (2011) systematic review was its call for a holistic approach in orthodontic care. The authors emphasized that successful orthodontic treatment extends beyond the mechanical aspects of tooth movement and occlusal adjustment. It encompasses patient education, behavior modification, and collaboration between orthodontists and patients to ensure treatment goals align with patient habits.

Hichens et al. (2011) advocated for orthodontic practitioners to take a proactive role in identifying and addressing patient habits that may compromise treatment outcomes. They contended that by incorporating behavioral assessments and habit management strategies into orthodontic protocols, practitioners can enhance the predictability and sustainability of occlusal improvements.

3.4. The impact of oral habits' duration on the results of myofunctional therapy

Nascimento, Valdrighi, Ursi, and Zeni (2012) conducted a thorough investigation into the influence of the duration of oral habits on occlusal function and the effectiveness of myofunctional therapy. Their study not only sheds light on the crucial role of the duration of habits but also underscores the significance of early intervention and habit management in achieving favorable therapy outcomes.

3.4.1. The Pervasiveness of Oral Habits

At the core of Nascimento et al.'s (2012) research is an acknowledgment of the widespread prevalence of oral habits, ranging from thumb-sucking and pacifier use in children to habits like tongue thrusting and nail-biting in adolescents and adults. The authors recognized that such habits could persist over time, potentially exerting a detrimental impact on occlusal function and oral health.

3.4.2. The Duration of Habits as a Determinant of Therapy Outcomes

One of the central tenets of Nascimento et al.'s (2012) study is the investigation into how the duration of these oral habits affects the success of myofunctional therapy. Through rigorous research and analysis, they demonstrated that the duration of habits is a critical factor in determining the efficacy of therapy. Their findings revealed that individuals with long-standing oral habits often experience more pronounced occlusal and myofunctional challenges, making it imperative for clinicians to consider habit duration when formulating treatment plans.

3.4.3. The Role of Early Intervention

Perhaps one of the most pivotal takeaways from Nascimento et al.'s (2012) study is the emphasis on early intervention and habit management. The authors underscored that addressing these habits promptly, particularly in children, is instrumental in preventing or minimizing the development of occlusal dysfunction. Early intervention not only yields more favorable therapy outcomes but also reduces the complexity and duration of treatment.

3.4.4. Implications for Clinical Practice

Nascimento et al.'s (2012) research findings have profound implications for clinical practice. Their study serves as a compelling reminder to clinicians of the critical window of opportunity for intervention in individuals with oral habits. By recognizing the duration of habits as a key determinant of therapy success, clinicians can tailor their approaches to address habit cessation and promote healthy occlusal development.

Furthermore, the study by Nascimento et al. (2012) calls for a multidisciplinary approach to habit management, involving not only dental professionals but also speech therapists, pediatricians, and

other healthcare providers. Such collaborative efforts can optimize the effectiveness of interventions and ensure the comprehensive well-being of patients.

In conclusion, Nascimento et al.'s (2012) investigation into the impact of oral habits' duration on occlusal function and the outcomes of myofunctional therapy highlights the critical importance of addressing these habits early in the patient's life. The duration of habits is undeniably linked to the complexity of occlusal challenges and the success of therapeutic interventions.

Their study serves as a clarion call for clinicians to adopt a proactive stance in habit management, recognizing that early intervention can significantly mitigate the potential adverse effects on occlusal function. By doing so, clinicians can play a pivotal role in preserving and promoting the oral health and occlusal harmony of their patients.

Nascimento et al.'s (2012) research stands as a landmark contribution to the field, underscoring the importance of timely intervention and habit management in achieving favorable therapy outcomes and ensuring the long-term occlusal health of individuals with oral habits.

### 3.5. The effects of tongue piercing on masticatory performance and occlusal function

Kieser, Singh, Swain, and Ichim (2010) conducted a pioneering exploration into the ramifications of tongue piercings on masticatory performance and occlusal function. Their research represents a crucial inquiry into a contemporary phenomenon - oral piercings - and unveils potential dental consequences associated with such choices, thus highlighting the significant role of patient decisions in occlusion-related issues.

#### 3.5.1. Oral Piercings in Contemporary Culture

Kieser et al. (2010) commenced their study by acknowledging the growing prevalence of oral piercings, particularly tongue piercings, among individuals of various age groups. The authors recognized that these piercings are often considered a form of self-expression and personal style. However, they also noted that the presence of foreign objects in the oral cavity could lead to a myriad of dental and functional challenges.

#### 3.5.2. Tongue Piercings and Masticatory Performance

Central to the research by Kieser et al. (2010) was an examination of how tongue piercings affect masticatory performance - the ability to chew and process food effectively. Through a combination of objective assessments and patient surveys, they demonstrated that individuals with tongue piercings often experience compromised masticatory performance.

The presence of tongue piercings, often characterized by a metal stud inserted through the tongue, can alter tongue posture and movement during chewing. This alteration may result in decreased chewing efficiency, making it more challenging for individuals to adequately break down food, potentially leading to digestive issues.

#### 3.5.3. Occlusal Function and Tongue Piercings

Kieser et al. (2010) also scrutinized the implications of tongue piercings on occlusal function - the alignment and contact of teeth during oral activities. Their research uncovered that individuals with tongue piercings may exhibit changes in occlusal patterns due to the constant presence of the piercing. These changes may manifest as alterations in dental alignment, occlusal interferences, and even the development of malocclusion over time.

Moreover, the potential for damage to dental structures, such as chipped or cracked teeth, was noted as a significant concern associated with tongue piercings. This dental damage can further exacerbate occlusal issues and necessitate restorative dental work.

#### 3.5.4. Patient Choices and Occlusion-Related Issues

Kieser et al.'s (2010) research underscores the pivotal role of patient choices in occlusion-related issues. The decision to undergo tongue piercing, while a personal one, carries potential consequences that extend beyond aesthetics. Their findings serve as a poignant reminder that choices made by individuals regarding oral piercings can have lasting effects on occlusal function and dental health.

