

## STATISTICAL ANALYSIS ON THE EFFECT OF REMOVABLE PARTIAL DENTURES ON THE PERIODONTIUM

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### ABSTRACT

**Aim of the study:** To evaluate the factors which contribute to periodontal damage in cases of patients with removable partial dentures. **Material and method:** a questionnaire was created using the Google Forms platform, and it was addressed to 140 dentists of all ages. The data was processed and analyzed statistically and descriptively using the Microsoft Excel module in the Microsoft Office 2013 programming package. **Results:** Poor oral hygiene is considered one of the most common risk factors associated with periodontal tissue damage. Gingival recessions have been identified in most of the cases. Dentists who answered the questionnaire didn't consider that bone resorption was accelerated by removable partial dentures wear. The dentists preferred to use cast clasps in removable partial dentures. **Conclusion:** It is important to take into account and preserve the patient's periodontal health when manufacturing a removable partial denture.

**Keywords:** removable partial denture, clasps, periodontium, gingival recession, bone resorption

### INTRODUCTION

Periodontal tissue damage caused by removable partial dentures represents a common finding in dental practice. A removable partial denture is a type of prosthesis used to replace one or more missing teeth in partially edentulous patients; it is less expensive and invasive than other prosthetic treatment options, however, it also presents various disadvantages related to its retention mechanisms. Unlike the complete dentures, which are entirely lying on the soft tissues of the edentulous ridge, they are fixed on the remaining natural dental elements through cobalt-chrome or titanium clasps which increase the stability and retention of the

denture. Prosthetic appliances produce mechanical stresses as a result of forces acting through [1]. Poorly adapted removable partial dentures can easily cause micro-irritations on the periodontal tissues. Retention is the function that prevents the involuntary detachment of the prosthesis from the prosthetic field when movements occur [2]. The factors that lead to the detachment of the prosthesis are adhesive food, peripheral muscles, and gravity. The elements on which retention depends are the type of clasp and their number, implantation of abutment teeth, size of the subequatorial area, degree of friction, and flexibility. In this study, we analyze the preference between cast clasps and classic wipla clasps during usual dental practice, by the

opinions of the dentists who answered the questionnaire. The classic clasps are made of round wrought wire; their main functions are retaining and stabilizing the partial prostheses on the prosthetic field by engaging on the abutment teeth [3]. The classic wrought wire clasps are capable of flexing all spatial planes, therefore they can be adjusted in any direction in order to achieve optimal retention of the prosthesis. Unlike the wrought wire clasp, the cast clasp will flex either inward or outward in a horizontal manner, therefore making it harder to adjust. The clasps are of great importance for the longevity of the mobile partial denture. The classic wrought wire clasps are capable of flexing in all spatial planes, so they can be adjusted in any direction to achieve the optimal retention of the prosthesis. Unlike the wrought wire clasps, the cast clasps will flex either inward or outward in one direction, therefore making it harder to adjust. The clasps are of great importance for the longevity of the mobile partial denture. The keys for successfully choosing the type of clasps are the control of the tilting forces, of the retention, and the compatibility with both the contour of the teeth and the soft tissues [4].

The health of the periodontal tissues is represented by the absence of detectable inflammation. Among the local factors responsible for the irritation of periodontal tissues are poor oral hygiene, plaque accumulation, tartar, and dysfunctional prosthetic appliances. Marginal periodontitis often develops into chronic disorders that most often begin at the gingival level. The degree of periodontal damage can vary depending on the gingival profile, the type of prosthesis, and the presence of bacterial plaque and dental tartar on the prosthetic surfaces [5]. Therefore, having knowledge of periodontal pathology can be

fundamental for determining the right treatment plan and preventing gingival recession and bone resorption [6]. Thus, this study was conducted to obtain deeper insights into the influence of removable partial dentures on periodontal tissues.

