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Case report

Hybrid Implant-Prosthetic Rehabilitation of Edentulism: A Case Report

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SUMMARY

Introduction. Edentulism is a condition characterized by the absence of all teeth in the upper and/or lower jaw. The problem of edentulism can be solved using conventional removable complete dentures and by the increasingly common creation of fixed prosthetic restorations on implants. The aim of the paper was to present the case of a patient who underwent successful implant-prosthetic rehabilitation of edentulous upper and lower jaws by creating a hybrid prosthetic work.
Case report. After the successful fitting and osseointegration of implants, complete occlusal rehabilitation of the patient was performed using BioHPP (high-performance polymers) and zirconia.
Conclusion. With the combined use of implants, new materials and technologies, modern dentistry enables the creation of fixed prosthetic restorations after the loss of all teeth, which gives excellent functional and aesthetic results and enables a better quality of life to the patient.

Keywords: **edentulism, dental implants, prosthetic rehabilitation**

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INTRODUCTION

Regardless of the series of preventive programs aimed at preserving the health of the teeth and the orofacial system, literature data present a large number of cases of edentulous people (1). Edentulism as a global and socioeconomic problem has long been treated by making complete dentures using acrylate materials. The disadvantage of this type of therapy is the mobility of the restorations, and therefore the challenge of its retention and stabilization in the patient's mouth, as well as possible irritations and injuries of the oral mucosa (2). Furthermore, it is a fact that patients have difficulties getting used to removable compared to fixed dentures, thus the appearance of implants in prosthetic rehabilitation is considered a revolutionary invention in dentistry. The fitting of dental implants in clearly indicated cases enables optimal results that provide edentulous patients with a fixed prosthetic restoration or a dental bridge at the place that was once occupied by natural teeth (3, 4). Fixed dentures on implants compensate not only for the lost teeth but also for parts of the alveolar process that were resorbed after the extraction of natural teeth. The resorption of the alveolar process is not unique in all its segments, which makes the fabrication of fixed dentures on implants more complex (5).

BioHPP (high-performance polymers) is a material based on PEEK (polyetheretherketone) adapted for use in dentistry by adding nano-ceramic oxides. It is fully biocompatible and extremely applicable in large works on implants (6).

The aim of the paper was to present the case of successful implant-prosthetic rehabilitation of edentulous upper and lower jaws by creating a hybrid prosthetic restoration.

CASE REPORT

Herein we present the case of amale patient aged 60 with numerous periodontopathic teeth and alveolar bone resorption. Following a detailed diagnostic procedure that included the clinical examination and radiographic analysis (three-dimensional orthopantomograph - 3D image) of the upper and lower jaw, a treatment plan was determined. The clinical examination of the patient revealed pronounced luxation of the remaining teeth in both jaws. The 3D image revealed a large number of periodontopathic teeth in the fourth stage of periodontopathy and a large resorption of the alveolar bone (Figure 1).

Figure 1. *3D image of the patient*

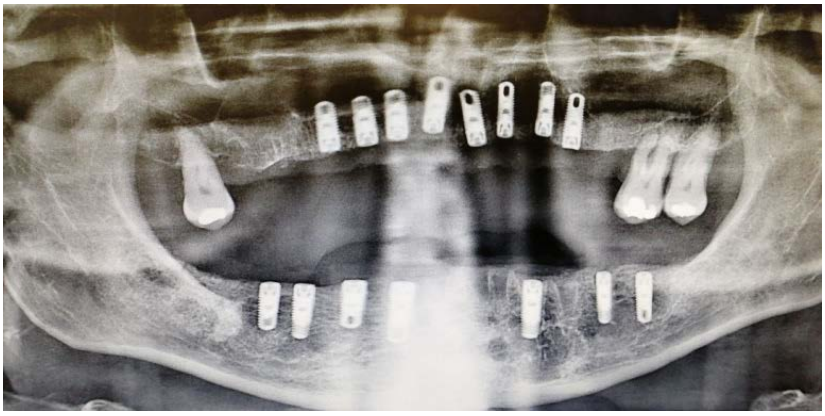

Figure 2. *Control orthopantomography of the patient after fitting the dental implants*

The surgical treatment plan included multiple tooth extractions, levelling of the alveolar ridge of both jaws, dental implants fitting (Zimmer Dental Inc., Carlsbad, CA, USA) in the upper (eight) and lower (seven) jaw, as well as the compensation of bone tissue with xenogeneic material (osteOXenon, Bioteck S.p.A, Arcugnano, Italy) along with guided bone regeneration (biocollagen membrane, Bioteck S.p.A, Arcugnano, Italy) in the same session (Figure 2). Immediately after implant fitting and control orthopantomography, the remaining upper molars were extracted.