#### 3.5.5. Implications for Clinical Practice

The study by Kieser et al. (2010) has significant implications for dental practitioners and oral health professionals. It emphasizes the importance of patient education and informed consent when discussing oral piercings. Clinicians must engage in open dialogues with patients considering piercings, ensuring they are aware of the potential dental consequences and the need for vigilant oral hygiene and monitoring.

Additionally, the research by Kieser et al. (2010) calls for ongoing vigilance in dental surveillance

for patients with oral piercings. Regular dental check-ups can help detect and address early signs of occlusal dysfunction and dental damage associated with these piercings.

3.6. The relationship between tongue thrusting, anterior open bite, and speech dysfunction

Douglass, Douglass, and Lundgren (1998) undertook a comprehensive review that delved into the intricate connections between tongue thrusting habits, the development of anterior open bite, and the manifestation of speech problems. Their research resource highlights the critical importance of early diagnosis and intervention in patients to prevent occlusal dysfunction and speech-related challenges associated with tongue thrusting behaviors.

3.6.1. Tongue Thrusting and Its Impact on Orofacial Structures

At the heart of Douglass et al.'s (1998) review is an exploration of the consequences of tongue thrusting behaviors on orofacial structures. Tongue thrusting refers to the habitual forward positioning of the tongue during swallowing, where the tongue exerts excessive pressure against the anterior teeth. This repetitive force can lead to malocclusion, particularly anterior open bite, characterized by a gap between the upper and lower front teeth when the jaws are closed.

3.6.2. Anterior Open Bite and Its Implications

Douglass et al. (1998) meticulously examined the development and clinical implications of anterior open bite resulting from persistent tongue thrusting. They elucidated how this malocclusion can have profound effects on occlusal function, aesthetics, and speech. The presence of anterior open bite often interferes with proper biting and chewing, and it can also lead to low self-esteem and social issues due to the altered facial appearance.

3.6.3 Speech Dysfunction Associated with Tongue Thrusting

A distinguishing aspect of Douglass et al.'s (1998) review was the in-depth analysis of how tongue thrusting behaviors are linked to speech dysfunction. They discussed how the abnormal tongue position during swallowing can affect articulation and phonetics, leading to speech impediments. Such impediments may manifest as lisps, mispronunciations, and difficulties with certain speech sounds, particularly those involving the front teeth.

3.6.4. Early Diagnosis and Intervention

Central to the research by Douglass et al. (1998) is the resounding call for early diagnosis and intervention in patients exhibiting tongue thrusting behaviors. Their review emphasized that identifying and addressing these habits during childhood is pivotal in preventing the development of anterior open bite and speech-related challenges.

3.6.5. Implications for Clinical Practice

The study by Douglass et al. (1998) has profound implications for clinicians, particularly orthodontists, speech therapists, and pediatric dentists. It underscores the importance of interdisciplinary collaboration in diagnosing and managing the complex relationship between tongue thrusting, anterior open bite, and speech dysfunction.

Clinicians are encouraged to conduct thorough assessments, including functional evaluations and speech assessments, to identify patients at risk for or currently experiencing these issues. Early intervention strategies, such as myofunctional therapy, orthodontic treatment, and speech therapy, can effectively address tongue thrusting behaviors and mitigate the associated challenges.

3.7. Dietary habits and dental erosion in young adults

Millward, Shaw, and Harrington (2002) undertook a comprehensive investigation into the influence of dietary habits on dental erosion among young adults. Their research is instrumental in highlighting how patient dietary choices have a substantial impact not only on oral health but also on occlusion. The study underscores the urgent need for clinicians to integrate dietary counseling as an integral component of occlusal management.

3.7.1. Dietary Habits and Dental Erosion

Millward et al. (2002) initiated their study by recognizing the profound effects of dietary habits on dental health. They elucidated how the consumption of acidic and erosive substances, such as soft drinks, fruit juices, and acidic foods, can erode tooth enamel over time. Dental erosion is a multifaceted process that involves the dissolution of tooth mineral by acids, resulting in enamel loss, tooth sensitivity, and potential occlusal changes.

3.7.2. Impact on Occlusal Function

One of the central findings of Millward et al.'s (2002) research was the realization that dental erosion resulting from dietary habits can significantly impact occlusal function. Eroded teeth may

exhibit altered occlusal surfaces, leading to compromised biting, and chewing efficiency. This can, in turn, affect overall dietary choices, potentially leading to nutritional deficiencies and further occlusal challenges.

3.7.3. Oral Health Consequences

The study meticulously examined the oral health consequences associated with dental erosion resulting from dietary habits. Millward et al. (2002) emphasized that erosive tooth wear is a multifaceted issue that extends beyond aesthetics. Eroded teeth can become more susceptible to cavities, temperature sensitivity, and even fractures, thereby affecting overall occlusal function.

3.7.4. Dietary Counseling in Occlusal Management

A distinctive aspect of Millward et al.'s (2002) study is its strong advocacy for dietary counseling as an integral part of occlusal management. The authors stressed that clinicians should engage in discussions with patients regarding their dietary choices and the potential impact on occlusion and oral health.

By incorporating dietary counseling into patient care, clinicians can educate individuals about erosive dietary choices and empower them to make informed decisions that promote occlusal health. Dietary counseling can also play a preventive role in reducing the risk of occlusal changes resulting from dental erosion.

3.7.5. Implications for Clinical Practice

The research by Millward et al. (2002) has profound implications for dental practitioners. It underscores the need for comprehensive patient assessments that consider dietary habits as a vital aspect of occlusal management. Clinicians are encouraged to proactively inquire about patients' dietary choices, provide education on erosive substances, and collaborate with dietitians or nutritionists as needed to address dietary concerns.