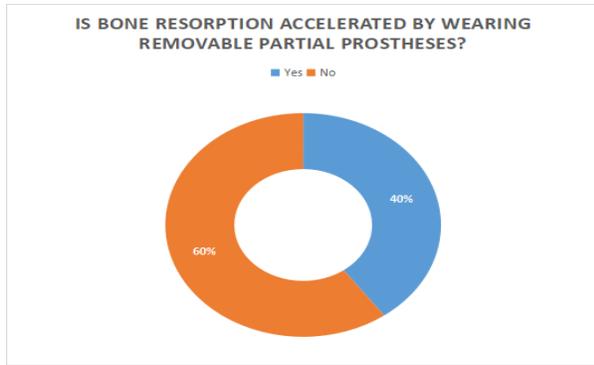
## **MATERIAL AND METHOD**

This study was performed with the aid of a questionnaire developed using the Google Forms platform, consisting of 14 questions addressed to 140 dentists with different levels of clinical experience, to collect information on the influence of removable partial dentures on the periodontal tissues. The questionnaire reached the dentists through various dental platforms and groups of specialists. The data was processed and analyzed statistically and descriptively using the Microsoft Excel module in the Microsoft Office 2013 programming package.

The questionnaire we used in the study can be seen in **Annex**.

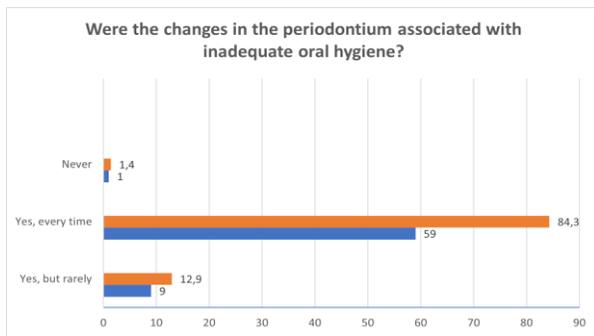
## **RESULTS**

After receiving the questionnaires completed by the 140 dentists that have agreed to participate in this study, we obtained the necessary information that was exported to an editable Microsoft Excel file, to create graphs that helped to interpret and analyse the data. Below, the graphic representations describe the most relevant findings of our study.

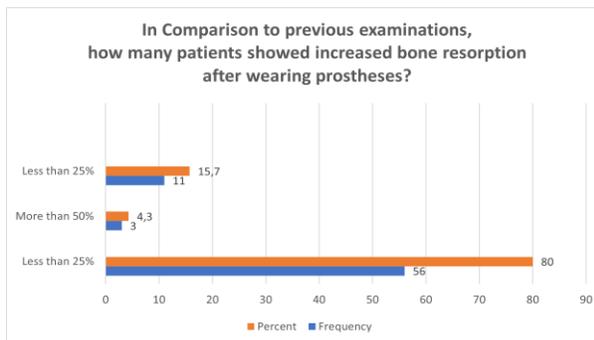


**Fig. 1 Acceleration of bone resorption caused by removable partial denture**

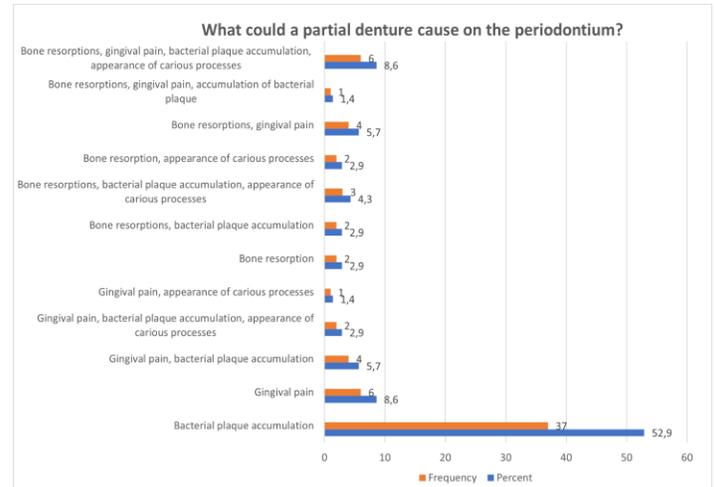
28 dentists agreed that bone resorption is accelerated by wearing partial dentures, and 42 of them disagreed with that.