The prosthetic therapy plan included the fabrication of temporary conventional (acrylate) removable complete dentures, which the patient wore until the creation of a definitive hybrid implant-prosthetic restoration after a six-month implant osseointegration period. Due to the presence of low-density bone in the area of the upper jaw (D3 and D4) and most of the lower jaw (D3), immediate implantation and inadequate primary stability of individual implants, as well as bone compensation with guided bone regeneration, we decided not to load the implants with abutment and temporary bridges immediately. Otherwise, we would compromise the stability and future osseointegration of the implants.

A week before the onset of the prosthetic restoration procedure, the implants were exposed, the healing caps removed, and sulcus formers were placed to obtain an adequate gingival margin of the future prosthetic construction (Figure 3).

After that, the impressions were taken. The sulcus formers were removed, and transfers were placed on the implants (Figure 4), followed by taking impressions of the upper and lower jaw with the addition silicone (VarioTimeHeraeus, Kulzer, Germany) using the closed-spoon method (Figure 5).

Figure 3. *Sulcus formers placed*

Figure 4. *Transfers placed on dental implants*

Figure 5. *Impressions of the upper and lower jaw with transfers*

The impressions were sent to the laboratory, implant analogs were placed over the transfers, and dental models were cast. After making the dental models, the transfers were removed and multi-unit abutments (Zimmer Dental Inc., Carlsbad, CA, USA) were placed on the analogs – in the frontal region, abutments were placed at an angle, i.e., straight in the lateral region. Bite templates were made and in the next phase, the interjaw relationships of the patient were determined.

Dental models with a certain height were scanned and analyzed in a virtual articulator (Amann Girrbach AG, Germany) where the entire prosthetic construction was then planned (Figure 6).

The intended hybrid restoration consisted of two parts — a BioHPP skeleton (Bredent, Germany) and a zirconium crown (Ivoclar, Liechtenstein).

A base formed of BioHPP material was made using computer CAD-CAM (Exocad, Ivoclar, Liechtenstein) software technology (Microsoft, USA).

In the next phase, the sulcus formers were removed, and multi-unit abutments transferred from the model were placed on the implants in the upper and lower jaw (Figure 7).

Considering that the obtained structure fully corresponded to the height of the bite (Figure 8) and the fitted implants, and that the gingival part of the

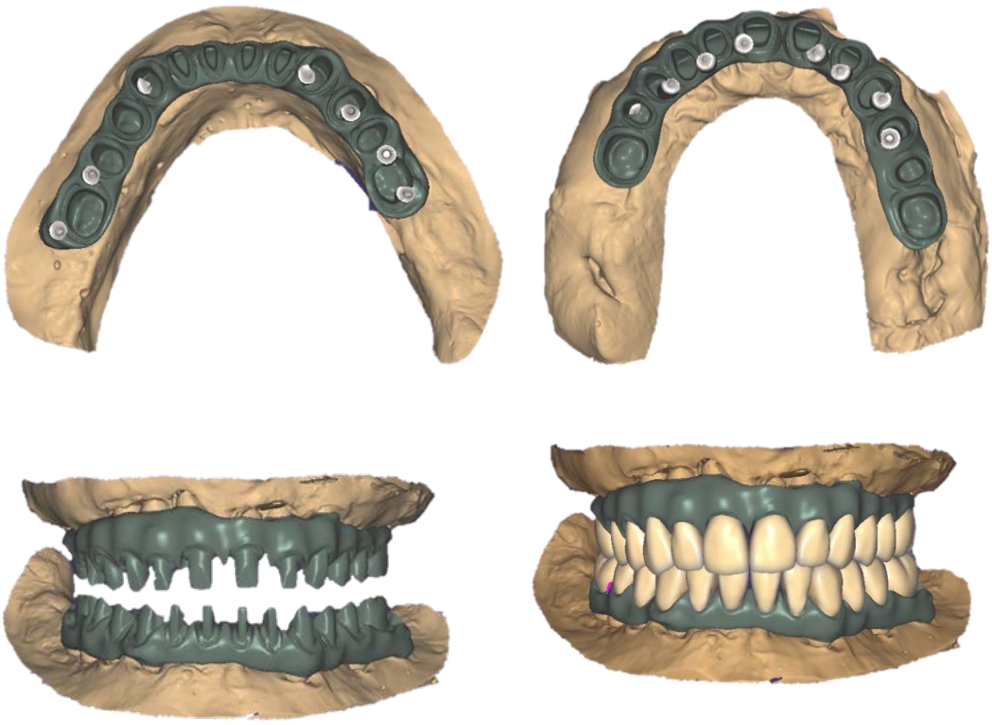

Figure 6. *The model analysis in the virtual articulator and prosthetic construction planning*

