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Methods

Tooth-Implant-Supported Mandibular Overdenture with Locator® Attachments. Case Report.

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Abstract

Tooth-implant-supported removable dentures represent a controversial treatment modality because of the biomechanical differences between natural teeth and osseointegrated implants. This case report describes the prosthetic rehabilitation of an 85-year-old patient with Kennedy Class I mandibular edentulism using a tooth-implant-supported mandibular overdenture retained by two Locator® attachments over dental implants and one ball attachment over a natural mandibular canine.

Two dental implants were placed in the anterior mandible and restored with Locator® attachments, while the remaining mandibular right canine was prepared and restored with a custom cement-retained ball attachment. A mandibular acrylic overdenture was fabricated and retained using both implant- and tooth-supported attachments.

Clinical and radiographic follow-up evaluations performed at 12 and 24 months demonstrated stable peri-implant and periodontal conditions without detectable bone loss or signs of inflammation. The patient reported high satisfaction regarding denture retention, stability, function, and esthetics, and no mechanical complications were observed during the follow-up period.

Within the limitations of this case report, the combined use of Locator® and ball attachments for a tooth-implant-supported mandibular overdenture demonstrated favorable short-term clinical outcomes and high patient satisfaction. Nevertheless, further long-term clinical studies are required to validate the predictability and long-term success of this treatment approach.

Keywords

overdenture, ball attachment, dental implants, splint

Introduction

Despite progress in contemporary preventive dentistry and the introduction of various innovations, a large portion of the adult population still suffers from partial or complete tooth loss [1]. Prosthetic treatment can restore chewing function, phonetics, and esthetics, thereby improving oral health, which in turn significantly influences social integration and quality of life. Removable dentures remain a primary treatment method, but their main disadvantage continues to be the reduced retention and stability during function [2].

Tooth-implant supported mandibular overdenture combines the stability of implants with the flexibility of removable dentures, offering enhanced support, retention, and patient comfort. The objective of this case report is to present a unique approach using both Locator®

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attachments and O-ring attachments with different types of abutments – implants and teeth to optimize denture stability and functionality.

Case Presentation

Patient Information

An 85-year-old male presented to our clinic with subtotal edentulism of the mandible (Kennedy Class I) and partial edentulism of the maxilla, which had previously been rehabilitated with removable partial dentures. The maxillary arch also exhibited a Kennedy Class II configuration. The patient reported poor retention, instability, and discomfort associated with the mandibular removable partial denture used to manage the subtotal edentulism.

Extraoral examination revealed no pathological findings. Intraoral examination demonstrated healthy oral mucosa without signs of inflammation or other abnormalities.

Cone-beam computed tomography (CBCT) analysis revealed sufficient bone volume and density in the anterior mandible to allow implant placement (**Fig. 1**).

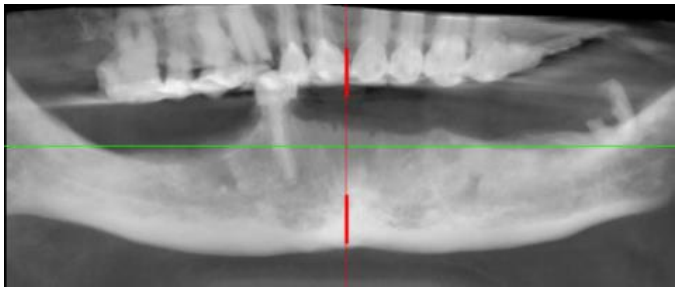

Figure 1. Panoramic CBCT view before implant placement.

The patient was diagnosed with subtotal mandibular edentulism and inadequate support and retention for a conventional removable partial denture.

The proposed treatment plan included placement of two dental implants in the regions of teeth 31 and 33, restored with Locator® attachments. The remaining mandibular right canine was planned for preparation and restoration with a cement-retained O-ring (ball) attachment. A mandibular acrylic overdenture supported by the two implants and the natural tooth was planned as the definitive prosthetic rehabilitation.