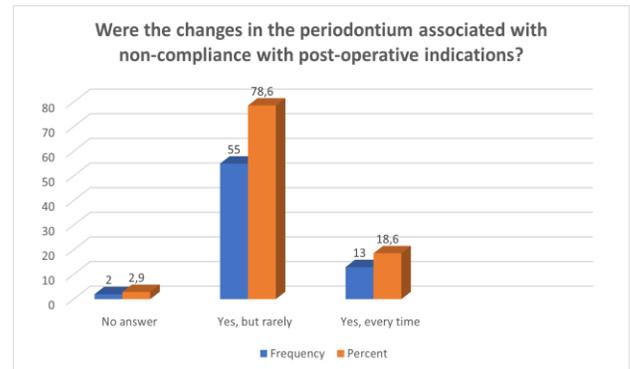
**Fig. 2 Association between changes in the health of periodontal tissues and inadequate oral hygiene**



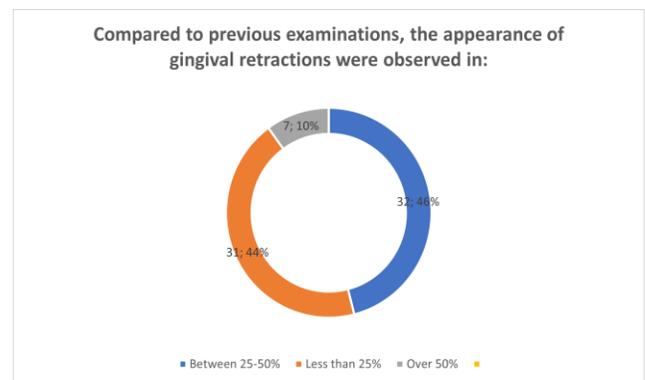
**Fig. 3 Results of increased bone resorption after wearing prostheses**



**Fig. 4 Influence of partial dentures on the periodontium**



**Fig. 5 Association of the occurrence of changes in the periodontium with non-compliance with postoperative indications**



**Fig. 6 Presence of gingival recessions compared to previous examinations on patients with removable partial dentures**

## DISCUSSIONS

According to the questionnaire regarding the influence of removable partial dentures on the tissues of the periodontium, the majority of dentists who answered (72.9%) declared they have been practicing for 5 - 10 years, while 14.3% of them have been practicing for 10 - 20 years, and 12.9% for less than 5 years. Thus, we obtained information from dentists who have worked for enough time to acquire knowledge and experience and from doctors with a shorter activity but theoretically well prepared, knowing the latest scientific acquisitions and sometimes more innovative.

The number of patients with partial dentures examined per month in the current practice by the responding doctors is 5-10 patients for 71.4% of them, followed by a percentage of 18.6% of those with more than ten patients per month. 10% of the respondents declared less than five patients per month with this type of prosthetic work.

A check-up appointment a few months after the insertion of the prosthetic appliance is an essential step because clinical investigation is necessary to prevent gingival recessions, bone resorptions, bacterial plaque accumulation, and other complications.

42.6% of the dentists who answered the question: "Do you think bone resorption was accelerated by wearing partial dentures?" had a negative response, while only 28.4% responded positively.

The questionnaires' results indicate that 75.7% of the dentists chose cast clasps. The cast clasps have a surface contact with the hard dental structure, while those made of wire have a linear contact; this is why the cast clasps are less hygienic than those made of wire.

However, cast clasps have the following functions: retention, stability, support, encirclement, reciprocity, passivity, and indirect maintenance. For the correct class type selection, we must keep in mind that it is important for the clasp to perform as many functions as possible and to be selected according to the clinical criteria [7].

