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# Comparative Assessment With Results From Research on Hybrid Dentures Over 4 Implants in the Mandible

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**Abstract:** In clinical practice, due to various factors, we are facing patients with few teeth left in the lower jaw, often without any perspective. As a result of the reduced load capacity, they are loosened and can be completely lost. On the other hand, prosthodontics has a great potential for a unique implant - prosthetic rehabilitation. The goal is to preserve the alveolar ridge and slow down its resorption. With the advancement of the technology, conventional dentures are being replaced with more sophisticated therapeutic methods, such as modern prosthodontic superstructures. One of the latest solutions for this problem is the application of the Brånemark system (Nobel Biocare). These restorations that are applied represent a multi-unit system of implants and one hybrid prosthesis. This represents a mobile prosthetic suprastructure, which can be fixed with specific attachments on 4 implants. This combination of placement of a hybrid prosthetic structure on 4 implants is known as „all on four“. There are many discussions and writings about this multidisciplinary concept in the professional world. Over these 4 implants, a suprastructure with maximum 12 teeth can be immediately placed. The prosthetic construction circularly covers the entire toothless mandibular ridge. The data obtained from the patients show difference in the development of the bite force in the mastication center. The results have also shown a better quality of life in patients using a hybrid denture compared to the conventional prosthetic rehabilitation.

**Keywords:** toothlessness, mastication, prosthodontics, suprastructure, therapy.

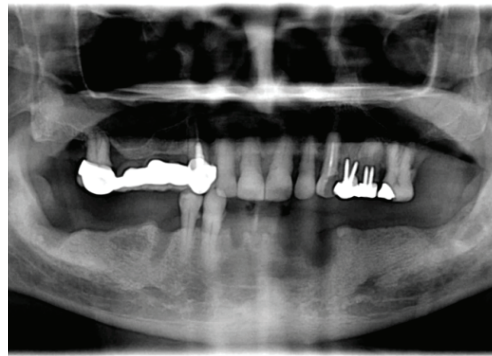
## Introduction

Chronic periodontal disease leads to loosening, migration and loss of teeth (Rizwan, S. et al. 2016). Due to various reasons, these patients can irreversibly lose their dentition over time. The masticatory function is greatly hampered due to the negative influence of the mastication forces Branschofsky, M. et al. 2011). As a result of the decreased functional efficiency and overloading during the mastication process, teeth start to luxate in all directions. In our everyday practice, we are in contact with patients, who only have a few teeth in their lower jaw due to various reasons. These remaining teeth have poor prognostic (Figure.1).

Prosthodontics represents a real magic when it comes to possible solutions compared with the conventional methods (Петровиќ Ковачева, Г., & Грчев, А. 2010). The main goal of this concept is to preserve the alveolar ridge and decrease the resorption of the alveolar bone in order to become a solid base for future prosthetic restoration. The modern concept of prosthetic solution is based on changing the old conventional dentures with fixed prosthetic suprastructures. An example of such prosthetic alternatives is the transitory use of immediate hybrid prosthesis. Immediate hybrid prosthesis represents a conditionally mobile suprastructure, which is fixed on previously inserted implants. This combination of dental prosthetic hybrid suprastructure placed on previously inserted implants is known as „all on four“ (Figure 2).



**Figure 1** *Few teeth remaining in the mandible*



**Figure 2** *All on four*

The suprastructural construction covers the whole toothless alveolar ridge. From both sides, the center of mastication force is moved mesially towards the first molar and the second premolar. This structure contains a set of 12 teeth. Proper mastication process develops in a period of seven days. This modern technique represents a sophisticated way of immediate rehabilitation with great functional effectiveness (Branemark, P. I. 1983). Due to the loss of most of the natural teeth, the process of mastication is greatly compromised (Shinogaya, T., & Sodeyama, A. 1999). Affected patients lose their normal ability to chew as well as their social integrity and the esthetics of their teeth is compromised. The main goal of this treatment is to maintain and restore all the functional aspects for the patients. In order to achieve this condition, proper biomechanical loading on the suprastructure must take place (Christopher, C. K. 2012).

