Root-retained overdentures as the first choice in the rehabilitation of partially edentulous patients: case report

Sobredentadura sobre raízes como primeira escolha na reabilitação de pacientes parcialmente edêntulos: relato de caso

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ABSTRACT
This case report aimed to describe the oral rehabilitation after the loss of multiple dental elements due to chronic periodontal involvement, with complaints of aesthetics, and loss of masticatory function. The patient, CRT, to 55 years old, presented, in maxillary, dental elements 13 and 23, horizontal bone loss and 1/3 of the roots' bone insertion. In the lower arch, the dental elements presents were 45, 44, 31, 32, 33, 34, and 35. Among these, the teeth 44, 33, 34, and 35 showing no loss of protective and support tissue, while teeth 45, 31, and 32 had more than half of the lost support bone and dental extrusion. Therefore, a complete upper denture and an overdenture were made with additional retention utilizing spherical retainers (o'ringing) installed in the dental roots. The treatment involved a multidisciplinary approach with indication the support periodontal, endodontic, oral and maxillofacial surgery, and prosthesis. Despite the lack of support tissue, the patient reported excellent retention and stability of new dentures. Mandibular overdenture with additional retention on roots provide greater retention to the complete dentures, returning aesthetics, function, and comfort to the patient, and should be considered as the first rehabilitation option in several clinical cases, especially when there are clinical, individual, and socioeconomic conditions related to patients who cannot install osseointegrated implants.
Keywords: overdentures, dental root, retention.

RESUMO
O presente relato de caso teve como objetivo descrever a reabilitação oral depois da perda de múltiplos elementos dentais por envolvimento periodontal crônico, com queixas de estética e perda de função mastigatória. O paciente, CRT, 55 anos, apresentava, na maxila, os elementos dentais 13 e 23, ambos com perda óssea horizontal e 1/3 da inserção óssea das raízes. Na arcada inferior, os elementos dentais presentes eram o 45, 44, 31, 32, 33, 34 e 35. Dentre estes, os dentes 44, 33, 34 e 35 apresentavam-se sem perda de tecido protetor e de suporte, enquanto os dentes 45, 31 e 32 tiveram mais da metade do osso de suporte perdido e extrusão dentária. Portanto, uma prótese total superior e uma sobredentadura foram confeccionadas com retenção adicional utilizando retentores esféricos (o'rings) instalados nas raízes dentárias. O tratamento envolveu uma abordagem multidisciplinar com indicação de suporte periodontal, endodôntico, cirurgia bucomaxilofacial e prótese. O paciente relatou excelente retenção e estabilidade das novas próteses, apesar da falta de tecido de suporte. A sobredentadura mandibular com retenção adicional nas raízes proporcionam maior retenção à prótese total, devolvendo estética, função e conforto ao paciente, devendo ser consideradas como a primeira opção de reabilitação em diversas condições clínicas, principalmente quando existem condições clínicas, individuais e socioeconômicas relacionadas aos pacientes que não podem instalar implantes ossointegrais.

Palavras-chave: sobredentaduras, raiz dentária, retenção.

1 INTRODUCTION
A complete denture for the rehabilitation of the stomatognathic system of complete edentulous patients is an alternative widely used to restore masticatory function, phonation, and aesthetics (REGIS et al., 2013). However, retention and stability are compromised significantly in elderly patients with high bone loss of the alveolar process (CARLSSON, 2014). For completely edentulous patients with favorable systemic and bone condition, rehabilitation can be performed using mucus-supported and implant-retained prostheses, which are retained by two osseointegrated implants positioned in the region corresponding to the canines (FEINE et al., 2002). This model of oral rehabilitation provides better stability and retention, increases masticatory efficiency, and decreases the process of bone resorption of the patient's alveolar ridge (de SOUZA et al., 2015), in addition to the ease of cleaning because it is a removable prosthesis (SALLES et al., 2021). Without installing implants, the complete dentures can have the minimum of retention and stability, even if well made (FEINE et al., 2002; de SOUZA et al., 2015). However, not all patients can undergo surgical procedures for implant installation due to...
systemic or psychological conditions or fear of the surgical procedure (ASSUNÇÃO et al., 2007; RIBEIRO et al., 2015).

