

Case Report

Clinical considerations of implant overdentures using Locator-bar attachments: A clinical report

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Running title: Clinical considerations of Locator-bar attachments for implant overdentures

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Abstract

This clinical report explores the experience of Locator-bar attachments design in a maxillary implant overdenture. While conventional complete dentures exhibit limitations in masticatory function, implant-retained overdentures, particularly those featuring attachments, have gained prominence for their enhanced stability and retention. The report delves into the clinical procedure of reconstructing a mandibular overdenture with two Locator attachments, while the primary focus lies on the utilization of Locator-bar attachments in the maxillary implant overdenture. The Locator-bar attachment, often coupled with a metal bar connecting multiple implants, has demonstrated superior retention and stability compared to conventional Locator attachments.

The discussion underscores the broader landscape of implant overdenture attachments, comparing unsplinted and splinted types. Recent studies advocate for the combination of Locator attachments with computer-aided design and computer-aided manufacturing (CAD/CAM) milling bars, creating a Locator-bar attachment. The CAD/CAM milling bar offers accurate parallel path insertion, ensuring a precise fit. Moreover, it provides a cost-effective alternative to traditional casting methods.

Complications and maintenance considerations are also addressed, with Locator-bar attachments exhibiting less marginal bone resorption than their Locator implant counterparts. However, challenges in oral hygiene maintenance, particularly plaque and calculus deposition, are noted for splinted attachments. The report emphasizes the significance of routine prosthetic maintenance, highlighting the advantage of Locator-bar attachments in facilitating quicker retention device replacements with a lower likelihood of bar re-fabrication.

Key words: implant overdenture, Locator attachment, Locator-bar attachment

Introduction

Although conventional complete dentures remain a common treatment for edentulous patients, their limited efficacy in providing sufficient masticatory function often results in suboptimal treatment satisfaction. As progressive ridge resorption diminishes retention and stability over time, conventional dentures can lead to discomfort, pain, and a decline in overall oral function.¹ In the past decade, implant-retained overdentures have become the preferred choice for reconstructing masticatory function in both fully and partially edentulous patients.² The superiority of implant overdentures lies in their enhanced stability and retention, which address the shortcomings of conventional dentures and significantly improve masticatory function.³ Recent reports consistently highlight the high success rates of single implants, which contribute to the overall effectiveness and stability of implant overdentures.⁴

To further augment the retention and stability of implant overdentures, various attachments, including bar-clip splinted attachments and individual attachments such as the Locator and magnet attachments, have been employed. Among these options, the Locator attachment stands out due to its versatility, reduced need for restoration space,⁵ lower costs, self-alignment for implant angulation correction, ease of component replacement, and compatibility between different implant manufacturers.

The applications of Locator attachments vary, ranging from a single Locator attachment directly connecting to a single implant to the Locator-bar attachment designed for multiple implants. The Locator-bar attachment, often coupled with a metal bar connecting more than four implants, significantly enhances retention and stability.⁶ Notably, the simple thread formation of the Locator-bar attachment eliminates the need to re-fabricate a bar in cases where the metal female component loses retention due to abrasion. Compared to the Locator attachment, the Locator-bar attachment shows less marginal bone loss and requires less maintenance.

This clinical report details the treatment of a completely edentulous patient at the Department of Prosthodontics, Taipei Veterans General Hospital. While the mandibular overdenture was reconstructed using two Locator attachments, the focus of this report is the clinical procedure employing the Locator-bar attachment in the maxillary implant overdenture.

Case report

A 67-year-old male sought assistance for his maxillary hybrid denture and mandibular conventional complete denture after the private dental clinic he attended suddenly closed. The patient reported issues with a broken mandibular denture and persistent discomfort around the maxillary implants, particularly the posteriormost implant on the right side (Fig. 1). Upon examination, the existing maxillary prosthesis, a four-implant-retained hybrid denture, showed various misfits at each implant connection. Clinically, severe bone resorption on the buccal surface of the maxillary first premolar implant was observed, accompanied by deep probing depths and pus discharge (Fig. 2A–C). Simultaneously, the patient's existing mandibular prosthesis, a conventional complete denture, had catastrophically fractured across the anterior area, breaking in half.

