

Root-Retained Overdentures: Pushing the Boundaries of Clinical Practice “Four Clinical Case Reports”

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Abstract While the popularity of implant-retained overdentures has recently increased, root-retained overdentures have been predominantly disregarded. This case series presents four challenging cases restored successfully by attachment-retained complete and partial overdenture prostheses; employing an innovative intra-radicular attachment that could overcome the most common complications faced with the outdated versions. After diagnostic assessments, the OT reverse 3 attachment (OT reverse 3 overdenture post for roots, Rhein 83, Bologna, Italy) was selected fundamentally on the basis of the extremely reduced restorative space, dentures were simply constructed and fitted chairside. Patients expressed satisfaction with their prostheses regarding retention, stability, esthetics, functionality, and ease of insertion and removal; immediately after delivery and during the three-month follow-up. The attachment's small size was found to fit perfectly the reduced space without denture over-contouring or encroachment on occlusion, and the attachment's elastic functionality reduced the troubles faced due to the advanced ridge resorption and root's divergence; through reducing stress transmission to abutments during the inevitable denture movements and during insertion and removal.

Keywords: *Intraradicular precision attachments, tooth-supported overdenture, OT reverse 3 attachment, restorative space, root preparation.*

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1. Introduction

Overdenture supported on natural teeth is an established preventive prosthodontic measure that diminishes bone resorption. Natural teeth support improves; masticatory efficiency, psychological well-being, directional sensitivity, and oral stereognosis. [1,2] Attachment-retained overdentures have added advantages of facilitating prosthesis retention and stability, they can salvage weak teeth, enhance the status of their periodontium, and enable their positive sharing in maintaining physiologic occlusion. compared to implant treatment, they are relatively more cost-effective, conservative, and preservative for the patient's own biological resources. [3,4,5] There are diverse attachments promoted by the manufacturers, and proper selection depends upon several factors. [6] However, in some cases, the available vertical restorative space could be the principal consideration for selection, wherein the use of Intra-radicular attachments should be counted. [4,7] Despite the trendiness of implant attachment systems, tooth-retained attachments are not diffusely used, particularly the Intraradicular type. Thus, this case series aimed to describe the prosthetic treatment of four patients

with removable prostheses using a novel intra-radicular attachment, furthermore, the importance of meticulous attachment selection was emphasized. Clinical procedures for the patients' rehabilitation have been briefly presented.

2. Case reports

2.1. Case 1

A 53-year-old female patient presented to the clinic complaining of poor appearance and function with her previous prosthesis. She expressed a strong desire to keep her remaining teeth and to have a well-retained, esthetic maxillary denture. patient's history didn't signify to have an impact on future dental treatments. Intraoral examination revealed the presence of endodontically treated; grade II mobile and decayed central incisors, grade I mobile and heavily restored canines, and sound firmly-retained second molars, in the maxilla against a partially edentulous mandibular arch. Radiographic examination revealed agreeable bone support along roots (greater than 2/3 of roots invested in bone), reasonable crown-root ratio, and proper root canal treatment.

Following periodontal, and restorative treatments of the remaining teeth\ roots, the preliminary impressions were

made, occlusion blocks were fabricated to take a tentative centric record at the approximate vertical dimension, and diagnostic casts were mounted. Examination of articulated models revealed the unfavorable proclination of the canines and the limited vertical space (four mm), this would hinder the achievement of proper occlusion and esthetics if canines were incorporated into the prosthesis design as an anchor for an extra-radicular attachment. After thorough assessments, the patient was presented with various options, each was explained in terms of procedures, cost, and time. The patient consented to the fabrication of an attachment-retained removable partial-overdenture RPOD in the maxilla wherein attachments were to be placed on canines, against a mandibular acrylic partial denture.

