

## A Root-Supported Overdenture: An Approach to Preventive Prosthodontics

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### Abstract

### Case Report

The use of residual teeth to support an attachment-retained overdenture is an alternative therapy to extractions and complete removable denture, particularly for the mandibular arch. Overdenture offers several advantages, including maintenance of the alveolar ridge and proprioception. Retention and stability are also enhanced by means of attachment systems, which improves chewing efficiency and better psychological integration of the prosthesis. This article describes, through a clinical case, the fabrication and interest of a tooth-supported overdenture using two axial attachments.

**Keywords:** Tooth-supported overdenture, Metal coping, attachment.

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## INTRODUCTION

In the presence of extensive edentulism, or when the remaining teeth are few or poorly distributed, the balance of a removable prosthesis can be difficult to find, especially in subjects with highly resorbed ridges.

Many patients who present themselves as a candidate for complete denture usually have few remaining natural teeth. By applying the basic principles of "preventive prosthodontics", [1] it is possible to achieve a satisfactory biomechanical balance and better psychological integration of prostheses by using of the subprosthetic root [2]. This procedure is called "overdenture therapy" [1].

Overdenture is any removable dental prosthesis that covers and rests on one or more remaining natural teeth, the roots of natural teeth and/or dental implants (GPT-8) [3].

Root-supported overdentures are an alternative to extractions and complete dentures. They can be retained with attachments that are resistant to denture displacement and improve denture retention and stability. Roots exploitation also preserves the alveolar ridge, reduces bone loss and increases both proprioception and masticatory performance [4]. As a result, patient comfort and confidence are increased.

In the sub-root removable prosthesis, stability is provided by the total removable prosthesis, the roots are

used as an additional means of retention, the prosthesis is therefore mainly based on bone and fibro mucosa tissues and the retention is improved by the system of attachments connected to the root pillars.

This principle requires the fabrication of a prosthesis that complies with the conventional rules of complete removable dentures, but also the selection of a resilient attachment system that allows vertical translation and/or distal rotation to take into account the difference in tissue depressibility that exists between the edentulous crest, the fibrous mucosa and the root [5].

Many attachment systems are commercially available for retaining overdentures, including bar and clip, ball and O-ring, ERA, and magnet attachments. The selection of the most appropriate system depends on the number, spacing, and location of the remaining natural teeth. Among these attachments, the Ball Attachment system is considered an appropriate, resilient mechanical attachment [6].

This case report describes a tooth-supported overdenture with two axial attachments with male parts (balls) integral with the overroot clevises, and the female parts embedded in the resin of the prosthesis to stabilize the mandibular prostheses.

## CASE REPORT

A 60-year-old male patient in good health presents for oral rehabilitation with a functional request.

Clinical examination revealed class II mod 2 edentulism in the maxilla and subtotal edentulism in the mandible.

The remaining teeth in the mandible are the canines (33,43), which are well implanted in the bone with healthy periodontal support, and the second premolar in malposition with mobility grade 2. A panoramic radiograph supplemented with an intraoral periapical radiograph showed adequate bone support in relation to 33, 43 with a report: radiological crown/radiological root less than 1 (RC/RR< 1) (Fig. 1, 2).



**Fig. 1: Initial clinical situation**



**Fig. 2: Panoramic radiograph**

#### Therapeutic Proposal:

After hygiene motivation and extraction of the 45, and in response to the patient's desire to regain efficient mastication, four solutions were proposed for the restoration of the mandibular arch:

- Realize a removable partial denture with two clasps on the canines. Over time, compaction of the prosthetic bases on the supporting surfaces will compromise esthetics because the canines will exceed the occlusal plane. In addition, there will be an apical displacement of the clasps under the area of the larger contour of the canines, compromising the retention of the removable partial denture.
- Extraction of the remaining teeth followed by conventional complete denture.
- Extraction followed by implant-supported overdenture.
- Tooth-supported overdenture.

Since the patient preferred not to have his teeth extracted and due to lack of financial means, we decided to preserve the canines and fabricate a tooth-supported overdenture for the lower arch and a removable partial denture for the upper arch.

The solution is to make two axial attachments with male parts (balls) integral to the overroot clevises at 33 and 43, and the female parts embedded in the resin of the prosthesis.

#### Prosthetic Achievement:

Prosthetic construction begins after endodontic treatment of canines during the preprosthetic step. The crown and root are then prepared: the crown is first cut to about 2 mm from the gingival level. The occlusal preparation of the root presents a plateau that follows the profile of the gingival margin. The cervical margin of the preparation is a juxta-gingival peripheral chamfer with slight convergence of the walls. The housing for the cylindrical-conical post, which is prepared at two-thirds of the root height; must maintain an apical seal of at least 3 to 5 millimeters (Fig. 3).



**Fig. 3: Preparation of roots**

A complete impression of the preparations and the supporting surfaces was made with individual trays (made on models from the primary impression) and a medium-viscosity polysulfur (Fig. 4).



**Fig. 4: Impression of preparations and surfaces of bone and mucosa**

After this step, two occlusion models are fabricated on the working models developed after the treatment of the impression, allowing the registration of the jaw relationship in centric relation and corrected vertical dimension of the occlusion.