The initial reconstruction involved fabricating a maxillary duplicate denture and a mandibular conventional interim denture (Fig. 3). Subsequent surgical preparations were carried out by the periodontists after the settling of upper and lower interim dentures. Bilateral mandibular canine implants (Biomet 3i, Palm Beach Gardens, FL, USA) were inserted at the same appointment. During the healing period of the lower arch, the previous maxillary first premolar implant was removed and then a new implant (Nobel Biocare, Kloten, Switzerland) was inserted after one and a half years (Fig. 4).

Both interim dentures underwent multiple adjustments during the healing period. Following implant osseointegration, two Locator attachments (Zest Anchors, Escondido, CA, USA) for the mandibular canine implants were delivered first.



Figure 1.
Intraoral view of prior maxillary hybrid denture and fractured mandibular conventional complete denture.

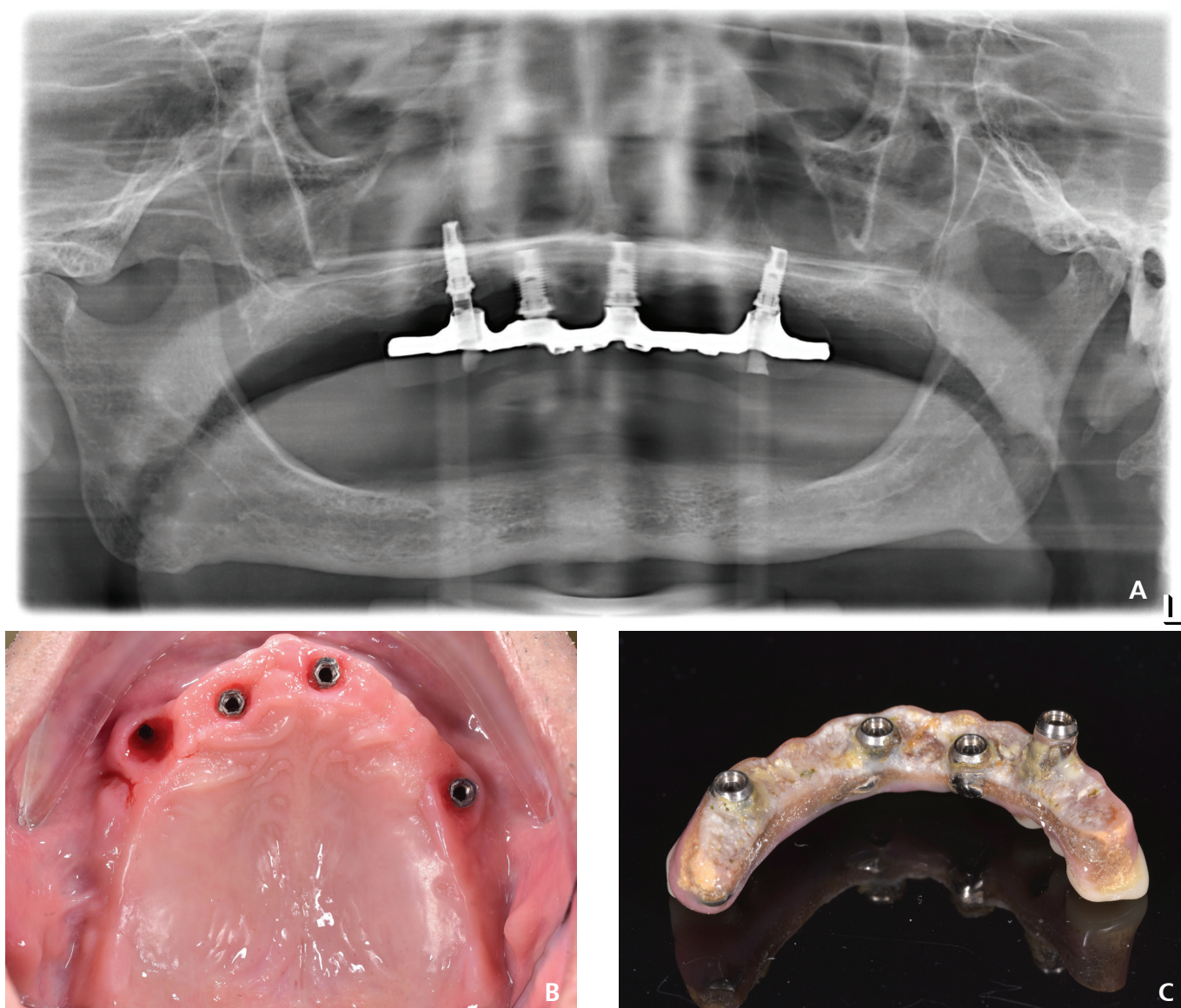


Figure 2. Clinical inspection of the maxillary arch.
(A) Panoramic film revealing various misfits on each implant.
(B) Severe gingival swelling observed around the maxillary right first premolar implant.
(C) Plaque and calculus deposition on the tissue surface of the maxillary hybrid denture.



Figure 3. Preliminary reconstruction with interim dentures.



Figure 4. Intraoral view during the healing period after a new maxillary first premolar implant insertion.

