Case Report

Prosthetic Rehabilitation with Root And Implant-Retained Maxillary Overdentures: A Clinical Report

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Abstract

Overdentures have been used as dental prostheses for many years. Compared with conventional complete dentures, overdentures can preserve a patient's roots or rely on implants for vertical support, and overdentures also have many other advantages, such as maintaining the height of the ridge while also improving retention and chewing performance. Moreover, rather than requiring the extraction of all compromised teeth, overdentures allow the roots or even previous malpositioned implants to be utilized as overdenture abutments. When used in conjunction with attachments, overdentures can also provide better retention and stability than conventional dentures.

The purposes of this clinical report are to present how full mouth rehabilitation can be implemented through the use of implants and a root as maxillary overdenture abutments and to discuss the previous literature related to the treatment described.

Key words: Dental implant, implant-retained overdenture, locator attachment, overdenture

Introduction

The full mouth rehabilitation of patients with generalized periodontitis is challenging for clinicians in terms of deciding whether or not the teeth can be preserved. If the prognosis for the remaining teeth is poor, an overdenture may be a good treatment when applied in conjunction with the extraction of the hopeless teeth and the preservation of some roots as overdenture abutments.

Alveolar bone is resorbed when teeth are extracted. The function of complete dentures is thus not as effective as that of natural teeth due to the resulting lack of occlusal support. Overdentures offer a solution by retaining natural teeth for vertical support. By the 1960s, a considerable amount of information regarding whether the concept of overdentures could provide a workable treatment had been collected. In addition, numerous textbooks have described the specific concepts and methods of overdenture therapy[1].

The purpose of this clinical report is to present how to perform prosthetic rehabilitation through the use of an overdenture in conjunction with the use of a root and two dental implants as abutments combined with

Fig. 1: A panoramic radiograph showing moderate to severe horizontal bone loss, as well as two old dental implants over the anterior maxillary area

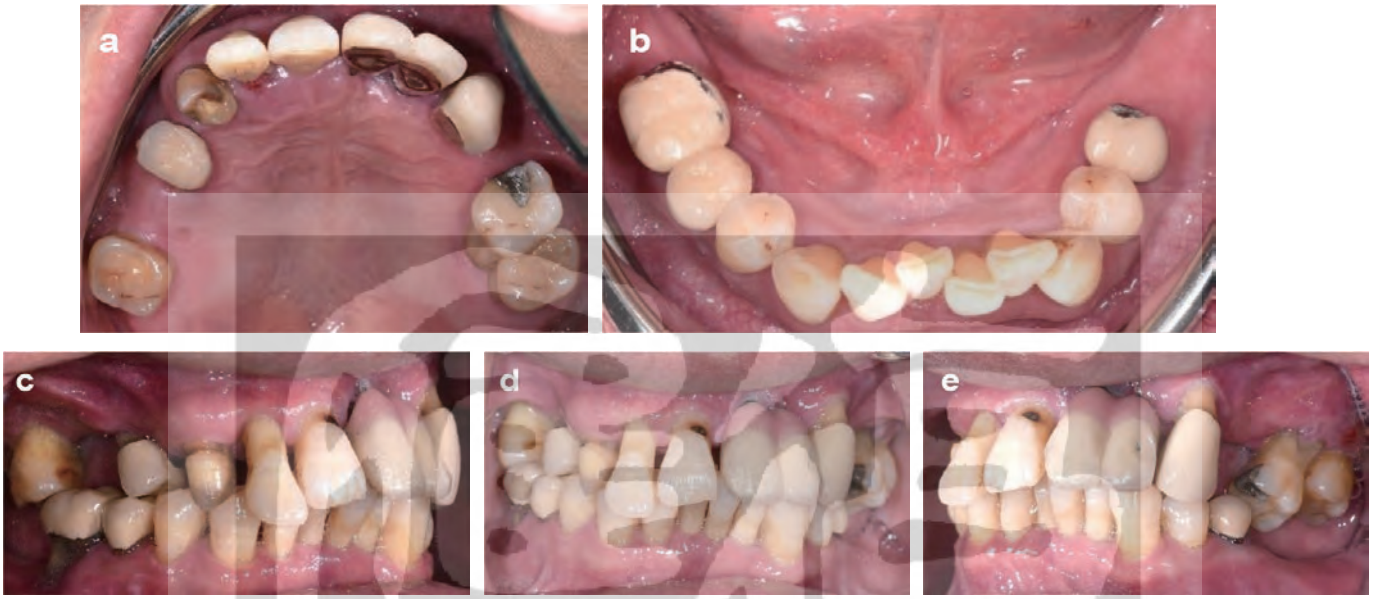

Fig. 2: (a) Occlusal view of the maxillary arch. (b) Occlusal view of the mandibular arch showing tooth crowding. (c) Right-side view revealing the prepared canine and severe bony destruction of the mandibular molar. (d) Frontal view showing greater gingival recession and flare-out of the maxillary anterior teeth. (e) Left-side view showing tilting and downgrowth of the maxillary molars.

two Locator attachments (Zest Anchors, Inc., Escondido, CA, USA).