In cases of individuals with several compromised teeth requiring multiple extractions, conventional techniques recommend the manufacture of an immediate complete denture to extractions, whether used for a transition period or as a definitive rehabilitation alternative (CARLSSON, 2014). These are well indicated for patients who, for social reasons or vanity, do not want to remain edentulous during the edges’ healing period after extractions. The advantages of immediate prostheses include making a natural prosthesis since it is possible to rely on the shape and color of the patient's natural teeth to choose artificial teeth, the functions of chewing and phonation are not lost, protection of the surgical wound exercised by the prosthesis and consequent reduction in postoperative pain (TURANO and TURANO, 2010). However, at that time, one must evaluate with more attention the option of maintaining dental abutments, and not be an automatic decision for quick and immediate resolution, once that maintained dental abutments the ridge is preserved (CARLSSON, 2014).

Denture’s 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 (VALENTE et al., 2019). However, to maintain good retention, all alternatives must be carefully planned before the extraction of the dental elements, as the bone loss of the alveolar process after tooth extraction occurs with great individual variation, impossible to predict at the time of extraction. The simplest way to prevent the bone loss is to avoid extraction of all teeth. To keep a few teeth for a tooth or root-supported overdenture has been shown to substantially reduce the bone loss (CARLSSON, 2014).

In this context, overdentures retained to roots are well indicated. They can be the first choice for oral rehabilitation when to include good oral hygiene of the patient, contraindication for the installation of osseointegrated implants, the impossibility of other types of treatment for economic reasons, lack of sufficient coronary structure for rehabilitation with a fixed or partial removable prosthesis (FEINE et al., 2002). The main advantages of root overdentures are the maintenance of alveolar bone, conservation of periodontal proprioception, distribution of functional and parafunctional forces, stability, retention and support of the prosthesis, aesthetics, distribution of masticatory forces between teeth and soft tissues (MENDES and PINTO, 2004).
Thus, this case report describes the rehabilitation of an individual's stomatognathic system with immediate upper complete dentures and complete dentures retained by roots abutments.

2 CASE REPORT

A 55-year-old male patient (CRT), from the city of Monte Alto - SP, metallurgist, went to the Ribeirão Preto School of Dentistry for dental treatment. After the anamnesis was performed, the loss of multiple dental elements was verified due to the condition of chronic periodontal disease (Figure 1). The patient had already undergone previous periodontal treatments and extraction. Its current situation showed that, among the remaining teeth, few had good bone support; the disease was controlled, and the patient did not have a focus of acute infections or excessive dental calculus in the remaining elements.

Figure 1. Panoramic radiography of the patient, before the beginning of the treatment described (1-A). Periapical radiographs after endodontic treatments of the pillar elements (1 B-D).
The presence of elements 13 and 23 was verified through clinical examination, both with horizontal bone loss and 1/3 of bone root insertion. In the lower arch, the patient had the elements 45, 44, 31, 32, 33, 34 and 35. Teeth 44, 33, 34 and 35 did not have a loss of protective and support tissue, while 45, 31 and 32 had more than half of the lost support bone and tooth extrusion.

After the clinical and radiographic examination, due to bone loss, difficulty in maintaining periodontal health by the patient and due to his desire, it was planned to make an immediate upper complete denture and a upper complete denture retained to root, keeping the elements 44, 33, 34 and 35, with o-ring retention system on teeth 33 and 44. Teeth 34 and 35 were maintained to preserve the alveolar bone and the patient's proprioception.

Thus, the treatment plan was organized, integrating endodontics, prosthesis and surgery, and it was planned to carry out the treatment in 17 clinical sessions. Initially, in the first 4 sessions, endodontic treatments were performed on the teeth that would be maintained in the oral cavity (44, 33, 34 and 35), following the pulpectomy and canal filling protocols in a single session (Figure 1 B, C, and D).

Then, in the 5th session, the prosthetic phase started. The initial impression was made with prefabricated trays, S4 and I4, and alginate (Jeltrate, Dentsply, Pirassununga, São Paulo, Brazil) (Figure 2).

Figure 2. Maxillary and mandibular initial impressions.

From the obtained molds type III stone plaster models (Asfer, São Caetano do Sul, São Paulo, Brazil) on which the individual self-curing acrylic resin trays (Jet, Classic, Campo Limpo Paulista, São Paulo, Brazil) were obtained, which were open, both for the
upper and the lower arch, for subsequent performance of functional impressions (Figure 3).

Figure 3. Individual molds and Upper (3-A) and lower (3-B) functional impressions.