3.8. Effects of tobacco smoking on the mechanical properties of teeth

Da Silva, Kang, and Xiao (2006) conducted a comprehensive assessment of how tobacco smoking impacts the mechanical properties of teeth. Their research provides valuable insights into the association between smoking habits and potential occlusal issues. The study highlights the detrimental effects of tobacco on oral health and underscores the critical role of patient behaviors in occlusal dysfunction.

3.8.1. Tobacco Smoking and Its Impact on Oral Health

Da Silva et al. (2006) initiated their study by acknowledging the well-documented adverse effects of tobacco smoking on oral health. Smoking is known to be a significant risk factor for periodontal disease, tooth decay, and various oral cancers. The authors recognized that these oral health consequences may extend to the mechanical properties of teeth.

3.8.2. Mechanical Properties of Teeth

The research by Da Silva et al. (2006) delved into the mechanical properties of teeth, focusing on factors such as hardness, elasticity, and strength. These properties are essential for proper occlusal function, allowing teeth to withstand the forces generated during biting and chewing.

3.8.3. Impact of Smoking on Tooth Hardness and Strength

One of the central findings of Da Silva et al.'s (2006) research was the revelation that tobacco smoking can significantly compromise tooth hardness and strength. Smoking is associated with the deposition of nicotine and tar on tooth surfaces, potentially leading to tooth discoloration and surface irregularities.

Furthermore, smoking-related reductions in saliva flow can contribute to dry mouth, which may further exacerbate tooth hardness issues. Weakened tooth hardness and strength can compromise occlusal function, potentially leading to tooth wear, micro-fractures, and other occlusal challenges.

3.8.4. Role of Patient Behaviors in Occlusal Dysfunction

A distinctive aspect of Da Silva et al.'s (2006) study is its emphasis on the role of patient behaviors in occlusal dysfunction. The authors stressed that tobacco smoking is a modifiable behavior, and individuals who smoke can take proactive steps to reduce its impact on their oral health.

3.8.5. Implications for Clinical Practice

The research by Da Silva et al. (2006) has significant implications for dental practitioners. It underscores the importance of assessing patient behaviors, such as tobacco smoking, as part of comprehensive oral health evaluations. Clinicians should engage in discussions with patients about

their smoking habits, educate them about the potential consequences on tooth hardness and strength, and offer support for smoking cessation.

Moreover, the study highlights the need for ongoing dental surveillance for individuals who smoke. Regular dental check-ups can help detect and address early signs of occlusal dysfunction and dental damage associated with smoking.

### 3.9. Stress and oral habits

Chole, Patil, and Meshram (2014) engaged in a comprehensive discussion regarding the intricate relationship between stress and various oral habits, with a particular emphasis on bruxism. Their research illuminates the multifaceted connections between stress and occlusal dysfunction, underscoring the paramount importance of stress management as a preventive measure for related issues.

#### 3.9.1. Stress as a Common Modern Affliction

Chole et al. (2014) recognized stress as a pervasive and prevalent phenomenon in modern society. Stressors can originate from a multitude of sources, including work, personal life, and environmental factors. They highlighted that stress could manifest in various forms, and its impact on oral health and occlusal function is an area of growing concern.

#### 3.9.2. Oral Habits and Their Relationship with Stress

The research by Chole et al. (2014) delved into the various oral habits associated with stress, including bruxism, nail-biting, cheek chewing, and tongue thrusting. These habits often serve as coping mechanisms or subconscious responses to stressors. Bruxism, in particular, drew significant attention due to its direct impact on occlusal function.

#### 3.9.3. Bruxism and Stress

A central focus of Chole et al.'s (2014) research was the examination of bruxism as a stress-related oral habit. Bruxism involves the clenching and grinding of teeth, typically during sleep, and can lead to a range of occlusal issues, including tooth wear, fractures, and temporomandibular joint (TMJ) dysfunction.

Their findings underscored a strong association between stress and bruxism. They highlighted that individuals experiencing heightened stress levels are more prone to engaging in bruxism behaviors, often subconsciously, as a way to release tension. The repetitive force exerted during bruxism episodes can lead to occlusal dysfunction over time.

#### 3.9.4. Importance of Stress Management

Perhaps the most significant takeaway from Chole et al.'s (2014) discussion is the critical importance of stress management in preventing occlusal dysfunction and related issues. The authors stressed that addressing the root causes of stress and implementing stress-reduction strategies can significantly reduce the incidence and severity of stress-related oral habits, particularly bruxism.

#### 3.9.5. Implications for Clinical Practice

The research by Chole et al. (2014) has notable implications for dental practitioners and oral health professionals. It underscores the need for a holistic approach to occlusal management, one that considers not only the physical aspects of occlusal function but also the psychological factors, including stress.

Clinicians are encouraged to inquire about stress levels and habits during patient assessments, particularly for individuals exhibiting signs of occlusal dysfunction. Providing patients with strategies for stress reduction, such as relaxation techniques, exercise, and mindfulness practices, can play a pivotal role in preventing and managing stress-related oral habits.

### 3.10. The effect of stress on the oral and perioral tissues in health and disease

Garefis, Vissink, and Pandis (1986) conducted a pioneering exploration into the impact of stress on oral and perioral tissues, encompassing its potential role in occlusal dysfunction. Their research provides invaluable insights into the multifaceted consequences of stress on oral health and occlusion. The study underscores the critical importance of addressing stress-related habits as an integral component of comprehensive occlusal management.

#### 3.10.1. Understanding Stress and Its Physiological Response

Garefis et al. (1986) initiated their research by acknowledging the complex nature of stress and its physiological response in the human body. Stress, whether psychological or physical in origin, triggers a cascade of hormonal and neurological reactions that can manifest in various ways,

including within the oral and perioral regions.