The maxillary prosthetic procedures were more complex due to the splinting bar design. The closed tray impression technique was performed first with four separate impression copings. The open tray impression technique was next applied to maximize the accuracy of the definitive cast. Then, a verification jig, which mimicked the design of the definitive bar attachment, was fabricated from aluminum using the computer-aided design and computer-aided manufacturing (CAD/CAM) system. The one-screw test was performed chair-side with the verification jig to verify any misfit made during the laboratory steps (Fig. 5). As the accuracy of the definitive cast and the design of the attachment were confirmed, the definitive maxillary bar attachment was milled with two prefabricated blind threaded holes. Then, the maxillary Locator-bar attachment (Zest Anchors, Escondido, CA, USA) was installed in the mouth after the two Locator attachments were fixed into the threaded holes (Fig. 6A–C). The remaining steps of the procedure for fabricating definitive dentures followed the traditional denture fabrication process (Figs. 7 and 8).

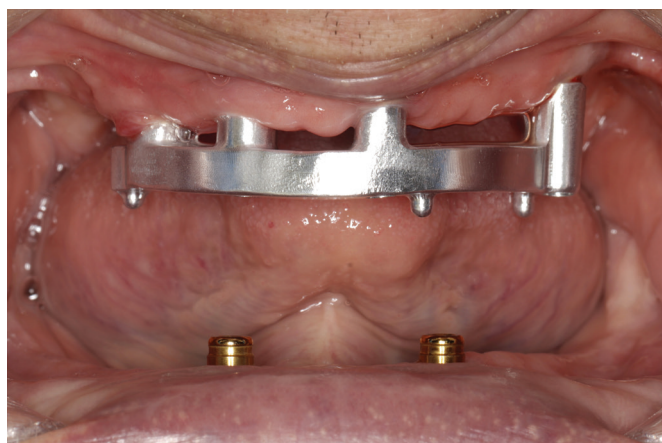


Figure 5. Intraoral view of maxillary verification jig, made of aluminum, used to verify the accuracy of the master model and the attachment design.



Figure 7. Intraoral view of the esthetic try-in.