For the functional impressions, performed in the 6th session, a two-phase technique was used, being peripheral sealing with stick Godiva (Godiva Exata, Nova
DFL, Taquara, Rio de Janeiro, Brazil) and molding of the support surface with a zinc-enolic paste (Lysanda, São Paulo, São Paulo, Brazil) on the toothless support surface and heavy condensation silicone (Perfil, Coltene, Rio de Janeiro, Rio de Janeiro, Brazil) for molding the teeth, where the tray was opened. Once the functional molds were obtained, they were disinfected with 1% sodium hypochlorite (Clorocin, Cinord Sudeste, Serrana, São Paulo, Brazil) for 10 minutes, and their edges were protected with useful wax (embedding) and the models were obtained after pouring in with type III plaster. After setting the plaster and obtaining the functional models, the upper and lower registration bases, with respective wax wheels, were obtained.

In the 7th clinical session, for the assembly of the upper model in a semi-adjustable articulator (ASA), the occlusal plane was defined based on the Camper Plane (Figure 16) and transferred to the ASA through the facial arch (Figure 4).

Figure 4. Functional models and their registration bases with wax rollers, top and bottom, respectively. Definition of the occlusal plane based on the Camper Plan, and registration with the facial arch.

In the 8th session, the vertical dimension of occlusion (OVD) was determined, and for that, metric, phonetic and aesthetic tests were used. Then, the centric relationship was recorded using the physiological method (Figure 5).
Figure 5. Maxillary and mandibular models with registration in centric relation. Front view of the articulated models (5 A, B); and seen from the right side and left, respectively (5C-F).

Artificial teeth were selected according to the height of the forced smile and distance between the canine lines, for size; face shape, for the shape of the teeth; skin color, hair and eyes, for the color of the teeth. Then, the artificial teeth were assembled in the patient’s anodontic spaces (Figure 6), on the upper and lower registration bases.

Figure 6. Assembly of artificial teeth only in anodontia spaces (6A-C). Proof of partial assembly of artificial teeth and aesthetic approval by the patient (6D).
The patient's mouth was esthetically tested for approval and confirmation of the correct assembly in the articulator, in the 9th session. Then, the models were prepared, where the crowns of teeth 13, 23, 31, 32 and 45 were entirely removed since these teeth would be extracted, while in the crowns of teeth 33, 34, 35 and 44 were removed preparations were made simulating the cutting of clinical crowns (Figure 7). After the plaster models were worn to predict the post-extraction edges, all teeth were assembled on the acrylic base, and the prostheses were finalized. The complete dentures were made according to conventional methods, with inclusion in the muffle.

Figure 7. Wear on the plaster model of the dental elements to be extracted (7A, B). Assembly of all teeth (7 C-E).

The clinical sessions for installing the prostheses were separated into two, as they are immediate complete denture. They include the extraction of various dental elements and the installation and adjustments in the same clinical session. In the 10th session, teeth 13 and 23 were extracted, and the upper complete denture was installed (Figure 8). Adjustments were made in regions of soft tissue pressure and occlusal adjustment of elements 31 and 32, which because they were extruded, were causing premature contact in the installed upper prosthesis.
Figure 8. View of the upper arch after extractions and sutures (8 A); view of teeth 13 and 23 that have been extracted (8 B); and installation of the immediate maxillary complete denture (8 C, D).

In the 11th session, cuts and preparations of the crowns of teeth 44, 33, 34 and 35 were made; extraction of teeth 31, 32 and 45; suture removal of teeth 13 and 23. After the preparations, the opening of the root canals was sealed with temporary restorative material (glass ionomer cement). Then, the lower complete denture was installed. Adjustments were made in regions of soft tissue pressure, occlusal adjustments, and relief at the base of the prosthesis, in the region where the roots of teeth 44, 33, 34 and 35 were located (Figure 9).
In the 12th session, the sutures were removed, and intraradicular moldings were made to make the retainers pin. It was necessary to remove filling endodontic material from elements 33, 34, 35 and 44. In teeth 33 and 44, approximately 8 mm of filling material were removed, while 34 and 35, approximately 6 mm were removed. The intraradicular retainers of these elements were intended to protect the remaining tooth structure (cementum and dentin). After removing the filling material, intraradicular moldings of the teeth were made with prefabricated acrylic pins (Pinjet, Angelus, Londrina, Paraná, Brazil) and DuraLay self-curing acrylic resin (Reliance Dental Manufacturing, Chicago, Illinois, United States of America) (Figure 10 A). The molded cores were cast in Ni-Cr (Figure 10 B) together with the male part of the socket (supra-root ball) for teeth 33 and 44, while for teeth 34 and 35, only the metal cores cast together with the coronary protection, without plug-in balls.