Case report

A 57-year-old male was suffering from severe periodontitis. The patient came to the periodontal department of Taipei MacKay Memorial Hospital (Taipei, Taiwan) for help. After an initial evaluation, the patient was referred to the prosthodontic department for full mouth rehabilitation. The patient's chief complaints were an unpleasing profile and the loosening of the teeth. The patient's major systemic disease was well-controlled hypertension. The patient denied any drug allergies. An examination revealed that the patient had moderate to severe horizontal bone loss and two previous implants over the upper left central incisor and lateral incisor (Fig. 1). Gingival recession and the flaring out of the anterior teeth were also noted, as was severe bony destruction around the tilting posterior teeth (Fig. 2). Following this survey, the dental problems requiring a solution were listed as follows: ill-fitting old prostheses, unfavorable implant positions, an uneven occlusal plane, and insufficient posterior support.

The initial treatment plan was to control the inflammation, stabilize the occlusion, enhance the chewing function, and regain the esthetics. The first therapies included oral hygiene instructions, the replacement of the old prostheses with provisional crowns, the extraction of hopeless teeth, and nonsurgical periodontal treatment (Fig. 3). Then, an interim overdenture utilizing the maxillary right canine and anterior left implants as abutments for the maxillary arch and a Kennedy Class I interim denture for the mandibular arch were fabricated to reconstruct

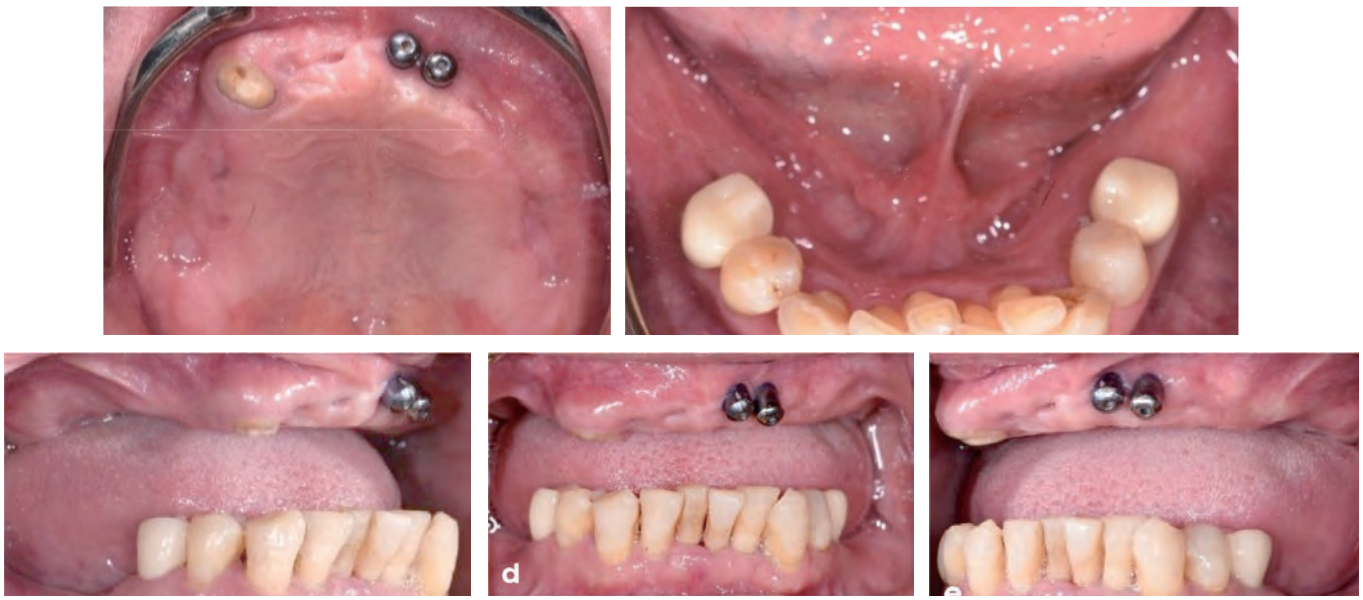

Fig. 3: After extraction, (a) Occlusal view of the maxillary arch. (b) Occlusal view of the mandibular arch. (c) Right-side view. (d) Frontal view. (e) Left-side view.

Fig. 4: Frontal and lateral views of the interim prostheses at the time of delivery. Even occlusal contacts and minimum anterior contact were designed for this case.