## Materials and Methods

In this study, a comparative assessment of the results has been made by using some quantitative and qualitative methods. Numerous gnatho-dynamometric measurements of the intensity of the masticatory pressure in the masticatory center have been performed at different time intervals. Comparative tests for improved quality of life among the treated patients have been done. All of the clinical, radiological and gnatho-dynamometric measurements, as well as assessments of the quality of life have been done in strictly determined time intervals: before the start of the treatment, seven days after the treatment, six weeks after the treatment and 18 months after the treatment.

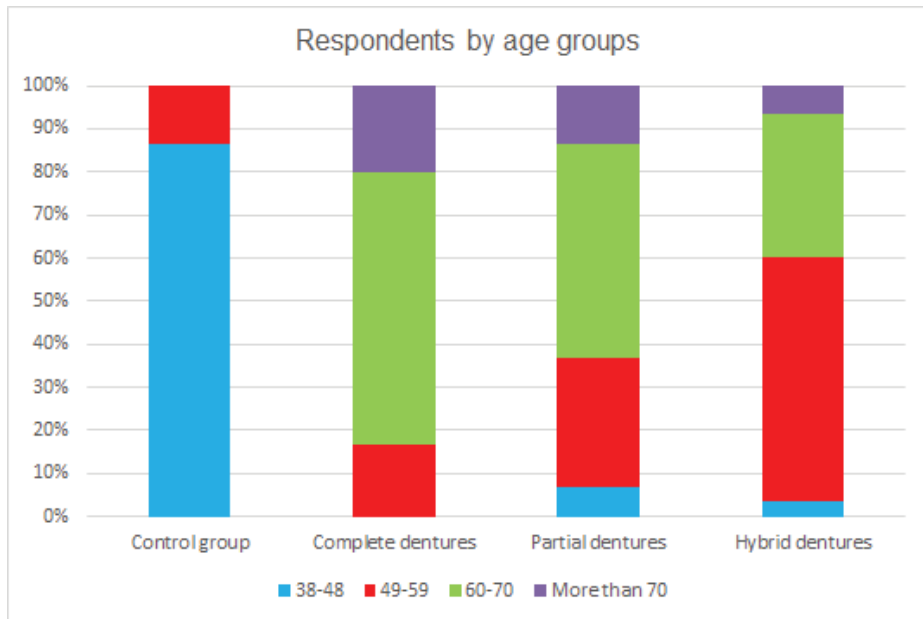
The examination process was done in the dental practices „Stela“ and „Dental Excellence“ in Skopje. There was a total of 120 patients, male and female, divided into different age categories: from 38 to 48, from 49 to 59, from 60 to 70 and over 70-year-old. A clinical examination and assessment of the periodontal complex and measurements of the intensity of the mastication force in the mastication center (N) were performed for all patients. The data from the studied groups was statistically processed with the Minitab 17 software. Mean values were used for all of the subjects in each of the four groups. To specify the differences between all of them, the ANOVA test was conducted. An additional statistical analysis of the differences between the mean values among any two groups, was also conducted. In comparison with all other groups separately, we used the Tukey's test to prove the statistical significance.

