

## Alternative fixation system for implant-retained overdenture: case report

### Sistema alternativo de fixação para overdenture implanto-retida: relato de caso

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#### ABSTRACT

The aim of this case report was to describe a prosthetic rehabilitation associated with an alternative model of polymer capsule for fixation system of implant-retained overdentures. Patient sought treatment at the clinic of School of Dentistry of Ribeirão Preto, due to lack of retention of their conventional total superior prostheses and inferior overdenture. The initial complaint was clinically confirmed by altered intermaxillary relationships and severe reabsorption of the maxillary crest. In order to restore the function and improve its quality of life, it was proposed a prosthetic solution including implant fixed prosthesis to maxilla and a mandibular overdenture, with ball-type attachments associated with an alternative model of polymer capsule. This treatment was proposed in order to reestablish the intermaxillary relationships and adequate occlusion, maintain retention and stability of the prosthesis. At the end of treatment and during a one-year follow-up of the case, the patient reported satisfaction and significant improvement in quality of life.

**Indexing terms:** Dental implantation. Polymers. Quality of life.

#### RESUMO

*O objetivo deste relato de caso foi descrever uma reabilitação protética associada a um modelo alternativo de cápsula polimérica para sistema de fixação de overdentures implantado-retidas. Paciente procurou tratamento na clínica da Faculdade de Odontologia de Ribeirão Preto, devido falta de retenção de suas próteses totais superiores convencionais e overdenture inferior. A queixa inicial foi clinicamente confirmada por relações intermaxilares alteradas e reabsorção severa da crista maxilar. Para restaurar a função e melhorar sua qualidade de vida, propôs-se como solução protética, a confecção de prótese fixa sobre implantes para a maxila e*

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*overdenture mandibular, com acessórios tipo bola associados a um modelo alternativo de cápsula polimérica. Esse tratamento foi proposto a fim de restabelecer as relações intermaxilares e a oclusão adequada, manter a retenção e a estabilidade da prótese. Ao final do tratamento e durante o acompanhamento de um ano do caso, o paciente relatou satisfação e melhora significativa na qualidade de vida.*

**Termos de indexação:** Implantação dentária. Polímeros. Qualidade de vida.

## **INTRODUCTION**

The success of oral rehabilitation with implants requires planning the case with consideration of the stomatognathic system as a whole, in order to promote favorable biomechanics, masticatory efficiency, implant longevity, and aesthetics. Although fixed prostheses are the models of choice for fully edentulous cases, patients with bone and systemic conditions are not always good candidates for this type of treatment. In these cases, implant-retained overdentures are an effective alternative, as they significantly improve patient function and satisfaction [1-3].

For overdentures, retention and stability characteristics are provided by the implants through the fixation system, classified as splinted, such as bar-type, and non-splinted, such as era®, magnetic and O-ring [4]. The shape of the dental arch, space inter-arches, implant placement, ease of adjustment, manual dexterity, and patient agreement will determine the most appropriate system choice [5]. Ball attachments are easy to insert, remove, hygiene, and are generally cost-effective [6-8]. The main disadvantage is the need for periodic O-ring replacements [9].

The constant loss of overdenture retention due to O-ring wear is caused by a number of factors, including inadequate positioning of the implants, unfavorable intermaxillary relationships, and fracture of fixation components, all of which result in greater or lesser degrees of wear for these components [9-12]. In an attempt to solve the problems related to fixing the components available in the dental market, the development of products, using materials, equipment, and techniques that overcome the clinical difficulties associated with oral rehabilitation, could lead to substantial improvement in health conditions and quality of life, particularly among patients that depend on this treatment modality [13].

Differences in wear on component surfaces, and in the resistance to insertion and removal of the prostheses after repetitive cycles, may also be associated with the use

of various materials in the fixation system, such as metal-metal or metal-polymer [8]. The development of capsules with variable retention capacity, exploiting the full extent of the mechanical properties of each material, represents a viable solution.

Polytetrafluoroethylene (Teflon®) is a polymeric material that is not commonly used in dentistry, generally applied to build materials, household and computer equipment. In Dentistry is applied to guide tissue regeneration, matrices, instrument coating and filling of the access channel to over-implant prosthesis screws [14]. However, as overdenture retention capsule, its application is inedited. The Teflon® is a physiologically inert material, acids and solvents resistant, such as hygiene chemical solutions, presents anti-adherent properties and low coefficient of static and kinetic friction, that allows the reduction of cell adhesion and of the microorganisms [14-16]. This material was evaluated in vitro as for retention force and deformation, presenting satisfactory results as fixation system for overdenture [16].