Treatment Procedure

First visit: Two Neodent GM Morse implants (Ø 3.5 mm × 8 mm) were placed in the mandibular regions of missing teeth 31 and 33 under local anesthesia. Osteotomies were prepared following the manufacturer's standard drilling protocol for dense (Type I-II) bone. Both implants achieved high primary stability, with insertion torque values of 40 Ncm. Locator® attachments with a gingival height of 4.5 mm were immediately inserted (Fig. 2). The surgical sites were sutured, and postoperative instructions were given.

Figure 2. Panoramic radiograph after implant placement and before preparation of the tooth.

Second visit: After a healing period of two months, the clinical crown of the mandibular right canine was trimmed to the gingival level. A post space was prepared to accommodate a ball attachment. An impression of the prepared canal was taken using A-silicone impression material and was sent to the dental laboratory for fabrication of a custom cement-retained ball abutment (pinlay type) (**Fig. 3**).

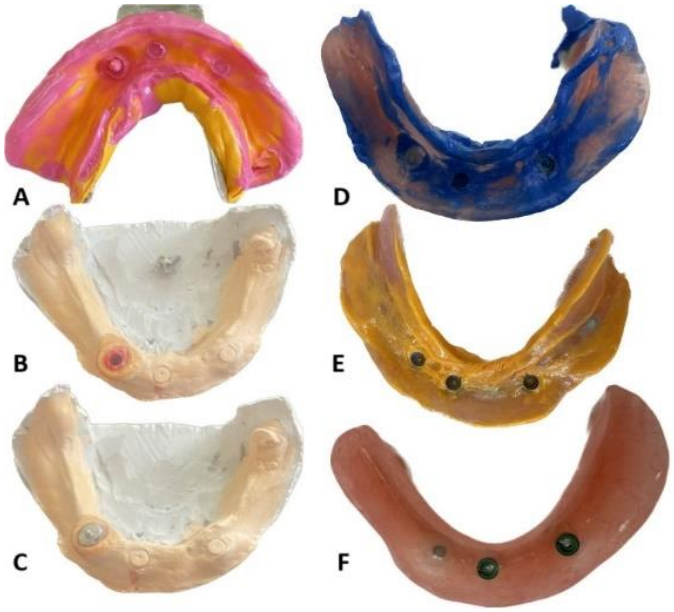

Figure 3. A. Impression with A-silicone material is taken from the prosthetic field with inserted retention in the tooth canal; **B.** and **C.** Gypsum models are casted and the O-ring attachment is monolithically connected to the pinlay; **D.** and **E.** impressions taken before and after insertion the retention over the O-ring; **F.** All retentive elements are in place.

Third visit: The fabricated ball attachment was cemented onto the prepared canine. Subsequently, open-tray impressions were made to record the implant positions using transfer copings and A-silicone impression material. The impressions were sent to the dental laboratory for fabrication of base plates with wax rims to record the occlusal vertical dimension (OVD).

Fourth visit: OVD was recorded using the method described by Kim et al. [3]. Defining the shade of artificial teeth and base of the denture followed.

Fifth visit: The alignment of the artificial teeth was checked, followed by instructions to the dental laboratory

for fabrication of the mandibular acrylic overdenture. In addition, tooth 38 was extracted during this visit.

Sixth visit: The definitive overdenture was clinically evaluated for fit, retention, and occlusal relationships. Chairside pickup of the attachment housings was performed intraorally using self-polymerizing acrylic resin to secure the prosthesis to both implants and the tooth-supported attachment. Oral hygiene instructions and maintenance guidelines were provided to the patient.

Follow-up 1: At the short-term follow-up (5 days after sixth visit), two minor sore spots were identified in the vestibular region adjacent to the implants and the tooth. Selective relief of the acrylic base was performed to eliminate the sore spots.

Follow-up 2: At 12 months, radiographic evaluation using panoramic x-ray imaging demonstrated stable peri-implant bone levels without signs of marginal bone loss. Intraoral examination revealed healthy peri-implant tissues and periodontal structures, with no signs of inflammation. The patient reported high satisfaction regarding retention, stability, and esthetics. There were no signs of mechanical complications with the denture (**Fig. 4 and 5**).