## Results

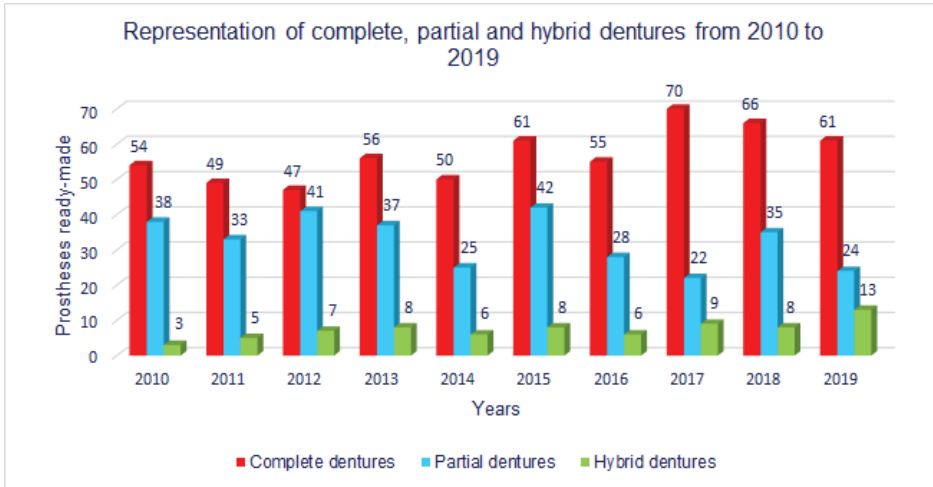
The subjects were divided into four groups. The first one was a control group with subjects with intact dentition, the second group were subjects with a total prosthesis, the third group involved subjects with partial prostheses and the fourth group represented subjects with hybrid prostheses. Each group consisted of 30 subjects.

In the first group, most of the subjects belonged to the youngest age group from 38 to 48-year-old. In comparison, the second group with subjects with total prostheses consisted of patients 60 to 70-year-old. Among the subjects with hybrid prostheses, the most predominant were patients aged 49 to 59 (Graph 1).

**Graph 1** Age groups



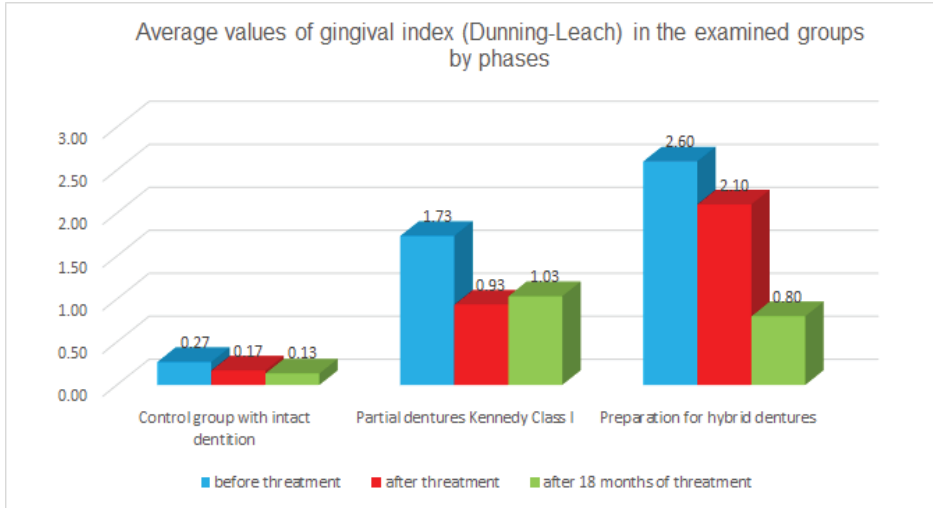
**Graph 2** Prevalence of type of prostheses among groups



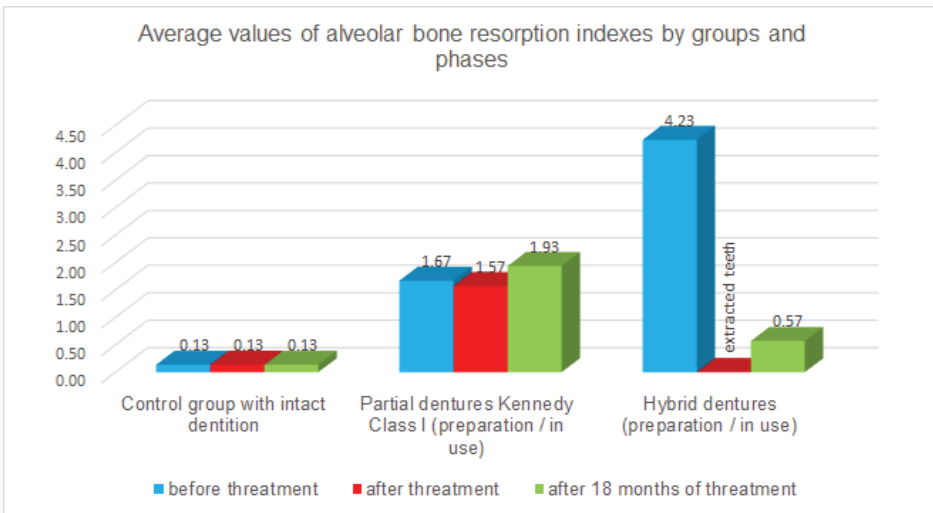
The prevalence of total prostheses among the patients was present during the whole period. The prevalence of partial prostheses decreased throughout the study period. On the other hand, the presence of hybrid prostheses increased during the study timeline, from 3 in 2010 to 13 in 2019 (Graph 2).