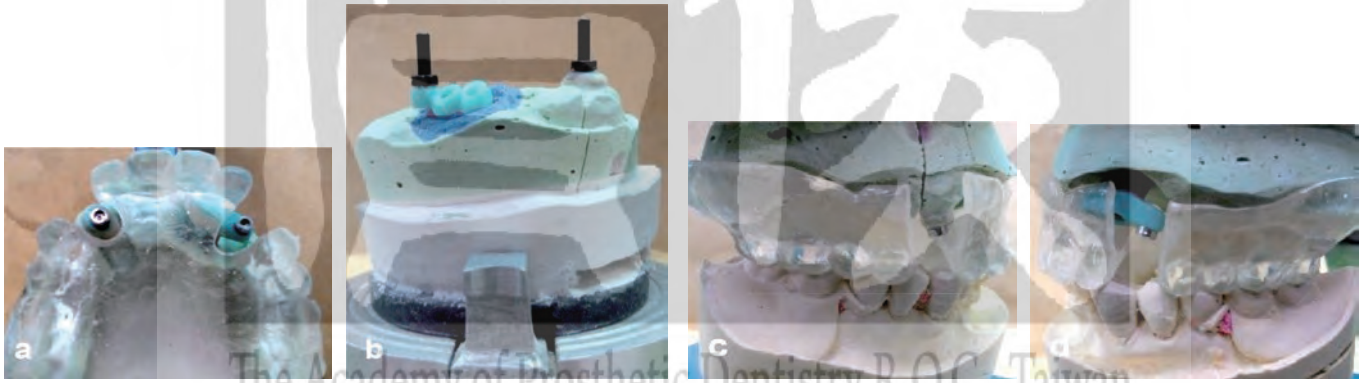

Fig. 5: Wax-up to check the Locator positions (a), parallel condition (b), and restorative space (c and d).

the function and esthetics of the patient (Fig. 4).

After 3 months of follow-up, the patient was satisfied with his chewing capacity and dental appearance. The patient's periodontal condition had become stable without any deep pockets, and the patient had also accommodated himself to the use of the removable prostheses. Hence, the definitive treatment plan was implemented. This plan included the application of Locator attachments in conjunction with the maxillary right canine and anterior left implants, an overdenture with a metal framework of the maxillary arch, surveying crowns of the mandibular left and right second premolars, and a Kennedy Class I RPD of the mandibular arch.

The design of the Locator attachments for the maxillary right canine was the root-form casting type. In order to equilibrate the angulation of the attachments, a casting bar splinting the two previous implants with the Locator attachments on the distal side was fabricated. A stent duplicated from the upper interim denture was used to check the Locator positions and restorative space. A wax-up was

Fig. 6: Delivery of root-form Locator attachment and bar in conjunction with Locator attachment

Fig. 7: Delivery of surveying crowns.

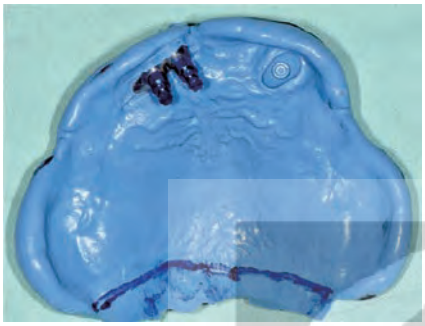

Fig. 8: Maxillary impression made through selective pressure impression.

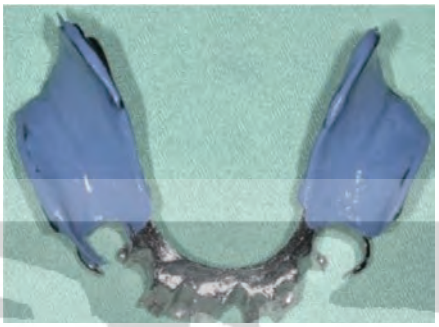

Fig. 9: Altered cast impression used for the free-end area.

Fig. 10: Frontal and lateral views of the final prostheses.

made following this use of the stent (Fig. 5). Then, the Locator attachments were cast and delivered (Fig. 6).

A final impression of the surveying crowns was taken with vinyl polysiloxane impression materials (Panasil® Putty and initial contact X-Light, Kettenbach, Germany). The wax pattern was checked with a surveyor to ensure the appropriate guiding plane and a precise undercut. Metal copings were then fabricated and tried in. The definitive restorations were set with resin cement (RelyX™ U200, 3M ESPE, America) (Fig. 7).

A final impression of the maxillary denture was taken with a custom tray and condensation-type silicone impression materials (Coltex®, COLTENE, Switzerland). The border molding method was implemented to obtain accurate border positions (Fig. 8).