The anterior abutments were de-coronated and the roots were reduced as low as possible to a nicely rounded dome. For the canines' troublesome labial inclination and divergence, the OT reverse 3 attachment was our choice. (Figure.1a) Peeso-Reamers were used to prepare the post-space to the calibrated length of the attachment's post by removing gutta-percha leaving one-fourth of the material, and the root canal orifice was prepared using the supplied sizing bur (OT 3 reverse diamond-shaped bur for roots, Rhein 83, Bologna, Italy). (Figure.1b) Using the supplied manual tools, the attachment female posts were carried into the corresponding root preparations, (Figure.1c) after radiographic verification of full adaptation of the posts into the prepared roots, they were cemented with resin cement. (Figure.1d)

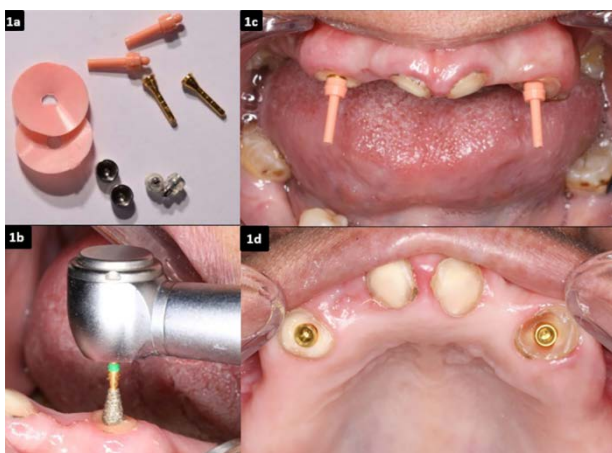


Figure 1. Attachment components (a) and installation steps (b, c, &d)

Regarding the posterior molars; guiding planes and occlusal rest seats were prepared at their mesial aspects to harmonize with the selected path of insertion. The stem of the attachment manual tool was cut to be used as transfer abutments during final impression-making. The maxillary master cast was poured, modified, and duplicated into a refractory cast to build up the wax pattern of the RPOD framework, which was then cast into cobalt chromium following the conventional lost wax technique. The framework was designed to have open windows around the transfer abutment locations to later permit direct chairside pickup of the attachment prosthetic components. Two Aker clasps were designed on the second molars to obtain retention at the posterior quadrants, this assisted the attachment's retention in the anterior quadrants, thus a widely distributed quadrilateral retention was achieved. (Figure 2a) After a

satisfactory framework try-in, the subsequent procedures were similar to conventional partial denture fabrication and processing. (Figure 2b) Eventually, to incorporate the attachment's retentive males into the processed denture base; each matrix was seated in place intraorally into the corresponding female post, (Figure 2c) and the fitting surface of the processed denture was further relieved to ensure passive seating over them, the chairside pick-up was done using auto-polymerizing resin (Dura-Liner II, Dental Mfg Co., Keliance), the resin was prevented from root contact, and locking into undercuts by using the attachment's rubber spacers. Before delivery, the occlusal discrepancies were corrected. (Figure 2d)

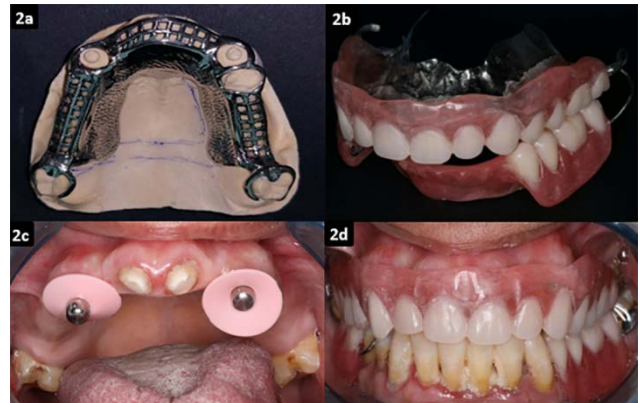


Figure 2. Partial overdenture fabrication and insertion in sequence

2.2. Case 2

A 49-year-old female patient presented to the clinic complaining of incompetent masticatory function and disturbed esthetics. She had never worn a denture before and she didn't report any relevant medical history. Clinical examination revealed a few endodontically treated nonmobile teeth; the mandibular right side first premolar, the maxillary left side canine, and the right side first and second premolars. Maxillary and mandibular ridges were in class I relationship, and the maxillary ridge exhibited deep labial undercut. Radiographic findings revealed agreeable bone support along the roots and a reasonable crown-root ratio.