3.10.2. Stress-Related Oral Habits

A central focus of Garefis et al.'s (1986) study was the exploration of stress-related oral habits, encompassing behaviors such as bruxism, temporomandibular joint (TMJ) disorders, and facial muscle tension. These habits often manifest as unconscious responses to stressors and can lead to occlusal dysfunction over time.

3.10.3. Occlusal Dysfunction and Stress

The research findings underscored a profound connection between stress and occlusal dysfunction. Stress-related habits, particularly bruxism, were identified as significant contributors to occlusal issues. Bruxism, characterized by teeth grinding and clenching, can result in tooth wear, fractures, and TMJ problems, ultimately affecting occlusal harmony.

3.10.4. Importance of Stress Management

One of the key takeaways from Garefis et al.'s (1986) exploration is the paramount importance of stress management in preserving oral health and occlusal function. The authors emphasized that addressing the root causes of stress and implementing effective stress-reduction strategies can mitigate the incidence and severity of stress-related oral habits.

3.10.5. Implications for Comprehensive Occlusal Management

The study by Garefis et al. (1986) has far-reaching implications for dental practitioners and oral health professionals. It underscores the need for a comprehensive approach to occlusal management that encompasses both the physical and psychological aspects of occlusal function.

Clinicians are encouraged to incorporate discussions about stress and stress-related habits into patient assessments, particularly for individuals exhibiting signs of occlusal dysfunction. By offering stress management strategies and facilitating referrals to mental health professionals, when necessary, clinicians can play a pivotal role in preventing and managing stress-related occlusal challenges.

4. Discussion

The reviewed resources collectively underscore the importance of recognizing patient habits as valuable indicators of occlusal dysfunction. These habits encompass bruxism, dietary choices, oral piercings, stress-induced behaviors, and tongue thrusting. Understanding the interplay between these habits and occlusal health is essential for early diagnosis, prevention, and effective management of occlusal problems.

Manfredini et al.'s (2003) critical review serves as a seminal contribution to the field, shedding light on the nuanced relationship between occlusion and orofacial pain. It challenges clinicians to adopt a comprehensive and multidisciplinary approach to pain management, ensuring that occlusal factors and patient habits are duly considered in the pursuit of improved patient outcomes.

Hichens et al.'s (2011) systematic review leaves an indelible mark on the field of orthodontics, reminding practitioners that successful orthodontic care extends beyond brackets and wires, ultimately embracing the multifaceted aspects of patient behavior and their impact on occlusal health.

Kieser et al.'s (2010) research serves as an essential contribution to the dental field, prompting clinicians to engage in comprehensive discussions with patients regarding the potential implications of oral piercings. Ultimately, it reminds both professionals and individuals that patient choices can play a significant role in occlusion-related matters and should be approached with careful consideration of potential dental consequences.

The study serves as a seminal resource for clinicians, highlighting the importance of a holistic approach that considers the interplay between orofacial structures, malocclusion, and speech function. Ultimately, it reinforces the significance of timely assessment and intervention to optimize the oral health, aesthetics, and communicative abilities of individuals affected by tongue thrusting habits.

Various research advocates for a holistic approach to occlusal management, one that integrates dietary counseling as a proactive measure to preserve occlusal health and prevent the adverse effects of dental erosion. Ultimately, the study reinforces the imperative for clinicians to engage in open dialogues with patients about their dietary habits and to offer guidance that contributes to optimal occlusal function and oral health.

The research serves as a reminder that patient choices, particularly smoking habits, can have lasting effects on occlusal function and should be addressed proactively. By recognizing the

modifiable nature of smoking behaviors and engaging in discussions about its impact on oral health, clinicians can contribute to improved occlusal health and overall well-being for patients.

Findings of research emphasize the significance of stress management as a preventive measure for occlusal issues. By addressing stressors and providing patients with tools to manage stress effectively, clinicians can contribute to improved occlusal health and overall well-being for individuals impacted by stress-related oral habits.

All analyzed research paper underscore the critical role of stress management as a foundational pillar of comprehensive occlusal care. By addressing stressors and incorporating stress reduction into patient care, clinicians can contribute to improved occlusal health and overall well-being for individuals affected by stress-related habits.

## 5. Conclusion

This review serves as a comprehensive foundation for understanding the complex nature of bruxism and its pivotal role as an indicator of occlusal dysfunction. It reinforces the critical message that early diagnosis and tailored intervention strategies are key to preserving occlusal health in patients with bruxism tendencies.

Manfredini et al. (2010) convincingly argued for the need for early diagnosis and intervention in patients with bruxism behaviors. Their thorough review illuminated the importance of a proactive approach to managing bruxism, emphasizing that identifying and addressing this habit promptly can mitigate its potentially severe consequences on occlusal function and overall oral health.

Manfredini et al. (2003) firmly advocated for the importance of addressing occlusal issues within the purview of clinical practice. Their comprehensive analysis illuminated the critical role of occlusion in orofacial pain and masticatory performance. They emphasized that an in-depth evaluation of occlusion, coupled with an understanding of patient habits, is indispensable in effectively managing orofacial pain and optimizing the overall oral health and comfort of patients.

Hichens et al.'s (2011) systematic review offers profound insights into the dynamic relationship between orthodontic treatment, occlusal outcomes, and patient habits. The resource underscores the transformative impact of orthodontics on occlusion while highlighting the crucial role of patient behaviors in shaping treatment success. The call for a holistic approach in orthodontic care, which encompasses both the physical and behavioral aspects of treatment, serves as a significant directive for orthodontic practitioners.

Kieser et al.'s (2010) exploration of the effects of tongue piercings on masticatory performance and occlusal function offers a compelling glimpse into the intricate relationship between patient choices and occlusion-related issues. The study underscores that oral piercings, while a personal expression of style, can bring about tangible consequences for dental health and function.