Dental hygiene has one of the most determinative roles in maintaining a healthy oral cavity. Prosthesis wearers must also maintain particular hygiene on the prosthetic works. The statistical analysis demonstrated the association of the changes in the marginal periodontium with inadequate hygiene in a proportion of 84.3%. In patients who have inserted partial dentures, adhesive creams can help stabilize, and products for cleaning partial dentures have the role of maintaining a high level of hygiene of the denture [8]. When patients have medical, physical, or mental factors that can lead to poor dental hygiene of dentures, denture cleaners can help improve their hygiene and kill bacteria. Combining brushing with denture cleaners reduces bacterial plaque and the number of bacteria [9].

Following the answers provided by dentists to the question: "Among patients with mobile prostheses, how many show clinical signs of periodontal disease?" 52.4% answered that over 50% of patients with mobile prostheses show clinical signs of periodontal disease. Periodontal disease includes various inflammatory conditions that harm the gums, bone, and periodontal ligament. The factor that leads to its appearance is the bacterial plaque which interacts with the host's immune defense and ultimately leads to inflammation [10]. The severity of periodontal disease depends on several factors, including oral hygiene and smoking. Proper engineering and professional

removal of the microbial biofilm are required to prevent periodontal disease [11].

Increased bone resorption after wearing prostheses was noted by 80% of the respondents in 25-50% of their clinical cases, 15.7% of them observed this pathology in less than 25% of cases, and 4.3% in more than 50% of patients with partial dentures.

Another investigated aspect was the influence of partial dentures on the periodontium. A percentage of 52.9% of the dentists answered that partial dentures favored the accumulation of bacterial plaque, and 8.6% of the dentists declared that wearing the dentures caused the patients pain in the gums.

Factors related to the presence of partial dentures and their design, manufacture, and materials seemed to influence periodontitis by an increased bacterial plaque accumulation; traumatic and allergic reactions to dental materials used for their manufacturing were less frequent [12].

To the question "Were the changes in the periodontium associated with non-compliance with the post-operative indications?" most of the respondents (78.6%) answered "yes, but rarely", and only 18.6% "yes, every time". Based on these results, we conclude that sometimes patients do not realize the importance of following the post-operative indications given by the dentist.

Among the dentists, 82.9% answered "yes, but rarely", to the question: "Were periodontal changes associated with local risk factors (smoking)?" and only 10% "yes, each time". Epidemiological studies show a significant effect of smoking on oral health and periodontal disease. Loss of connective tissue and increased dental mobility in smokers may

occur more quickly. Also, people exposed to environmental tobacco smoke have a higher risk of developing periodontal disease than active smokers [13]. Quitting smoking is a beneficial factor for periodontal health. Every patient should know that smoking has harmful oral effects [14].

The biggest part of the respondents (84.3%) found that periodontitis in cases of partial denture wearers is rarely associated with the presence of a general risk factor like diabetes, and only 10% of them identified a strong correlation between the two pathologies. Diabetes may cause bone loss with a lower bone height and a lower bone density [15]. Multiple oral lesions may occur in diabetic patients with partial dentures, caused by permanent wear, due to a predisposition to rapid bone resorption and changes in the thickness of the oral mucosa. Thus, diabetic patients are more prone to oral lesions than clinically healthy patients. The lesions that can occur in diabetic patients with mobile prostheses are: mechanical, chemical, and biological. The chemical lesions are due to the material used to make dentures [16,17].