Figure 3. Dentures fitting (a&b), pre & post denture insertion (c&d)

After proper assessments, the possible treatments were presented to the patient. The patient desired to have a

retentive and esthetic restoration with minimal cost and without extraction of her precious remaining teeth, so we came up with a treatment plan to fabricate upper and lower overdentures; an attachment-retained maxillary overdenture with open-face labial flange to guard against excessive labial fullness, employing in this; the OT reverse 3 attachment to compensate for the extremely reduced space and the asymmetric bilateral root positions and inclinations, and an attachment-retained mandibular overdenture to enhance the poor retention, employing the low-profile OT equator pivot attachment (OT equator titanium-tin coated pivots, Rhein 83, Bologna, Italy) that was selected to provide soft retention and elastic function for the lower denture by using its specialized self-aligning housing system (Smart Box, Rhein 83, Bologna, Italy). After root preparations and attachment cementation, border molded impressions were obtained, and dentures were fabricated as usual. The attachment retentive components were incorporated into the dentures by direct chair-side pickup. (Figure 3a-d) Dentures were delivered to the patient following occlusal equilibrations.

2.3. Case 3

A 23-year-old female patient presented to the clinic,



Figure 4. Preoperative, intraoperative, and post-operative clinical photographs

2.4. Case 4

A 48-year-old male patient presented to the clinic, suffering from disturbed speech and mastication. Intraoral examination revealed; loss of entire natural dentition except for two mandibular canines, and well-formed maxillary and mandibular ridges in class I relationship. Both canines exhibited overeruption and grade II mobility. Radiographic examination revealed acceptable bone support and crown root ratio. The patient requested a removable, low-cost prosthesis. Evaluation of the patient's mounted diagnostic casts revealed an extremely limited three-dimensional 3D restorative space to incorporate an attachment, (Figure 5a-d) thus, the patient was restored with a maxillary complete denture against a mandibular conventional overdenture without incorporating attachments.

During follow-up, the patient expressed great satisfaction with upper denture retention, however, he wasn't pleased with his mandibular denture which was undoubtedly less retentive, he expressed a desire to make the lower denture more retentive. Based on the reduced restorative space, the OT reverse 3 attachment was selected to improve the lower denture retention, after root preparations and attachment cementation, the retentive male components of the attachment were integrated into the denture intaglio chair-side. (Figure 6a-c).

complaining of incompetent masticatory function after multiple teeth loss. She was presented with a partially edentulous maxilla, but she had all her mandibular teeth lost except for the mandibular canines which exhibited short clinical crowns; however, they had optimum bone support and favorable crown-root ratio as was verified radiographically. Intraoral examination revealed; poor growth of the maxilla and a highly arched palate, while the mandibular ridge exhibited an advanced degree of resorption at the posterior. Medical history and investigations revealed a vitamin "D" deficiency-related bone disease, which explained the poor intraoral condition despite her young age. Following the comprehensive assessments, all possible treatments were evaluated. It was essential to exploit the remaining mandibular canines to compensate for the dreaded tissue support and retention, however, their short clinical crowns and the collapsed restorative space precluded the use of telescopic or bar-clip attachments. The OT reverse 3 attachment was thus chosen due to its small size and elastic functionality necessary in this case, to compensate for the expected excessive denture movements. After teeth preparations and attachment cementation, the maxillary acrylic RPD and the mandibular overdenture were fabricated and then fitted chairside as previously mentioned. (Figure 4a-c).