Later, a tooth mounting on wax is made. After the clinical, esthetic and functional tests and validation of the mounting wax, a key was made with a putty elastomeric to take the reference of the ideal profiles of the prosthetic extrados and anterior teeth. This key allows visualization of the prosthetic space available to incorporate the assembly of the complementary retention system without interfering with the ideal profile and lingual anterior teeth (Fig. 5, 6).



**Fig. 5: Tooth mounting**



**Fig. 6: Vestibular key in high viscosity elastomer**

In the laboratory, root-tenon copings are modeled in wax. The male parts of the attachments (calcinable preforms) are fixed to the coping model along the insertion axis using special instruments mounted on a surveyor (Fig. 7, 8).



**Fig. 7: Fixation of the male parts of the axial attachments on wax models of the root post copings**



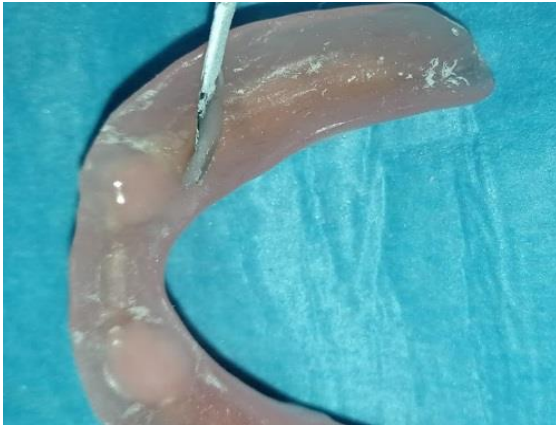
**Fig. 8: Spacing control between the axial attachments and the mandibular tooth profile**

After casting, the metal copings with attachments are validated on the model using silicone keys and then in the mouth.

The resin of the prosthesis is cured, the copings with attachments are cemented on the roots of the teeth and the removable prosthesis is placed in the mouth. During this step, the intrados of the mandibular prosthesis is recessed in front of the attachments. The occlusion is checked and balanced (Fig. 9, 10).



**Fig. 9: Clinical trying and sealing of the male parts of the attachments**



**Fig. 10: Auto-polymerizing resin placed in the housings prepared for the female parts**

The spacers are in place and the female parts of the attachments (retaining sheaths in metal housings) are integrated into the prosthetic intrados using chemical curing resin under occlusal pressure (Fig. 11).



**Fig. 11: The female parts of the attachments are incorporated into the prosthetic intrados**

## DISCUSSION

The root-supported overdenture is considered a preventive therapy because it prevents complete edentulism and preserves the last remaining tooth and its supporting structures.

Patients with complete removable dentures often report problems with oral function, typically caused by compromised retention and stability of the mandibular prosthesis. In fact, the reduced support surface, the rapid resorption of the alveolar ridge, the presence of the tongue and the difficulty in obtaining a fine salivary meniscus are all factors that make it difficult to achieve retention in the mandible [2].

Utilization of residual tooth roots preserves alveolar bone and reduces bone resorption over time. Crum *et al.*, proved that the use of roots to support a complete mandibular prosthesis preserved bone levels 8 times better than the simple placement of a conventional removable prosthesis [7].

By preserving the submerged root for the overdenture, desmodontal proprioception is maintained. Receptors in the periodontium receive a variety of stimuli that allow precise neuromuscular control of mastication. In 1978, Rissin *et al.*, compared the masticatory performance of patients with natural dentition, complete dentures, and overdentures. They found that the overdenture patients had one-third higher chewing efficiency than the complete denture patients [8].

In addition, Preparing the tooth by removing coronary part till gingival level provides a more favorable lever system. This solution reduces stress on the residual teeth with compromised periodontal and improves their prognosis [9].

Prosthetic stability is increased through sustentation provided by root topography and maintenance of alveolar bone. Retention is optimized by using various attachment systems depending on the requirements of the clinical case.

In this case, we used an axial ball attachment, which allows to compensate the divergence of the root axes of the canines. Furthermore, the ball attachment is considered the simplest for clinical application, less bulky and requires less vertical prosthetic space than the bar attachment, and easy maintenance of oral hygiene.

The female part, in this case, is embedded in the resin of the denture intrados using the direct technique because it is simpler and requires fewer steps than the indirect technique.

Overdenture also has psychological advantages resulting from the dental anchorage, which allows the patient to be more confident in social life.

However, the disadvantage of root-supported dentures is the difficulty in maintaining oral hygiene.

Oral hygiene instructions must be given to the patient, clinical and radiological recall check-ups should be performed at regular intervals of 6 months or less to maintain the prosthetic, restorative and periodontal status of the patient at an acceptable level, which in turn leads to the success of overdenture therapy [10].

## CONCLUSION

The mandibular tooth-supported overdenture is one of the best alternative treatment modalities for an edentulous patient, providing functional, aesthetic and psychological comfort.

This treatment option requires a complete diagnosis and a rigorous clinical methodology to select the most appropriate retention systems for the clinical situation.

Maintenance of prosthetic and oral hygiene is critical to the success of rehabilitation.

Clinical controls are necessary to readjust the prosthesis in case of bone resorption, to reactivate the retentive elements in case of loss of retention, and finally to monitor and prevent any complications of the prosthesis.

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