Following the answers given by dentists to the question regarding which of the risk factors was most frequently in cases of the damaged periodontium, the results were: poor oral hygiene 68.6%, smoking 1.4%, systemic factors 2.9%. The lack of oral hygiene seems to be the principal cause of periodontal pathology, but the other factors also participate in the damage of the periodontium. By combining different types of hygiene like manual or vibratory sonic brushing and the use of chemical cleaning agents, the biofilm and dental plaque on the denture may decrease. The concentrations of the prosthesis cleaning solutions can negatively influence the

maintenance of the prostheses regarding color stability. Brushing is one of the most important techniques to maintain optimal hygiene [18]. The surfaces of dentures represent environments to support microorganisms that can affect the health of physically vulnerable patients [19]. The patient has to maintain dental prostheses' hygiene, oral health to avoid unpleasant odors [20]. The results obtained from dentists to the question: "Is the same prosthetic treatment applied for patients with periodontal disease?" 42.6% answered no, and 28.4% answered yes. The prosthetic treatment is adapted for each patient. The sequence of the clinical procedures is as follows: acute complications, professional hygiene of the oral cavity, curettage of granulation tissue, biostimulation treatment, immobilization, and finally, prosthetic restoration [20]. Another important index in the qualitative evaluation of removable partial dentures is gingival recessions. 32.46% of the doctors involved in this study answered that gingival recessions were present in over 50% of cases, 31.44% detected the presence of gingival recessions in 25-50% of cases, and only 7.1% found them in less than 25% of partial dentures wearers. Gingival recession is one of the most common

aesthetic concerns associated with periodontal tissue [21]. The causes of gingival recessions are periodontal disease, accumulation of tartar and plaque, incorrect brushing, occlusal forces that are transmitted unevenly, and incorrectly performed dental treatments such as prosthetic works or invasive dental clasps [22].

## CONCLUSIONS

Partial dentures with cast clasps are preferred by dentists, being the most effective ones. These prosthetic works may cause bacterial plaque if oral hygiene is poor and the dentures are not adapted. The most common risk factor for periodontium in partial dentures patients is poor oral hygiene. General risk factors such as diabetes may cause oral lesions, local risk factors such as smoking can lead to the accumulation of bacterial plaque, tartar, and tooth mobility.

The same prosthetic treatment of patients with a healthy periodontium is not applicable for those with periodontal pathologies and remaining teeth more vulnerable to occlusal trauma. Gingival recessions are related to unevenly transmitted occlusal forces and inadequate partial dentures.

**Conflict of interest:** the authors declare no conflict of interest associated with this paper.

**Informed Consent Statement:** informed consent was obtained from all subjects involved in the study

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ANNEX

Question	Answers
1. How long have you been practicing as a dentist?	A. Less than five years B. Between 5-10 years C. Between 10-20 years D. More than 20 years
2. How many patients with the partial prosthesis do you treat per month?	A. Less than 5 B. Between 5-10 C. More than 10
3. Do you think bone resorption was accelerated by wearing partial dentures?	A. Yes B. No
4. What type of clasp do you consider to be more effective?	A. Classic wrought wire clasps B. Cast clasps
5. Were the changes in the periodontium associated with inadequate oral hygiene?	A. Never B. Yes, but rarely C. Yes, always
6. How many patients with mobile prostheses show clinical signs of periodontal disease?	A. None B. In less than 25% of cases C. Between 25-50% of cases D. In over 50% of cases
7. How many patients showed increased resorptions after wearing removable partial dentures?	A. None B. Less than 25% C. Between 25-50% D. Over 50%
8. What could be the effects of partial dentures on the periodontium?	A. Bone resorptions B. Pain in the gums C. Bacterial plaque accumulation D. Appearance of decays
9. Were the changes in the periodontium associated with non-compliance with the post-operative indications?	A. Never B. Yes, but rarely C. Yes, always
10. Were periodontal changes associated with local risk factors (smoking)?	A. Never B. Yes, but rarely C. Yes, always
11. Were changes at the periodontal level associated with general risk factors such as diabetes, cardiovascular disease?	A. Never B. Yes, but rarely C. Yes, always
12. Which of the following risk factors for periodontal pathologies have been most frequently?	A. Smoking B. Poor oral hygiene C. Systemic factors
13. Is the same prosthetic treatment applied to patients with periodontal disease?	A. Yes B. No
14. Compared to previous examinations, gingival recessions have been observed in:	A. None B. Less than 25% C. Between 25-50% D. Over 50%