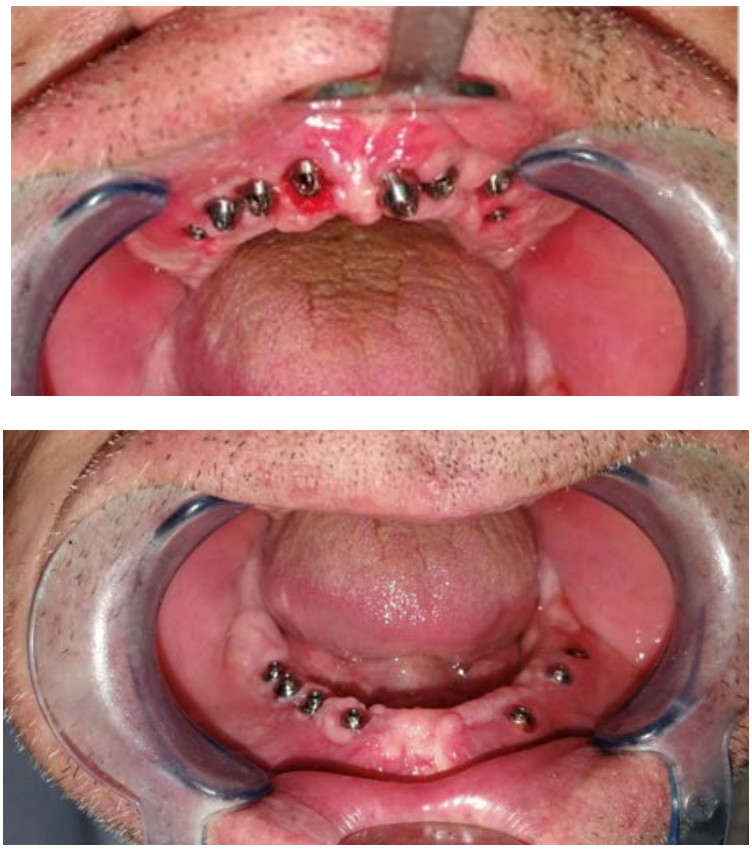

Figure 7. *Multi-unit abutments in the upper and lower jaw*

restoration corresponded to the edentulous ridge, the hybrid restoration model was sent to the laboratory for further preparation.

The construction was tested in the patient's mouth by screwing the caps of the BioHPP skeleton to the abutments (Figure 9). The compensated ridge of the BioHPP skeleton was coloured using a special liquid light-curing gingiva-coloured composite Crea Lign (Bredent, Germany) to obtain a faithful replica of the anatomical structures of the soft oral tissues. Zirconium crowns were made using computer CAD-CAM technology and cemented to the skeleton with composite cement (DTK Kleber, Bredent, Germany).

The entire hybrid construction with cemented zirconium crowns was placed and fixed to the implants by the method of screwing the skeleton caps to multi-unit abutments on the implants (Figure 10).

The patient was prosthetically completely rehabilitated, and his satisfaction with the function and appearance of the restoration was verified at follow-up examinations.