A definitive impression of the Kennedy Class I RPD of the mandibular arch was made with condensation-type silicone impression materials (Coltex®, COLTENE, Switzerland) after surveying, designing, and teeth preparation. In order to make the teeth and the soft tissue support of the denture base as compatible as possible, the altered cast impression technique was executed (Fig. 9).

The occlusal scheme used in this case was bilateral balanced occlusion for the even distribution of occlusal force. The esthetics and bite record were checked with the wax denture. After processing, lab remounting was done to correct the packing error. Finally, the finished prostheses were delivered (Fig. 10).

After the patient wore the new denture for two weeks to let the soft tissue settle

Fig. 11: After the soft tissue settled down, the Locator caps with black processing were intraorally picked up and then changed to the blue male part.

Fig. 12: Instruction in the use of an inter-dental brush for maintenance of oral hygiene.

down, the Locator caps with black processing were intraorally picked up. Then, the blue Locator male retentions were inserted into the denture caps (Fig. 11). The patient was satisfied with the definitive prostheses. The denture was more stable, and the chewing efficiency was improved. A maintenance care program was then performed, including oral hygiene instructions and instructions regarding home care of the denture, especially the use of interdental brushes through the bottom of the bar (Fig. 12). After 12 months of follow-up, no major complications were noticed, and periapical radiography showed that the bone level of the implant was stable (Fig. 13, Fig. 14).

Fig. 13: Periapical radiograph taken after the delivery of the attachments.

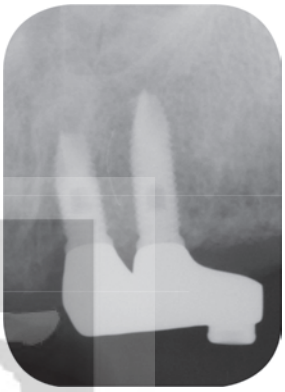

Fig. 14: After 1 year of follow-up, a periapical radiograph showing that the bone level of the implant was stable.

Discussion

Overdentures can be a better treatment option than complete dentures in some cases. As Fenton summarized, overdentures can successfully keep patients from becoming fully edentulous[1]. Through the preservation of the teeth or roots, patients can chew better, maintain their ridge heights, and have dentures that are more stable and retentive. In this case, the patient felt satisfied with the new prostheses due to the improved chewing efficiency they provided.

After the introduction of osseointegrated implants, the possibilities of treatment were notably improved[2]. In the case described above, the overdenture not only used a root but also previous dental implants as abutments. If the osseointegration of the existing implants was good, the replacement of the previous abutment with a new attachment was feasible.

When root abutments fail, it is usually due to caries and vertical root fractures, especially when the abutments are on the maxilla and the opposing teeth are natural teeth[3]. Therefore, the maintenance of oral hygiene care and fluoride application is important. Routine dental check-ups with radiography are also crucial.

Roots and implants can improve the retention and stability of overdentures through the use of attachments[4]. A variety of attachments can be qualified for use, such as ball attachments, Locator attachments, bar attachments, and even magnets[4,5]. The Locator attachment was introduced in 2001, and was selected in the case presented herein due to a number of advantages, such as the various vertical heights and types available for most implant systems and conditions[5]. In addition, a bar can also be used in conjunction with Locator attachments to correct the angulation of implants. The Locator attachment is self-aligning and has resilient dual retention[5-7]. Cakarer and colleagues[8] reported that the rate of complications associated with Locator attachments is lower than that associated with ball and bar systems. However, the use of

a bar design requires prudence due to its bulk and the associated oral hygiene problems[9]. That said, a duplicated interim denture can be used as a guide to prevent such problems. The guide can determine the space available for the bar and any attachments.

Despite having the support from the root and implants in this case, the design of the overdenture was still similar to that of a complete denture, such that the primary stress bearing areas were the hard palate and tuberosity. The primary function of the root and implants was to improve the retention through the Locator attachments. Previous studies have suggested the use of four to six implants splinted with a bar to support maxillary overdentures with palate-less designs[2,10]. Meanwhile, the principle of wide coverage with the denture base should still be obeyed in order to decrease the stress per unit[11].

Combination syndrome should be considered in this case. It is a dental condition that frequently occurs when the maxilla is fully edentulous but anterior teeth remain in the mandible[11,12]. The preservation of healthy roots and implants could prevent this condition. The other way to prevent the condition is to properly design the denture with even distribution of the posterior occlusion and light contact of the anterior teeth[12]. Nevertheless, using a root and implants simultaneously as overdenture abutments in the maxillary arch was an innovative method for prosthodontic treatment. Going forward, periodic attention and maintenance due to the necessity of renewing the retention elements and relining the denture base will be indispensable[7,11].

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