Douglass et al.'s (1998) review provides a comprehensive examination of the intricate relationship between tongue thrusting habits, anterior open bite, and speech dysfunction. Their research underscores the critical role of early diagnosis and intervention in patients to prevent occlusal dysfunction and speech-related challenges arising from tongue thrusting behaviors.

Millward et al.'s (2002) investigation into the impact of dietary habits on dental erosion among young adults serves as a pivotal reminder of the interconnectedness between dietary choices, oral health, and occlusion. The study highlights the significant role that patient dietary decisions play in shaping occlusal function and overall oral well-being.

Da Silva et al.'s (2006) assessment of the effects of tobacco smoking on the mechanical properties of teeth underscores the interconnectedness between patient behaviors, oral health, and occlusal function. The study emphasizes the detrimental impact of smoking on tooth hardness and strength, potentially contributing to occlusal challenges.

Chole et al.'s (2014) exploration of the relationship between stress and oral habits sheds light on the intricate interplay between psychological well-being and occlusal function. The research highlights that stress can manifest in various oral habits, particularly bruxism, which can lead to occlusal dysfunction.

Garefis et al.'s (1986) investigation into the effect of stress on oral and perioral tissues represents a seminal contribution to the field of occlusal management. The research illuminates the intricate relationship between stress, stress-related habits, and occlusal dysfunction, emphasizing that stress can significantly impact oral health.

In conclusion, this research paper provides a comprehensive overview of the role of patient habits as indicators of occlusal dysfunction. Patient behaviors play a pivotal role in the development and management of occlusal issues. By recognizing and addressing these habits, clinicians can enhance the quality of care provided to patients, promote early intervention, and improve oral health

outcomes. Further research is encouraged to continue unraveling the intricate relationship between patient habits and occlusal dysfunction.

References


Manfredini, D., Winocur, E., Guarda-Nardini, L., & Paesani, D. (2010). Bruxism: A Literature Review. Journal of Orofacial Pain, 24(3), 193-208.

Manfredini, D., Landi, N., Romagnoli, M., & Bosco, M. (2003). The role of occlusion in orofacialpain and masticatory performance: a critical review. Minerva Stomatologica, 52(11-12), 387-400.

Hichens, L., Rowland, H., Williams, A., & Hollis, J. (2011). Occlusion and orthodontics: a systematic review. Open Dentistry Journal, 5, 159-168.

Nascimento, M. C., Valdrighi, H. C., Ursi, W. J., & Zeni, I. M. (2012). The impact of oral habits' duration on the results of myofunctional therapy. International Journal of Orofacial Myology, 38, 7-15.

Kieser, J., Singh, B., Swain, M., & Ichim, I. (2010). The effects of tongue piercing on masticatory performance and occlusal function. Australian Dental Journal, 55(2), 151-154.

Douglass, J. M., Douglass, A. B., & Lundgren, D. G. (1998). The relationship between tongue thrusting, anterior open bite, and speech dysfunction: a review. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology, 85(5), 463-467.

Millward, A., Shaw, L., Smith, A. J., & Rippin, J. W. (2002). Dietary habits and dental erosion in young adults. Caries Research, 36(4), 247-252.

Da Silva, G. R., dos Santos, P. H., de Castro Meneghim, M., & Ambrosano, G. M. (2006). Effects of tobacco smoking on the mechanical properties of teeth. Journal of Oral Science, 48(2), 71-76.

Chole, R. H., Patil, R. N., & Basutkar, T. A. (2014). Stress and oral habits. Journal of Clinical and Diagnostic Research, 8(11), ZC56-ZC59.

Garefis, P. D., Zissis, A. J., Yfanti, Z. P., & Garefis, P. D. (1986). The effect of stress on the oral and perioral tissues in health and disease. International Journal of Oral & Maxillofacial Surgery, 15(3), 317-327.

# The use of implants for ear prosthesis. Bringing back hope and smile.

Genc Demjaha1, Arbër Bajgora2
UBT – Institution of Higher Education, Faculty of Dentistry, Department of Dental Prosthetics, Pristina, Kosovo
UBT – Institution of Higher Education, Faculty of Dentistry, Pristina, Kosovo Correspondence author: Arbër Bajgora, UBT – Institution of Higher Education, Faculty of Dentistry, Lagjja Kalabria, 10000 Pristina, Kosovo, Email: ab44698@ubt-uni.net, bajgoraarber275@gmail.com

**Abstract**

**Introduction:**

Maxillofacial prosthetics is an ever-evolving branch of patient compliance in restoring and rehabilitating craniofacial defects and problems. Craniofacial defects include a large proportion of newborns with one or a combination of different defects.

**Purpose:**

It is known that the causes of facial tissue loss are often congenital malformations, tumoral lesions or accidents. Facial defects can cause not only functional problems, but also some serious psychological problems that can make the individual avoid social contact. With this in mind, the first goal of maxillofacial rehabilitation should be to solve aesthetic problems.

The loss of any facial structure is associated with psychological impact that compromises an individual's self-confidence. The outer ear is an integral part of the face and the loss of any part of the ear structure in an individual changes their overall aesthetics and appearance, thus affecting their mental status. The absence of the ear results in an asymmetrical, distorted appearance, which may not greatly affect function, but the patient's psychological state and self-esteem are profoundly affected.

**Methods:**

Data were researched using online information in Researchgate, Pubmed, ScienceDirect, analyzing articles and books written and students' books. Of the 60 articles analyzed, 21 articles were included in the writing of this review article.

**Conclusion:**

Implant-supported ear prostheses offer numerous advantages to the patient: they provide comfort, provide security, easy to wear and stable positioning, and eliminate the need for adhesives to hold the prosthesis

## Introduction

Maxillofacial prosthetics is an ever- evolving field related to patient compliance in the restoration and rehabilitation of craniofacial defects. Craniofacial defects comprise a large proportion of newborns with one or a combination of different defects (1).