The mean values of all of the measured indexes throughout different periods, namely, before treatment and follow ups after 7 days, 6 weeks, and 18 months are presented in graphs 3, 4, 5, 6, 7, 8 and 9.

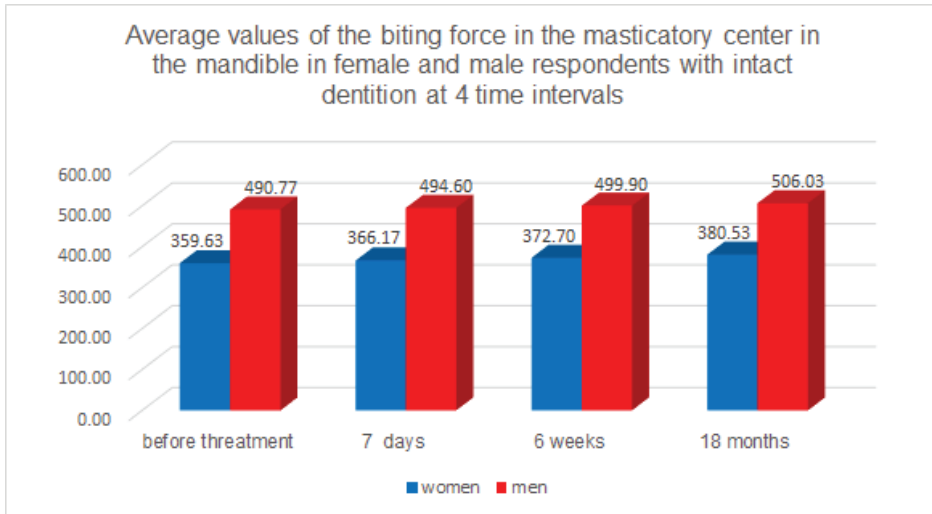
**Graph 3**



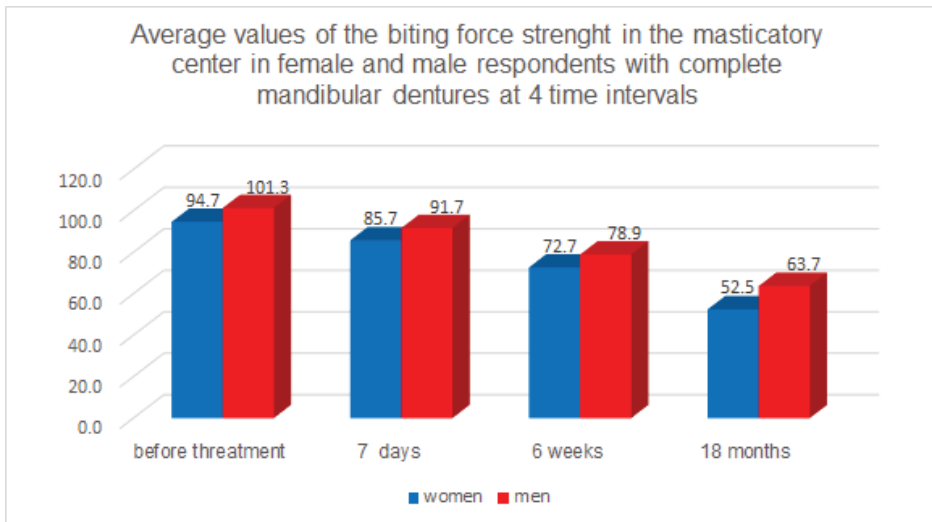
**Graph 4**



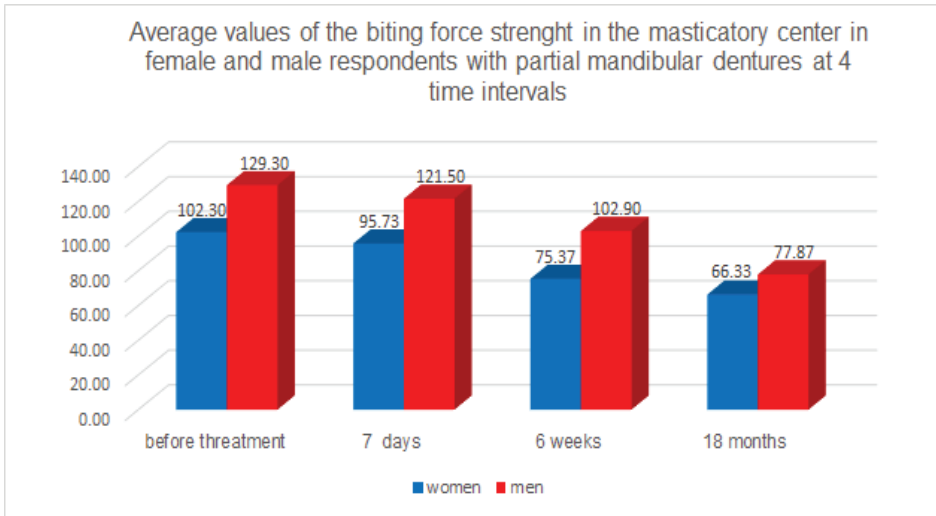
### Graph 5



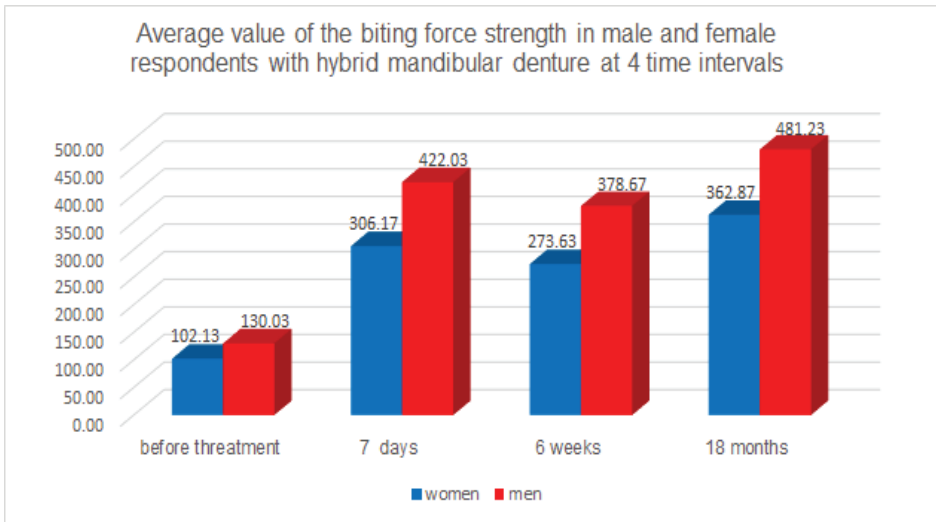
### Graph 6



**Graph 7**



**Graph 8**



In order to assess the quality of life among the subjects „GOHAI“ (Gender Oral Health Assessment Index), standardized surveys according to WHO were conducted (Hassel, A. J.et al. 2008). The data was properly obtained and processed. The survey consisted of 12 questions with five possible answers (Zenthofer, A., & Rammlersberg, P. 2014).