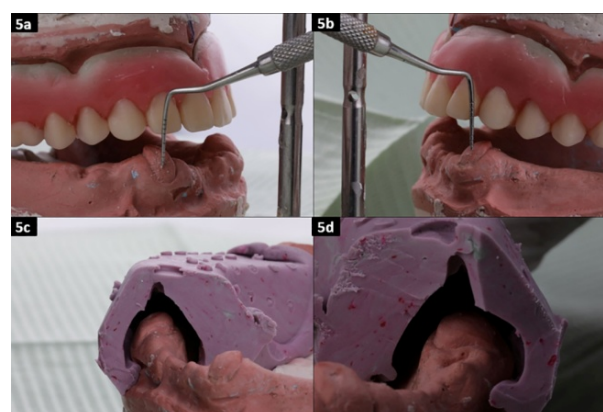


Figure 5. 3D assessment of the restorative space; vertically (a&b), labio-lingually (c&d)

All patients were given instructions on prosthesis care, hygiene maintenance, insertion, and removal in the proper path. They were given appointments for routine follow-ups (the next day, after one week, two weeks, and then every month for three months). It is worthy of reporting that all four patients expressed satisfaction with their prostheses immediately after delivery, and during follow-up, especially regarding retention, stability, and ease of insertion and removal.



Figure 6. Attachment installation (a) and denture fitting (b & c)

3. Discussion

Once upon a time, the predilection in dentistry was the use of special attachments cemented into the residual roots as an aid for retaining a complete or partial overdenture prosthesis. It was a pioneering time that we have overlooked in the present era of dental implants. In the present climate, prosthodontists are pleased with the outcome of two-implant retained overdentures, but they have forgotten that the concept of root overdentures was the basis for implant overdentures. Oftentimes, we have faced limitations in patient's acceptance of implant treatment or the poor patient's systemic conditions preclude it, in many instances, we find it a bit easier to convince patients to save teeth to stabilize their dentures, but the key to success is figuring out how to make an overdenture plus attachments as simple as possible. During the choice of an attachment, we should consider; the pattern of stress distribution from attachments through the abutments and other structures, the available restorative space, and the number, location, and individual inclination of the remaining teeth. [7] Although there may be several choices, treatment options are somewhat limited in some cases where vertical space is reduced. [8] In our cases, articulated diagnostic casts served for better three-dimensional evaluation of the restorative space. This is a crucial assessment because sufficient space must exist buccolingually and vertically for the selected attachments to be surrounded by a reasonable thickness of resin without weakening the denture base. In terms of space requirements, the intra-radicular attachments have a significant advantage in that no additional metal casting for denture reinforcement is required. [7]

Canine teeth were accepted as very crucial abutments, they are situated in a very strategic position in the dental arch and can maintain the level of the anterior resorption-prone bone. Their long, broad single-rooted nature, their exceptional alveolar bone support, and their greater periodontal surface area make them ideal teeth to sustain overdenture attachments. [9]

Periodontal mobility was not exceeding grade II when treatment commenced, and was changed after oral hygiene measures and crown reduction to no mobility. This may be attributed to the improvement in the crown-root ratio

and to the stress reduction. This interpretation was supported by; Renner et al, [5] who pointed out that using retained roots as overdenture abutments can prevent mobility in 50% of roots, and improve periodontal status in 25% of roots. Also, no abutment mobility was detected on the patient's scheduled follow-ups, this is probably due to the favorable stress transition from dentures to the periodontium through the used attachment that offers innate resiliency and stress reduction properties. [10]

In the presented cases attachment selection was made considering; the limited restorative space, the ridge resorption, the divergence, the asymmetry, and the proclination of the roots; as the elasticity of the male stud can reduce the problems related to denture insertion and loading even if a lack of parallelism exists or the patient performs a wrong insertion; the retentive male is a split stud made from titanium embedded in a soft nylon matrix, which combines both elasticity and durability, on the other hand, the female root pivot is made in titanium+TiN (titanium nitride coating) that has over 1600 Vickers hardness, this can minimize wear, bending, and fractures of the male studs, which are the most reported complications for older intra-radicular attachments versions. [7,8,10]

Besides the aforementioned the OT reverse 3 attachment offered us the following advantages; there was no positive intraoral projection to disturb the tongue, the male part did not occupy more than two mm thickness in the acrylic, did not block the proper setting of artificial teeth, and didn't encroach on denture flanges, it was adequately retentive against dislodging forces despite its reduced dimensions, it required less complex laboratory procedures and easily applied on the chair side.