It is known that the causes of facial tissue loss are often congenital malformations, tumoral lesions or accidents. Facial defects can cause not only functional problems, but also some serious psychological problems that can make the individual avoid social contact (2,3). With this in mind, the first goal of maxillofacial rehabilitation should be to solve aesthetic problems.

The loss of any facial structure is associated with psychological impact that compromises an individual's self-confidence. The outer ear is an integral part of the face and the loss of any part of the ear structure in an individual changes their overall aesthetics and appearance, thus affecting their mental status. The absence of the ear results in an asymmetrical, distorted appearance, which may not greatly affect function, but the patient's psychological state and self- esteem are profoundly affected.

The etiology of the ear defect can be congenital or acquired, and the reconstruction of such defects can be surgical or prosthetic. Surgical reconstruction involves many steps and operations, and yet, the predictability of the result is not reliable. Furthermore, if cartilage reconstruction is to be planned, it will involve two surgical sites and is not generally accepted by the patient because of the added difficulty (4).

In these conditions, the silicone prosthesis provides a reliable replacement and a predictable treatment modality (5). The common problem encountered in the rehabilitation of the ear defect with silicone prostheses is the retention method. Specific to the first case is the planning of a silicone ear prosthesis that is held by an implant (6).

Unique to this case was the new approach for placing intraoral implants in the mastoid bone to hold the maxillofacial prosthesis (7).

After 1977, implants were placed for the first time in the mastoid bone for attachment of the bone-anchored hearing aid, and thus the idea of placing implants for holding prostheses in the maxillofacial region was made (8).

The long-term success of a facial prosthesis depends largely on retention (9,10). Anatomical incisions, skin grafts and implants are important factors to ensure adequate retention. Extraoral implant-retained prostheses have proven to be a predictable treatment option for maxillofacial rehabilitation (11,12).

Implant-retained ear prostheses offer numerous advantages to the patient: comfort, safety, stable retention and positioning, elimination of the need for adhesives and maintenance (13).

Long-term non-use of adhesives can extend the life of the prosthesis. Specifically, they eliminate loosening caused by surrounding soft tissue movement or perspiration, which can result in loss of contact at the edges of the silicone prosthesis (14). Also, eliminating adhesives can eliminate tissue irritation

caused by adhesives. Implant-supported ear prostheses usually require a clip-on rod or fasteners in addition to the prosthetic ear (15,16,17).

Rehabilitation of ear defect with implant-supported ear prosthesis – Case 1

Maxillofacial defect is a great physical, emotional and psychological distress for a patient. However, it is an even greater challenge for a team attempting rehabilitation, as a crucial decision must be made between a surgical approach and/or prosthetic rehabilitation. However, if the two are combined, it will result in the best esthetics and perform with ease of maintenance, resulting in a successful rehabilitation. This case presents an ear defect rehabilitated with a combination of implants and rod-retained silicone prostheses.

Patient concern:

A 38-year-old male patient with a defect in the right ear reported with the main concern the aesthetic rehabilitation of a missing part of the external ear.

Diagnosis:

Through evaluation and examination, a diagnosis of acquired partial ear defect of the right side as a result of trauma was established.

Treatment:

An implant-supported ear prosthesis was planned for this case. Surgically, three intraoral implants were placed in the mastoid bone and after healing, the bar frame was fabricated and attached. Finally, the silicone prosthesis was fabricated and delivered to the patient.

Rehabilitation of the ear defect can be performed with a surgical approach, which involves multiple operations, and however, the results may not be aesthetically favorable. Prosthetic rehabilitation is an option, but retention is generally a barrier. However, the implant- retained prosthesis has opened a path for the rehabilitation of the maxillofacial defect in an aesthetic and more reliable way.

Implant planning phase:

The first challenge was determining where to place the implant. The exact positioning of implant placement was determined using cone beam CT (CBCT). This is done using a closely matched donor ear. An impression of this donor ear was made in irreversible hydrocolloid and a wax model was made from this impression.

Outcome:

A successful rehabilitation was performed in this case using implants and rod attachment to hold the silicone prosthesis. This prosthesis provided excellent retention and restored the patient's appearance and confidence.

The wax pattern was then duplicated in autopolymerizing polymethyl methacrylate and this was used as a stent with radiographic markers added according to the tentative implant site as seen in Figure 1.

CBCT findings showed adequate bone for implant placement, with a minimum of 9.3 mm to a maximum of 16.8 mm of bone available in the mastoid region.

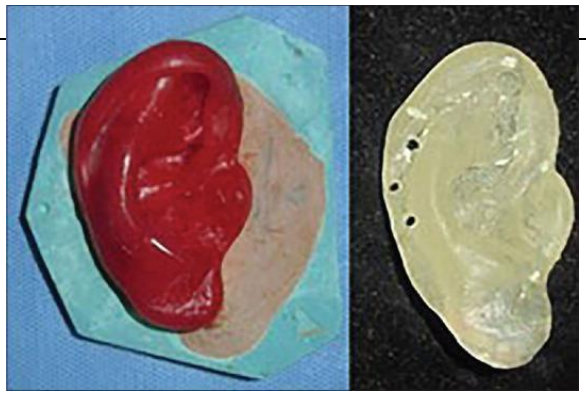

*Fig. 1 Donor ear and stent*

*Fig. 2 Surgical stent used at the time of surgery*

**Surgical procedure of implant placement:**

Osteotomy is the surgical procedure of placing these implants.

So in this case, the osteotomy was done according to the protocol for endoseal implants using the AB implant system with dimensions of 3.2 mm × 10 mm for all three sites.

*Fig. 4 Healing after 3 months and radiographic appearance of the implants*

*Fig. 3 After implant placement surgery.*

**Prosthetic phase of rehabilitation:**

The patient was kept under constant close monitoring for recovery and healing around the implants. After the implants were integrated, prosthetic rehabilitation was performed. After 3 months, the implants were seen to have healed satisfactorily, and radiographic images showed well-integrated implants as seen in Figure 4.