The results from the GOHAI-QoL showed that the subjects using hybrid prosthesis over 4 fixed implants were more satisfied with their oral health-based quality of life (OHRQoL). The results also showed that there was no significant difference between subjects from the control group with intact dentition and subjects that were using hybrid prosthesis ( $p > 0.05$ ).

## Discussion

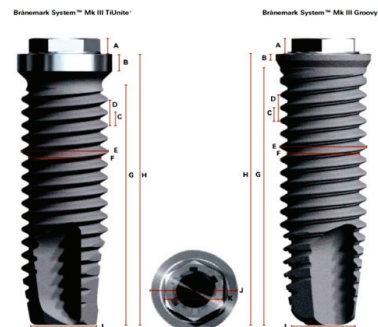
The main purpose of every prosthetic treatment is to implement the basic medical concept (Gross, M. D. 2008). Besides the therapeutic prosthetic rehabilitation, preventive care is also very important (Chen, Y. Y. et al. 2008). There are some rules that should be applied in any prosthetic rehabilitation

- Reconstruction of the occlusion height
- Maintenance of normal articulation
- Proper rehabilitation of the masticatory apparatus in order to maintain normal function
- Esthetic corrections and
- Enabling proper phonation

The implants that were used were from the Brånemark (Nobel Biocare) brand, series Branemark System Mk III Ti Unite and Branemark System Mk III Groovy, with application of biocompatible artificial bone Geistlich Bio-Oss® (Figure 3).



**Figure 3** Branemark System Mk III



**Figure 4** Transfers

The loading of the implants was done after 48-72 hours, when transfers were set (Figure 8). After setting of the transfers within the next 168 hours (7days), the hybrid prosthesis had to be placed and properly adjusted for mastication. If this procedure is done in more than 7 days, it is counterproductive. This method was recommended by McCracken et al. and was supported by many in vivo and in vitro studies, done in the most eminent implantology centers. The highest intake of minerals at metabolic level happens in this period (Duyck, J.et al. 2000). After the seventh day, the metabolic processes decrease sharply, so that, if the loading is done after that period, the results will be compromised. Our studies confirmed these results. In accordance with this, the time from the implantation to the fully loaded hybrid prosthesis should be in our focus (Figure 4).

In order to have good results, it is very important for the prosthodontist to provide a solid static and polygonal balanced occlusion (Sivakumar et al. 2015). The occlusion should be evenly distributed over the whole alveolar ridge. This prevents the bad impact of horizontal and vertical masticatory forces and furthermore increases the process of osteointegration in the masticatory center and along the anterior part of the alveolar ridge. All of this combined allows good function, which is our ultimate goal (Figure 5 and 6).



**Figure 5** Mastication function



**Figure 6** Balanced occlusion

This study shows that the strength of the masticatory force and the quality of life of the subjects using hybrid prosthesis give the most satisfactory results from both functional and psycho-social aspect, during all periods, when compared with the subjects using total prostheses and partial prostheses in class Kennedy I. The re-

sults obtained for the subjects with hybrid prostheses are very close to the results obtained for the control group.

According to the results, we can conclude that the protocol with the hybrid prostheses allows proper functional rehabilitation for every individual. The follow up results show reliable stability of the implants and functional efficiency of the suprastructure for a period of over 18 months (Figure 7) .

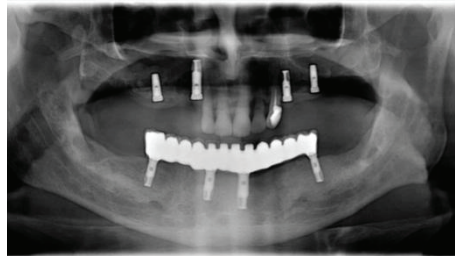


**Figure 7**

Orthopantomographic x-ray (follow up) after 18 months (Figure 8,9,10,11)



**Figure 8**



**Figure 9**



**Figure 10**



**Figure 11**

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