Another attachment alternative here could be the magnetic attachments which are highly accepted systems due to their small dimensions, low profile, and favorable load distribution. The degree of stability with magnets can be described as retention without reciprocation and therefore they could be an attachment of choice when abutment teeth offer limited support and unpromising prognosis. However, in these cases where dentures are subjected to many horizontal dislodging forces, magnetic attachments may not administer satisfactory retention and stability. Stud attachments offer higher retentive and stabilizing forces compared to magnetic attachments. [7]

Treating edentulous patients is a relatively routine part of our daily clinical practice, so every effort should be made to preserve natural teeth. We should rebelieve in the concept of root overdentures among various prosthetic treatment options as a mainstay of preventive prosthodontics, and every prosthodontist should try to incorporate this treatment option in his armamentarium to contribute to the gradual transition from natural dentition to complete dentures. It is also necessary to investigate the continuously revolting attachment market on a regular basis, so we can expand the boundaries of clinical practice of root overdenture prostheses.

4. Summary

The appropriate selection and incorporation of overdenture attachments into our dental practice can open up another

dimension and a new era in dental treatment planning and patient satisfaction.

References

- [1] Matto, K.A., Yadav, L., and Rahman, S.U. "Immediate overdenture - a treatment option for bone preservation," *J. Med. Sci. Clin. Res.*, 3: 3879- 3882, 2015.
- [2] Singh, V., and Mattoo, K.A. "Oral Stereognosis pattern in patients with dental prosthesis in the elderly population," *Int. J. Clin. Exp. Physiol.*, 1:211- 215, 2014.
- [3] Schuch, C., de Moraes, A.P., Sarkis-Onofre, R., Pereira-Cenci, T., and Boscato, N. "An alternative method for the fabrication of a root-supported overdenture: a clinical report," *J. Prosthet. Dent.*, 109 (1): 1-4, 2013.
- [4] Mattoo, K.A., Singh, M., and Singh, S.P. "Precision retained partial denture - A proxy treatment option for full mouth rehabilitation," *Med. Res. Chron.*, 1(2): 144-149, 2014.
- [5] Renner, R.P., Gomes, B.C., Shakun, M.L., Baer, P.N., Davis, R.K., and Camp, P. "Four-year longitudinal study of the periodontal health status of overdenture patients," *J. Prosthet. Dent.*, 51(5): 593-598, 1984.
- [6] Epstein, D.D., Epstein, P.L., Cohen, B.I., and Pagnillo, M.K. "Comparison of the retentive properties of six prefabricated post-overdenture attachment systems," *J. Prosthet. Dent.*, 82: 579-584, 1999.
- [7] Preiskel, H.W. *Overdenture made easy: a guide to implant and root supported prostheses*. London: Quintessence Publishing Co Ltd, 1996.
- [8] Tuna, S.H., Kürkcüoğlu, I., and Kısacık, FÖ. "Management of a Challenging Prosthetic Case with the use of an Intraradicular Attachment: A Clinical Report," *J. Dent. & Oral. Disord.*, 1(1): 1003, 2015.
- [9] Auroy, P., and Lecerf, J. "Prosthetic restoration of the canine," *J Dentofacial Anom Ortho*, 13: 112-132, 2010.
- [10] *Attachments and pre-fabricated castable components, catalog/technical manual for dentists and dental technicians*, Rhein 83, 12th edition, 2017. Available: https://www.rhein83.com/wpcontent/uploads/2018/11/Catalogo_ENG_2017_MOD_D122_REV_12-del-13-11-2017_WEB.pdf.



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