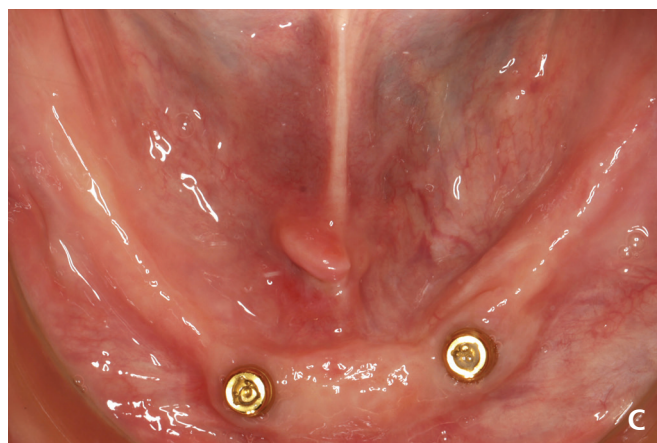
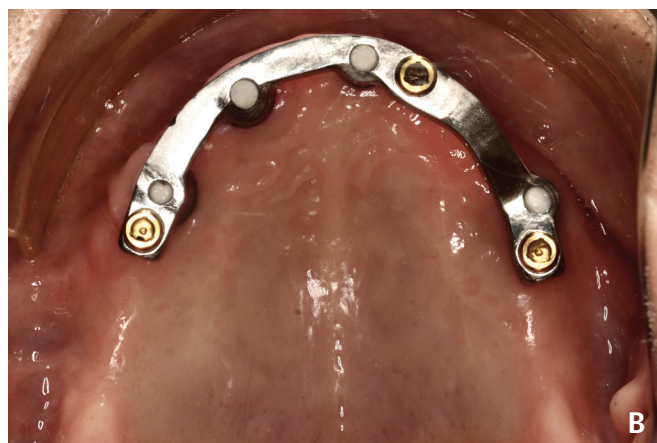


Figure 6.
 (A) Intraoral view of implant attachments.
 (B) The maxillary Locator-bar attachment used four implants that were splinted with a milling bar.
 (C) The mandibular Locator implant attachments utilized two implants.