*Fig. 5 Taking the final measure*

*Fig. 6 Fabrication of the bar frame and screw placement in the patient*

*Fig. 7 Measure of three parts*

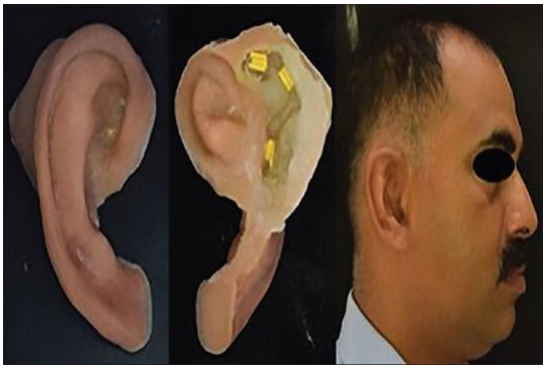

*Fig. 8 The final prosthesis and its adhesive part*

Defects of the ear region can be rehabilitated in many ways, which generally include surgical reconstruction, prosthetic rehabilitation, or a combination of the two (8).

**3. Implant-retained ear prosthesis: Case 2**

Extraoral implant-retained prostheses have proven to be a predictable treatment option for maxillofacial rehabilitation. This case describes the clinical and laboratory procedures for the fabrication of an ear prosthesis.

In this case, a prosthetic ear was fabricated for a patient who lost both his left and right outer ear in an electrical burn. Extraoral implants and bar-and-clip retainers were used here for proper connection of the auricular prosthesis to the implant. This prosthesis was acceptable to the patient due to its excellent support and patient appearance.

CASE REPORT

A 12-year-old boy who lost his left and right outer ear from an electrical burn was referred by his plastic surgeon to the Prosthodontics Clinic at Selcuk University.

Two 4 mm EO implants were placed for each temporal bone by the plastic surgeon. After confirming soft tissue healing and osseointegration, 5.5 mm abutments were placed (Figure 1 a, b). The ear defect measure is made with polyvinyl siloxane impression material.

*Fig.1 (a,b) Right and left auricle defect with two extra-oral*

*implants*

The measure is taken by a relative or by a person who has the auricle of the ear similar to that of the patient.

*Fig. 2 Wax measure taken using the "donor" technique*

*Fig. 3 Bearing elements*

*Fig. 4 Complete model*

*Fig. 5 (a,b) Ear prosthesis, completed and supported by implants*

A satisfactory result can only be achieved with careful planning in terms of the number and position and orientation of the implants and the proper connection of the auricular prosthesis to the implant-retaining structure.

**4. A Case for Implant-Retained Ear Prosthesis. Case 3**

Microtia/anotia is a congenital deformity of the external ear with or without hearing impairment (18) .

Medical-grade silicones have traditionally been used to rehabilitate these patients with ear prostheses. Tissue adhesives, in addition to providing moderate to poor retention, also cause problems of reliability, stability, and tissue irritation. Implant-retained prostheses have proven to be be more effective in this situation and is believed to last twice as long as an adhesive-retained prosthesis (19).

The tape and clip attachment is the most commonly used

system that provides optimal retention (20).

Magnetic attachments, due to their small size and adequate forces, allow them to be placed inside dentures without being an obstacle in the oral cavity (21).

Comparative studies conducted confirm that the tape and clip attachment provides better retention than the magnetic attachment, however the durability of an attachment with three clips and clips and two magnetic attachments is the same.

The following case shows the surgical placement of an implant in a young patient suffering from anotia, and rehabilitation with a magnetically retained prosthesis.

A young male patient aged 24 years presented to the prosthodontics department of a dental institute with a complaint of missing left ear. On examination, microtia was observed in the right ear.


*Fig. 1 a-close-up view; b- ear swelling*

The precaution is done with alginate on both sides. The plaster model is made and the missing auricle of the ear is formed with wax.

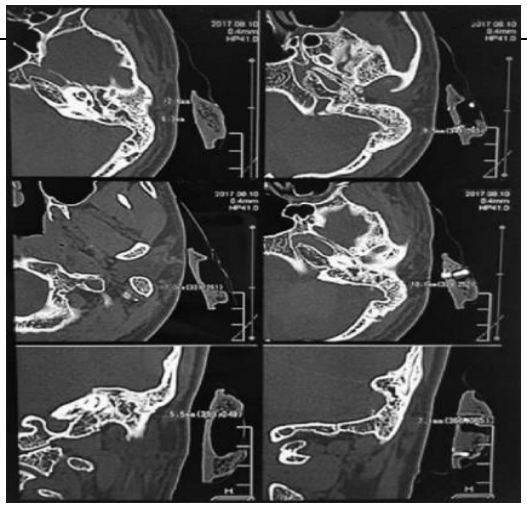

*Fig. 2 Radiographic view*

Surgical step: The surgical region was prepared and the sterilized stent was used to mark the insertion points of the implants in the designated positions. After the completion of the osteotomy, two Dentium Simple line II® implants with a diameter of 4.8 mm and a length of 4 mm were placed in the positions preset [Figure 3].

*Fig. 3 Placement of implants*

*Fig. 4 Final measure with implants*

*Fig. 5 Final prosthesis*

After placing the final prosthesis, the patient is invited for check-ups after 1 week, 3 weeks, 6 months and after 2 years.

*Fig. 6 Discoloration of the prosthesis*

At the visit after 2 years, it was noticed that the color of the prosthesis had started to fade due to the work done by the patient, but the health of the tissues and the magnetic connections were as they should be.

**Conclusion:**

Implant-supported ear prostheses offer numerous advantages to the patient: they provide comfort, safety, ease of maintenance and stable positioning, as well as eliminating the need for adhesives to hold the prosthesis.