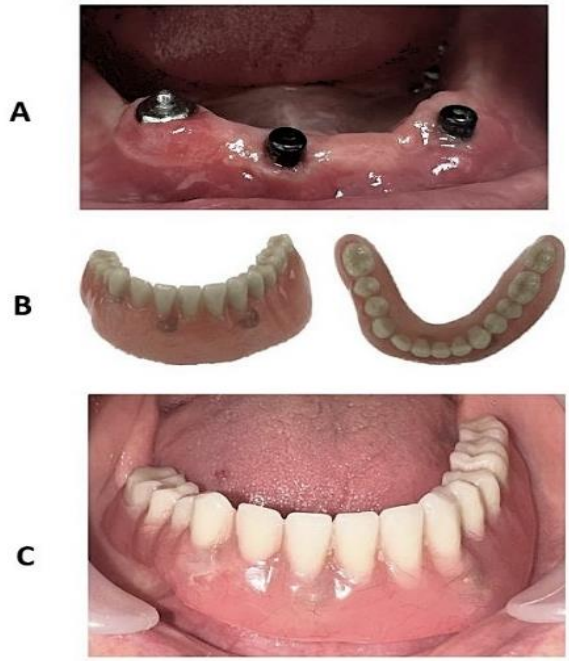

Figure 4. A. Intraoral view of the prosthetic field after 12 months; B. Extraoral view of the denture; C. Intraoral view of the dentures inserted over the implants and the tooth after 12 months

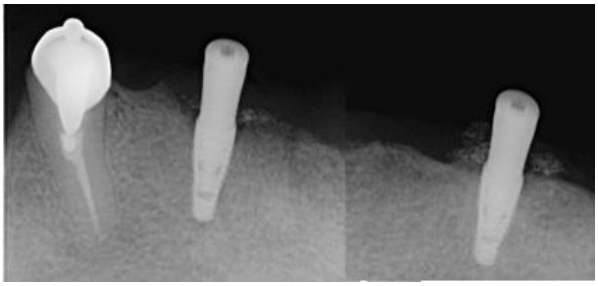

Figure 5. Periapical X-ray of the tooth and the implants after 12 months. No bone loss is visible.

Follow-up 3: After 24 months, no bone loss was observed around the implants or the natural tooth at the X-ray. **(Fig.6).** Intraoral examination showed no signs of inflammation. The patient reported high satisfaction regarding retention, stability, and esthetics.

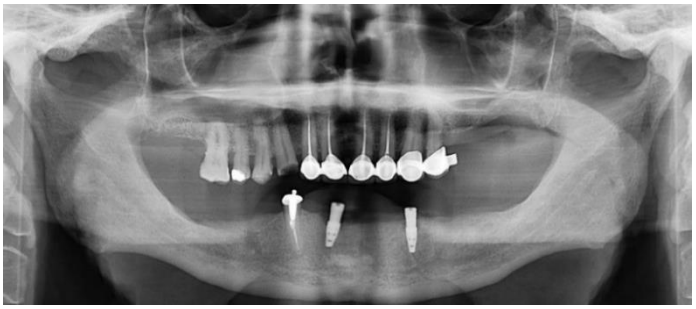

Figure 6. Panoramic X-ray after 24 months. No bone loss around implants or the tooth is visible.

Discussion

Over the past few decades, implant treatment has become a widely accepted approach for managing both partially and fully edentulous patients, with long-term survival rates consistently reported above 90% [4]. However, the simultaneous use of both natural teeth and implants as abutments for a single prosthetic restoration remains controversial because of the biomechanical differences between these supporting structures. While implants achieve osseointegration and form a rigid bond with the surrounding bone, natural teeth are supported by the periodontal ligament, which allows physiological mobility. This difference in mobility results in altered stress distribution during function, potentially increasing the risk of biological and mechanical complications, including restoration fracture, marginal caries, and intrusion of the natural abutment tooth [5,6]. Moreover, studies evaluating the secondary splinting of teeth and implants with removable prostheses are insufficient.