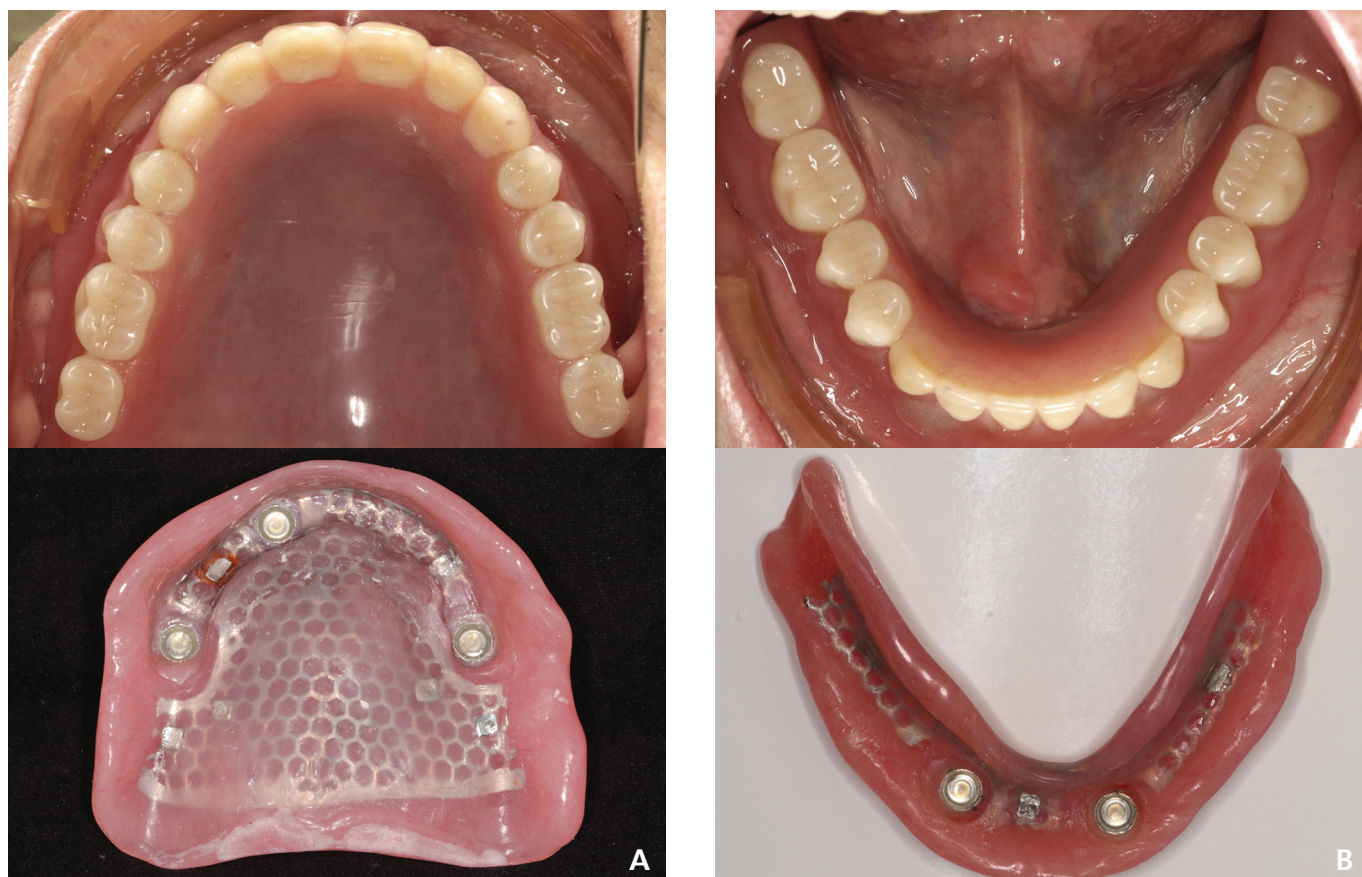


Figure 8. Delivery of the definitive prostheses.
(A) The maxillary implant overdenture.
(B) The mandibular implant overdenture.

Discussion

In contemporary dentistry, implant overdentures have emerged as the preferred choice over conventional complete dentures for edentulous patients. They offer not only improved masticatory function,⁷ but also enhanced retention and stability,⁸ and are particularly beneficial for individuals with compromised posterior bone quality or limited treatment budgets. The various attachments for implant overdentures can be broadly categorized as either splinted or unsplinted types.⁹

The unsplinted type, also known as a solitary attachment, can be installed with limited restoration space.⁵ These attachments boast advantages such as lower cost, self-alignment for implant angulation, easy maintenance, and simple replacement.¹⁰ However, they are weaker in horizontal stability than the splinted type of attachments, necessitating more frequent maintenance.¹¹ Conversely, in the splinted type attachments, or bar attachments, lateral stress is distributed through multiple implant insertions and rigid bar connections; consequently, these attachments offer superior retention and cross-

arch stabilization but require more restoration space, typically at least 13–14 mm.¹²

Recent studies have explored the combination of Locator attachments and CAD/CAM milling bars, which creates a Locator-bar attachment. The CAD/CAM milling bar's key benefit is its accurate parallel path of insertion, which ensures precise adaptation to the denture base and reduces wear or retention loss due to excessive friction. While the fabrication of a precise casting bar involves a complex and technique-sensitive procedure, the CAD/CAM milling bar serves as a cost-effective alternative that easily achieves a passive connection fit without the complexities associated with casting. Moreover, a low-cost milling verification jig can be employed to confirm the master model's accuracy before manufacturing the definitive bar, thereby minimizing the risk of repeated fabrication or soldering.

In the case of complications, a clinical study has shown less marginal bone resorption with splinting with Locator-bar attachments compared to separate Locator implant attachments.⁶ This may

be attributed to the rigid bar connection between implants, which effectively disperses stress. Conversely, maintenance of oral hygiene of splinted attachments, particularly Locator-bar attachments, poses greater challenges, with higher plaque and calculus deposition, compared to unsplinted attachments. Some studies have observed a higher number of lost implants with maxillary implant overdentures with four splinted implants than with dentures with separate implants.¹³ However, a systematic review found no statistically significant difference in short-term survival rates of implants or overdentures between splinted and unsplinted implants.¹³ Nonetheless, a 10-year follow-up study suggests a potential negative impact on long-term survival rates.¹⁴

Prosthesis maintenance is a noteworthy consideration for all types of implant overdenture attachments that require routine care post-insertion. Notably, Locator attachments often require replacement of the retention device, while the Locator-bar attachments have the advantage of quicker replacement and lower likelihood of refabrication of the bar.