Prosthesis retention may be one of the most important requirements to be achieved during treatment of the edentulous patient, due to its substantial effect on function and quality of life. Thus, this case report describes the replacement of a conventional maxillary total prostheses by a fixed prosthesis, and the creation of a new mandibular overdenture using a Teflon® polymer capsule fixation system (patent BR102016028989) [16], aiming to satisfy the patient regarding improvement in retention and stability of both prostheses.

## **CASE REPORT**

A 84 years old male patient with good systemic health conditions, searched the School of Dentistry of Ribeirão Preto, University of São Paulo with complaint lack of retention and stability of maxillary total prosthesis and mandibular overdenture. Clinical and radiographic examinations revealed the presence of two inferior implants in the region of the teeth 33 and 43, with

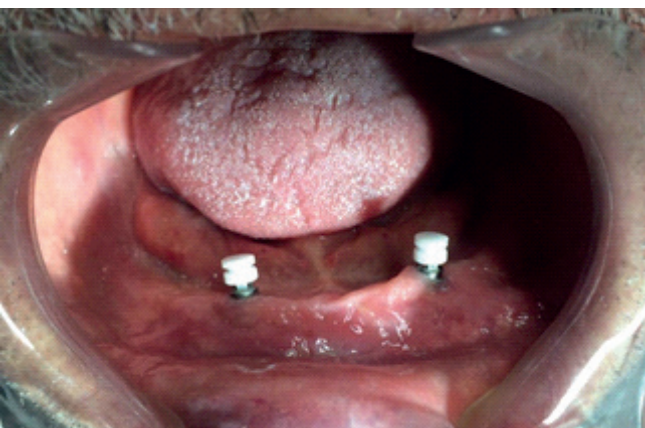
severe reabsorption of the maxillary border, as well as an inadequate intermaxillary relation between the prostheses, O-ring wear, and unfavorable aesthetics. We noted no other pertinent features of his medical history.

To manage the patient's complaints, we proposed a plan for installation of four implants in the upper arch in the region of teeth 12, 14, 22 and 24, to support the fixed prosthesis, and simultaneously create a new overdenture with a conventional O-ring system.

After installation of the new prostheses, the patient returned to the clinic complaining of lack of retention of the inferior overdenture. Clinical examination revealed O-ring wear, instability of the prosthesis, and difficulty with insertion. Then was suggested to replace the conventional capsule with O-ring with an alternative model, made of polymeric material, Teflon®, with dimensions of Ø 4 x 3 mm.



**Figure 1.** Overdenture prepared for capture of capsules.

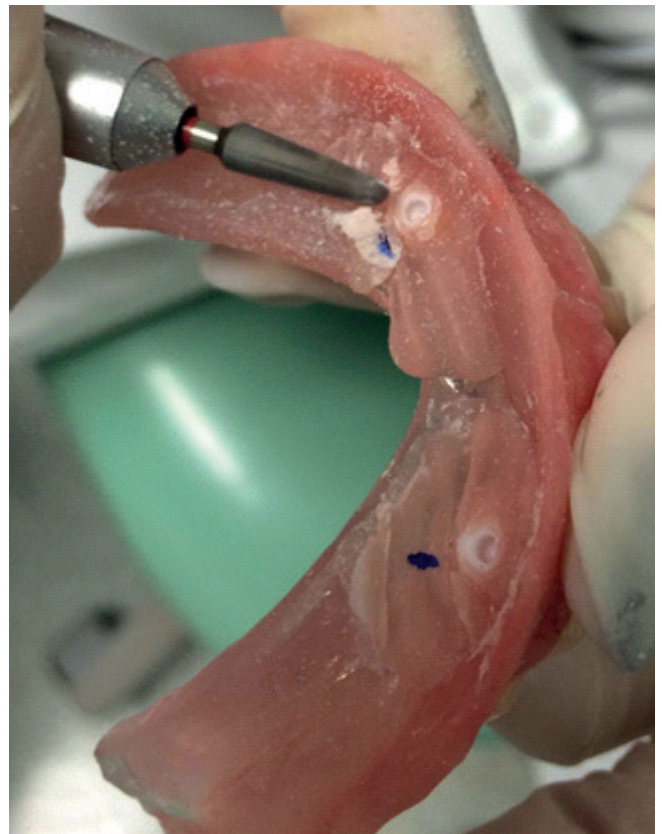


**Figure 2.** Teflon capsules positioned on the implant ball attachments.

The conventional capsules were removed with a frusto-conical cutter (figure 1) and the Teflon® capsules (Fig. 2 and 3) were fixed with autopolymerizable acrylic resin (Clássico, Campo Limpo Paulista, SP, Brazil). After polymerization was performed the finished, polished (Fig. 4), and installed the prostheses (Fig. 5). Soft tissues



**Figure 3.** Teflon capsules captured.



**Figure 4.** Finishing and polishing after capture of capsules.

conditions, mandibular overdenture adaptation and retention showed satisfactory results clinically analyzed and reported by the patient during the 6-months follow up.