After the casting of the intraradicular retainers, in the 13th session, they were tested, adjusted and cemented (Figure 10 C). The test and the adjustments of the retainers were made using liquid carbon (Kota, Cotia, SP, Brazil) and periapical radiographs. Then, the pieces were cemented with self-adhesive resin cement (Rely-X U200, 3M, Sumaré, São Paulo, Brazil) in color A2. In the 14th session, the retainers' female components were captured at the base of the denture part (Figure 10 D). A relief was made at the denture base in the region of the teeth retainers 33 and 44; the female component was fitted over the male component. The self-curing acrylic resin was inserted at the denture base and placed in the oral cavity position. After polymerization of the acrylic resin denture, the female components remained at the denture base. The excess material was removed, and the base of the part was polished. Three more clinical sessions were held exclusively for the denture' physiological adjustment, where occlusal and prosthetic bases adjustments
were made. Once the denture's adaptation to the rim was verified, and the patient was without complaint and satisfied with the treatment performed, the treatment was ended (Figure 10 E, F).

Figure 10. View of the intraradicular moldings of the teeth (10 A, B). Root caps were cemented (10 C). After the clinical session of capturing the retainers' female components, the base of the lower denture was adjusted and installed (10 D). Image before and after the clinical case (10 E, F).

3 DISCUSSION

After tooth extraction, the alveolar process is reduced due to bone loss, with significant individual variation, which is impossible to predict at the time of extraction (Fig. 1). For many patients, this can lead to severe problems with the retention of conventional dentures (CARLSSON, 2014).

Conventional complete denture has long been amply considered a treatment for restoring fully edentulous patients' stomatognathic systems. 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 (VALENTE et al., 2019). It is essential to concern that most edentulous subjects will have to continue relying on complete dentures due to systemic or psychological conditions or fear of the surgical procedure or the low-income population to consider implant installation (ASSUNÇÃO et al., 2007; RIBEIRO et al., 2015). In this situation, the bone loss phenomenon can be consideration continually (CARLSSON, 2014).

To avoid this condition, the simplest is, of course, to prevent extraction of all teeth. Keeping a few teeth and using them or their roots for a tooth or root supported overdenture has been shown to reduce the bone loss in the mandible substantially. There are many advantages of root or tooth-supported overdentures over complete dentures, such as
improved denture stability and retention (MERCOURIADIS-HOWALD et al., 2018; BERGER et al., 2020). There are relatively few studies on tooth and root supported overdentures. Still, those available have demonstrated a wide range of survival rates, from very good to relatively low results, and a great need for prosthetic maintenance (MERCOURIADIS-HOWALD et al., 2018; BERGER et al., 2020). Nevertheless, tooth or root supported overdentures are a therapeutic option that deserves more attention because of its apparent advantages compared to conventional complete dentures (CARLSSON, 2014; BERGER et al., 2020; KRALJEVIC et al., 2020).

The overdenture retained to roots or teeth could be the first choice the modalities of rehabilitation in future complete edentulous, and better used in mainly when the socio-economic situation of the edentulous people not favorable; one must consider this segment of the population, oftentimes, is poor, as a consequence, cannot afford implant treatment; (CARLSSON and OMAR, 2010; CARLSSON, 2014), and in most the countries, the rehabilitation overdenture to roots is included in service offered on public system health (CARLSSON and OMAR, 2010).

Although this type of rehabilitation may require greater professional skill, more sessions, and a higher cost due to the needed multidisciplinarity, it can be a treatment that can better preserve the alveolar ridge, promote better chewing function and quality of life for less favored, when comparing with a complete denture (MERCOURIADIS-HOWALD et al., 2018; BERGER et al., 2020). Besides, it will has a direct bearing on the assessment of global health for edentulous patients conditions in future.

4 CONCLUSIONS

Based on the case report, the following conclusions were drawn:

Conventional complete dentures are an alternative widely used in rehabilitating the stomatognathic system of toothless patients. However, it can present retention problems in patients with significantly resorbed alveolar rims. Considering pillar teeth for overdentures can be a first-choice alternative for health promotion that population.

Complete dentures made with additional retention on roots provide greater retention, aesthetics, function, and comfort to the patient compared to conventional complete dentures.
REFERENCES