In this clinical case, the patient expressed high satisfaction with the masticatory function, retention, and esthetics of the new implant overdentures following a four-month post-insertion period. Further observation is warranted, particularly of the maxillary Locator-bar attachment, to assess the long-term treatment outcomes.

References

1. Redford M, Drury TF, Kingman A, Brown LJ. Denture use and the technical quality of dental prostheses among persons 18-74 years of age: United States, 1988-1991. *J Dent Res*. 1996;75:714-25.
2. Thomason JM, Kelly SA, Bendkowski A, Ellis JS. Two implant retained overdentures—a review of the literature supporting the McGill and York consensus statements. *J Dent*. 2012;40:22-34.
3. Awad MA, Lund JP, Shapiro SH, et al. Oral health status and treatment satisfaction with mandibular implant overdentures and conventional dentures: a randomized clinical trial in a senior population. *Int J Prosthodont*. 2003;16:390-6.
4. Batenburg RH, Meijer HJ, Raghoobar GM, Vissink A. Treatment concept for mandibular overdentures supported by endosseous implants: a literature review. *Int J Oral Maxillofac Implants*. 1998;13:539-45.
5. Lee CK, Agar JR. Surgical and prosthetic planning for a two-implant-retained mandibular overdenture: a clinical report. *J Prosthet Dent*. 2006;95:102-5.
6. Seo YH, Bae EB, Kim JW, et al. Clinical evaluation of mandibular implant overdentures via Locator implant attachment and Locator bar attachment. *J Adv Prosthodont*. 2016;8:313-20.
7. Cardoso RG, Melo LA, Barbosa GA, et al. Impact of mandibular conventional denture and overdenture on quality of life and masticatory efficiency. *Braz Oral Res*. 2016;30:e102.
8. Martínez-Lage-Azorín JF, Segura-Andrés G, Faus-López J, Agustín-Panadero R. Rehabilitation with implant-supported overdentures in total edentulous patients: A review. *J Clin Exp Dent*. 2013;5:267-72.
9. Trakas T, Michalakis K, Kang K, Hirayama H. Attachment systems for implant retained overdentures: a literature review. *Implant Dent*. 2006;15:24-34.
10. Walton JN, MacEntee MI, Glick N. One-year prosthetic outcomes with implant overdentures: a randomized clinical trial. *Int J Oral Maxillofac Implants*. 2002;17:391-8.
11. Prasad S, Faverani LP, Santiago Junior JF, Sukotjo C, Yuan JC. Attachment systems for mandibular implant-supported overdentures: A systematic review and meta-analysis of randomized controlled trials. *J Prosthet Dent*. 2022. Available at: [https://www.thejpd.org/article/S0022-3913\(22\)00485-1/fulltext](https://www.thejpd.org/article/S0022-3913(22)00485-1/fulltext)
12. Sadowsky SJ. Treatment considerations for maxillary implant overdentures: a systematic review. *J Prosthet Dent*. 2007;97:340-8.
13. Di Francesco F, De Marco G, Sommella A, Lanza A. Splinting vs Not Splinting Four Implants Supporting a Maxillary Overdenture: A Systematic Review. *Int J Prosthodont*. 2019;32:509-18.
14. Ferrigno N, Laureti M, Fanali S, Grippaudo G. A long-term follow-up study of non-submerged ITI implants in the treatment of totally edentulous jaws. Part I: Ten-year life table analysis of a prospective multicenter study with 1286 implants. *Clin Oral Implants Res*. 2002;13:260-73.