A review by Hoffmann concluded that tooth-implant connections experience higher failure and complication rates than tooth-tooth or implant-implant supported restorations, and that the combination of teeth and implants yields a lower long-term success rate than the use of implants alone. Tooth intrusion was reported in 0%-66% of all cases and was more frequent in cases with non-rigid connections than in those with rigid connections [7]. Another literature review conducted by Melilli et al. [8] indicated that the survival rate of implants in removable prostheses supported by both teeth and implants using traditional anchorage systems is notably high. However, to validate this rehabilitative approach, further studies with a higher level of evidence, more representative samples, and extended follow-up periods are essential.

A study by Nickenig et al. [9] aimed to assess and compare the clinical outcomes of tooth-implant-supported fixed and removable partial dentures in a selected group of partially

edentulous patients, with biological and technical complications recorded and reviewed. The survival data for both types of prostheses were comparable to those of prostheses supported solely by implants, with no difference in complication rates between primary splinting (fixed) and secondary splinting using telescopic systems (removable). However, a greater risk of biological complications was observed for endodontically treated abutments or teeth with reduced attachment levels.

According to Hanif et al. [10], despite the growing demand for dental implants, several biological and mechanical complications persist. While the concept of osseointegration is well documented and has proven successful, the combination of implants and removable partial dentures still requires longitudinal studies to validate its efficiency and long-term safety.

In a systematic review by Zancopé et al. [11], removable partial dentures combined with dental implants were found to have high survival rates. The study also reported enhanced patient satisfaction and improved masticatory function, without negatively affecting implant survival rates.

A study by Oliveira et al. [12] focused on the treatment of a patient using removable partial dentures supported by a regular-diameter anterior-type implant featuring an external hexagon and equipped with an O-ring attachment. This approach resulted in improved stability and retention, leading to an improved quality of life for the patient by providing greater security during functional movements and satisfactory esthetics.

Molinero-Mourelle et al. [13] conducted a systematic review and meta-analysis to assess the clinical performance of tooth-implant-supported removable partial dentures, specifically evaluating abutment survival in relation to the attachment system used. The findings suggest that these dentures are a reliable option, demonstrating excellent prosthetic and implant survival rates, along with favorable abutment outcomes after 3- and 5-year follow-ups. Additionally, complications may be minimized when five or more abutments are used. Thus, tooth-implant-supported removable partial dentures present a favorable and promising alternative for restoring a partially edentulous arch by optimizing the number and distribution of abutments.

Recent long-term clinical studies further support the use of combined tooth-implant-supported removable dentures. Klotz et al. [14] reported high survival and success rates for both tooth-implant-supported and solely implant-supported double-crown-retained overdentures during follow-up periods of up to 11 years, concluding that both treatment concepts represent reliable rehabilitation options despite the occurrence of minor complications requiring maintenance. Similarly, Zierden et al. [15] demonstrated favorable denture and abutment survival after long-term function, while emphasizing the importance of regular supportive care to minimize biological complications. Comparable outcomes were also reported by Krennmair et al. [16], who observed excellent implant and natural tooth survival with only limited denture maintenance in patients treated with implant-tooth-supported telescopic removable dentures. Although these studies used different attachment systems from those employed in the present report, they consistently support the concept that preserving strategically positioned natural teeth in combination with implants can provide predictable biological and prosthetic outcomes over extended follow-up periods.

The favorable clinical findings observed in the present case are also consistent with previously published clinical reports describing similar rehabilitation concepts. Oliveira et al. [12] reported improved denture stability, retention, and patient quality of life following rehabilitation with an implant- and tooth-supported removable partial denture using an O-ring attachment. More recently, Al Jaghsi [17] described successful rehabilitation with a double-crown tooth-implant-supported removable denture, demonstrating sustained improvements in masticatory efficiency, prosthesis stability, esthetics, and oral health-related quality of life after one year. Likewise, Lim et al. [18] presented favorable long-term outcomes in three patients treated with tooth-implant-supported double-crown removable partial dentures, reporting stable implants and natural abutment teeth during follow-up periods extending up to 18 years. Although different prosthetic designs and attachment systems were used, these reports are in agreement with the present findings, supporting the clinical feasibility of preserving suitable natural teeth while strategically supplementing support with dental implants.