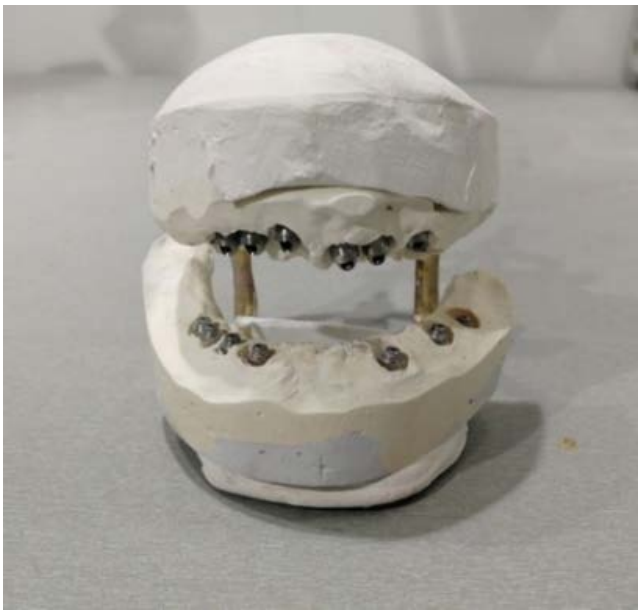

Figure 8. *Interjaw relationships checked in the dental laboratory*

Figure 9. *Testing the BioHPP construction in the patient's mouth*

Figure 10. *The final prosthetic restoration placed in the patient's mouth*

DISCUSSION

The paper presents the case of a patient in whom the problem of the loss of all teeth was solved using modern hybrid prosthetic therapy. CAD – CAM software for design, as well as the analysis of 3D images, provide the possibility to precisely plan the therapy (7, 8). The fitting of implants slowed down and reduced the loss of bone tissue, and the fabrication of the hybrid prosthetic restoration avoided the need for removable dentures and discomfort they cause. The patient received an aesthetic restoration made in accordance with the most modern principles of the profession, thereby ensuring its safety and durability.

The advantage of hybrid implant-prosthetic restorations fixed by the screwing method compared to conventional restorations on implants fixed by cementing is the possibility of removing the prosthetic restoration in case of potential problems (cracking and restoration of zirconium crowns, servicing of hybrid bridges, periodontal problems, etc.).

BioHPP forms the basis of the prosthetic restoration, while the crowns are made of zirconium ceramics. The replica of the gingiva is made of a gingiva-coloured composite, which covers the BioHPP material.

BioHPP is used as the base in the manufacture of crowns, bridges, and dentures on implants owing to its mechanical stability and resistance to breakage. The material is excellently polished, which prevents food retention and the formation of plaque on the restoration, and is easy to clean. Due to its elasticity, which is similar to the elasticity of the natural bone, this material is a great choice for restorations supported by implants. Over time, especially during the process of chewing when the lower jaw is deformed to a certain extent, BioHPP follows this change and protects the implants from overloading (9, 6).

The biocompatibility of the BioHPP material and its biomechanical properties make it an excellent substitute for alloys used in dentistry, given its proven high fracture resistance of 1.518 N (10, 11).

In addition, BioHPP is lighter than the metal alloys it replaces in prosthetic restorations, therefore, it is more comfortable to wear in the mouth. Allergy to BioHPP is almost non-existent, given that it is insoluble in saliva (12). BioHPP is white and its colouring provides exceptional aesthetic effects (13).

Zirconia ceramic is the material of choice for making mechanically resistant crowns and bridges with the best aesthetic performance. Processing with CAD-CAM technology enables fast and high-quality fabrication of restorations by designing the patient's smile. Numerous advantages of all-ceramic compared to metal ceramic crowns have been described in the literature (14). The combination of BioHPP and zirconia ceramic ensures excellent function and appearance of fabricated prosthetic restorations.

CONCLUSION

The hybrid-prosthetic construction provides complete occlusal rehabilitation of the patient and restoration of the function of the orofacial system with a maximum aesthetic effect. Such combined restorations are especially justified in patients in whom, in addition to teeth, the lost alveolar ridge needs to be reconstructed.

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Hibridna implanto-protetička rehabilitacija bezubosti: prikaz slučaja

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SAŽETAK

Uvod. Bezubost je stanje koje karakteriše nedostatak svih zuba u gornjoj i/ili donjoj vilici. Problem bezubosti može se rešiti konvencionalnim mobilnim totalnim protezama i sve češćom izradom fiksnih protetičkih nadoknada na implantatima. Cilj ovog rada bio je da se prikaže slučaj pacijenta kod kojeg je izrada hibridnog protetičkog rada dovela do uspešne implanto-protetičke rehabilitacije bezubosti gornje i donje vilice.
Prikaz slučaja. Nakon uspešne ugradnje i oseointegracije implantata postignuta je kompletna okluzalna rehabilitacija pacijenta korišćenjem BioHPP (engl. *high-performance polymers*) materijala i cirkonije.
Zaključak. U savremenoj stomatologiji kombinovana upotreba implantata, novih materijala i tehnologija omogućava izradu fiksnih protetičkih radova nakon gubitka svih zuba, što daje odlične funkcionalno-estetske rezultate i pacijentu omogućava kvalitetniji život.

Ključne reči: **bezubost, dentalni implantati, protetička rehabilitacija**