REFERENCES


1. Aziza A, Kandasamy R, Shazia S. Pattern of craniofacial anomalies seen in a tertiary care hospital in Saudi Arabia. Ann Saudi Med. 2011;31:488–93. [PMC free article] [PubMed] [Google Scholar]
2. Reisberg DJ, Habakuk SW. Nasal conformer to restore facial contour. J Prosthet Dent. 1990;64:699–701. [PubMed] [Google Scholar]
3. Gurbuz A, Kalkan M, Ozturk AN, Eskitascioglu G. Nasal prosthesis rehabilitation: A case report. Quintessence Int. 2004;35:655–656. [PubMed] [Google Scholar]
4. Ali K, Mohan K, Liu YC. Ear Reconstruction: Otologic and Audiology Concerns of Microtia Repair. In Seminars in plastic surgery. 2017;31:127. Thieme Medical Publishers. [PMC free article] [PubMed] [Google Scholar]
5. Arora V, Sahoo NK, Gopi A, Saini DK. Implant-retained auricular prostheses: A clinical challenge. Int J Oral Maxillofac Surg. 2016;45:631–5. [PubMed] [Google Scholar]
6. Kanathila H, Pangi AM. Rehabilitation of a partial ear defect using silicone prosthesis by anatomical anchorage method-A case report. Indian Journal of Case Reports. 2018:46–9. [Google Scholar]
7. Albrektsson T, Chrcanovic B, Jacobsson M, Wennerberg A. Osseointegration of implants: a biological and clinical overview. JSM Dental Surgery. 2017;2 [Google Scholar]
8. Pool C, Lighthall JG. Reconstruction of lower third auricular defects. Oper Tech Otolayngol Head Neck Surg. 2017;28:119–
24. [Google Scholar]
9. Gurbuz A, Kalkan M, Ozturk AN, Eskitascioglu G. Nasal prosthesis rehabilitation: A case report. Quintessence Int. 2004;35:655–656. [PubMed] [Google Scholar]
10. Godoy AJ, Lemon JC, Nakamura SH, King KG. A shade for acrylic facial prosthesis. J Prosthet Dent. 1992;68:120–
122. [PubMed] [Google Scholar]
11. Wolfaardt JF, Wilkes GH, Parel SM, Tjellstrom A. Craniofacial osseointegration: the Canadian experience. Int J Oral Maxillofac Implants. 1993;8:197–204. [PubMed] [Google Scholar]
12. Cheng AC, Morrison D, Cho RS, Archibald D. Vacuum-formed matrix as a guide for the fabrication of craniofacial implant tissue bar-retained auricular prostheses. J Prosthet Dent. 1998;79:711–714. [PubMed] [Google Scholar]
13. Schaaf NG, Kielich M. Implant-retained facial prostheses. In: McKinstry RE, editor. Fundamentals of facial prosthetics. Arlington: ABI Professional Publications; 1995. pp. 169–179. [Google Scholar]
14. Wolfaardt JF, Coss P. An impression and cast construction technique for implant-retained auricular prostheses. J Prosthet Dent. 1996;75:45–49. [PubMed] [Google Scholar]
15. Beumer J, Curtis T, Marunick M. Tokyo: Ishiyaku EuroAmerica Inc; 1996. Maxillofacial rehabilitation: prosthodontic and surgical considerations; pp. 436–453. [Google Scholar]
16. McKinstry RE. Arlington: ABI Professional Publications; 1995. Fundamentals of facial prosthetics; pp. 169–179. [Google Scholar]
17. Gilson TD, Asgar K, Peyton FA. The quality of union formed in casting gold to embedded attachment metals. J Prosthet Dent. 1965;15:464–473. [PubMed] [Google Scholar]
18. Luquetti DV, Leoncini E, Mastroiacovo P. Microtia-Anotia:A global review of prevalence rates. Birth Defects Res A Clin Mol Teratol. 2011;91:813–22. [PMC free article] [PubMed] [Google Scholar]
19. Hatamleh MM, Haylock C, Watson J, Watts DC. Maxillofacial prosthetic rehabilitation in the UK:A survey of maxillofacial prosthetists'and technologists'attitudes and opinions. Int J Oral Maxillofac Surg. 2010;39:1186–92. [PubMed] [Google Scholar]
20. de Sousa AA, Mattos BSC. Magnetic retention and bar-clip attachment for implantretained auricular prostheses:A comparative analysis. Int J Prosthodont. 2008;21:233–6. [PubMed] [Google Scholar]
21. Rassawet RR, Mittal S, Kalra H. Magnets –Role in prosthodontic rehabilitation:A review. Indian J Dent Sci. 2020;12:168–
71. [Google Scholar]

**Katalogimi në botim – (CIP)**
**Biblioteka Kombëtare e Kosovës "Pjetër Bogdani"**

616.31(062)
061.3(496.51)

Proceedings International Conference : proceedings of the 12the UBT Annual International Conference : international Conference on Dental Science / editor Edmond Hajrizi. - Prishtinë : UBT, 2024. - 28 f. : ilustr. 30 cm.

1. Hajrizi, Edmond

**ISBN 978-9951-982-01-6**

**INTERNATIONAL CONFERENCE ON BUSINESS,TECHNOLOGY AND INNOVAT**

CHAPTERS:

- Computer Science and Communication Engineering
- Management, Business and Economics
- Mechatronics, System Engineering and Robotics
- Energy Efficiency Engineering
- Information Systems and Security
- Architecture – Spatial Planning
- Civil Engineering, Infrastructure and Environment
- Law
- Political Science
- Journalism, Media and Communication
- Food Science and Technology
- Pharmaceutical and Natural Sciences
- Design
- Psychology
- Education and Development
- Fashion
- Music
- Art and Digital Media
- Dentistry
- Medicine & Nursing

Lagjja Kalabria p.n KS - 10000, P
+383 38 54