Radiographic assessment was performed using panoramic and periapical radiographs obtained during the follow-up period. Peri-implant bone stability was evaluated by visually comparing the marginal bone level at the mesial and distal aspects of each implant with the implant shoulder as a reference point. The first visible bone-to-implant contact was used as the reference for marginal bone level evaluation. The natural tooth abutment was assessed for crestal bone stability, periodontal ligament space alterations, and periapical pathology. Radiographs obtained at 12 and 24 months were compared with the postoperative radiographic records. No radiographically detectable marginal bone loss was observed during the follow-up period. Panoramic and conventional periapical radiographs were selected because they represent the standard imaging protocol routinely used for postoperative and follow-up evaluation in our clinical practice. Since this report describes the clinical course of a single patient rather than a quantitative radiographic study, standardized parallel periapical radiographs with calibrated linear measurements were not obtained at each follow-up visit. Due to the lack of standardized parallel periapical radiographs with calibrated linear measurements at all time points, the radiographic assessment should be interpreted as descriptive and as a limitation factor. The radiographic stability observed in the present case is consistent with the findings of Bujak et al. [19], who reported no significant differences in bone level changes between tooth-implant-supported and solely

implant-supported prosthetic restorations, suggesting that appropriately planned tooth-implant-supported rehabilitations can maintain stable supporting bone over time.

To compensate for the difference in physiological movement between implants and teeth, we used different retentive elements. For both implants, we used attachments requiring a higher retentive strength (1650 g) - the green insert from the Locator®. For tooth 43, we used an attachment with a lower retentive strength (950 g) - the pink insert in the Rhein 83 system. The retention used over the implants is inserted into a metal housing matrix, which is mechanically more rigid than the self-polymerizing acrylic resin used to retain the insert for the tooth. We consider that this difference in resilience between metal and acrylic can compensate for the difference in physiological movement between the implants and the tooth. In addition, the extrusive forces on the tooth are lower because the Rhein 83 retention has almost half the retentive strength of the Locator® system used over the implants.

We consider that by preserving the tooth, we avoided one additional surgical intervention for the patient. It is well known that every extraction is followed by a healing period that may ultimately result in bone loss [20], regardless of whether a grafting procedure is used. In that respect, the decision to keep the tooth offered better predictability regarding the surrounding tissues.

A serious limitation of this report is the relatively short follow-up period of two years. Although no biological or mechanical complications were observed during this period, continued maintenance remains essential because complications may develop after longer periods of function. Clinicians should monitor peri-implant bone levels, periodontal health of the retained tooth, attachment wear, loss of retention, screw loosening, denture fracture and the possible need for replacement of retentive inserts. Previous long-term studies have shown that maintenance interventions are common even in successfully functioning implant-retained overdentures, although most complications can be managed chairside without compromising treatment success [16, 21]. Therefore, regular clinical and radiographic follow-up is essential to ensure long-term biological and prosthetic stability.

Conclusion

This case report demonstrates a specific approach for compensating for the difference in physiological movement between dental implants and natural teeth through the successful use of Locator® attachments and O-ring attachments in a tooth and implant supported mandibular overdenture. This type of denture provides significant improvements in stability and patient satisfaction.

Additional information

Funding statement

None.

Ethical compliance

Written informed consent was obtained from the patient for the publication of clinical data and images.

Conflict of interest

The authors declare there are no conflicts of interest.

Author contributions

A. Naydenov: Performed the surgical procedures and participated in the prosthetic phase of treatment.
I. Liondev: Participated in the surgical procedures and clinical management of the case.
R. Todorov: Contributed to the prosthetic procedures and clinical data acquisition.
I. Dzhondrova: Collected and analyzed the data, prepared the manuscript draft, performed critical editing, and approved the final version for publication.

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