**Figure 5.** Installed overdenture prostheses.

## DISCUSSION

Conventional total prostheses have long been considered standard treatment for restoring the stomatognathic system of fully edentulous patients. However, the presence of severe bone resorption, especially of the mandible, generates a series of inconveniences, including lack of retention and stability, difficulty masticatory, and speech and psychosocial problems [4,11,17].

Among the modalities for implant-supported prostheses, mandibular overdentures have been widely used, since they require a reduced number of implants compared with fixed prostheses, which makes it possible to be indicated in cases of bone resorption, as they are less expensive and are easily hygiene, especially by geriatric patients with limited manual dexterity [4,17].

The most commonly associated prosthetic complication (33%) with the use of overdentures [8,12,18] is wear of the fixation components, due to functional loads, the insertion/removal path of the prosthesis, implant angulation, or the presence of parafunctional habits<sup>7</sup>, generating the need for periodic maintenance [12,19,20]. Thus, for longevity of restorative treatments, biomechanical principles must be respected in order to guarantee maximum effectiveness of the materials used.

Dental restoration procedures are constantly developing. One reason for this is the more effective use

of newer materials with better handling and application properties. As a result, several techniques have been described to assist clinicians in obtaining predictable restorative dental procedures [14,21]. Thus, detailed planning involving medical, surgical and prosthetic knowledge is of great importance in order for new materials and technologies to be effective. In the present case, after diagnosis and planning, a fixed prosthesis for the maxillary arch and a mandibular overdenture replacement were indicated, due to the persistent lack of retention and stability associated with the commercial O-ring component, which was both clinically verified and reported by the patient.

Synthetic biomaterials have significant advantages. Among them are high chemical resistance, which minimizes the degradation caused by the use of hygienic solutions, and low cellular adhesion [15]. Although the use of metallic accessories with the O-ring for overdenture retention is established in the literature, the characteristics of synthetic biomaterials justify its use for the production of prosthetic components.

Considering that the degree of retention and stability of the overdenture is based, among other factors, on the type and design of the attachment, it was decided in this case report by the use of an alternative model for the connection of the inferior overdenture, using a polymeric material, Teflon®, in an attempt to provide greater patient satisfaction.

Polytetrafluoroethylene (PTFE) is a physiologically inert polymer widely used in industry and in many medical fields, such as mesh for hernia surgeries and vascular grafts [22-24]. Studies have reported the use of this material in dentistry as a way to reduce bacterial adhesion. This is a desirable property for prosthetic components, as they are directly related to the development of biofilms that provide pathways for colonization and invasion of pathogens into bony tissue [15,25].

The supra or subgingival location of the prosthetic components seems to have a significant influence on the formation of biofilm, so the choice of material in component manufacture must be strategic, to inhibit bacterial colonization. Titanium (Ti) and zirconium oxide (ZrO<sub>2</sub>) are the most used in the manufacture of components, however, no antimicrobial coating is known for such surfaces [25].

In clinical experience, a favorable acrylic resin/Teflon capsule union has been reported. The proposed retention system contributed decisively to the retention

and stabilization of the overdenture, resulting in patient satisfaction and improved self-esteem.

## CONCLUSION

The retention and stability of overdentures are important factors for the success of the treatment. These can be obtained with the use of polymeric components, as reported in the present study. The fixation system used showed good results at follow-up.

## Collaborators

MLC VALENTE, participated in the design of the study, performed clinical procedures on the patient, drafted and critically reviewed the article. DT CASTRO, performed clinical procedures on the patient, drafted and critically reviewed the article. FL BUENO, performed clinical procedures on the patient, and critically reviewed the article. ABV TEIXEIRA, performed clinical procedures on the patient, drafted and critically reviewed the article. GG SILVA, participated in the design of the study, performed clinical procedures on the patient, drafted and critically reviewed the article. AC REIS, participated in the conception and design of the study, performed clinical procedures on the patient, drafted and critically reviewed the article. All authors read and approved the final version of the manuscript.

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