Prosthetic Rehabilitation of Mandibular Knife Edge Ridge Using Implant-Supported Removable Prosthesis: A Case Report

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Introduction

Due to advancements in implant prosthetic technology, the quality of life for edentulous patients has improved drastically. Due to less surface area and less retention, conventional mandibular denture seems less favorable than a maxillary complete denture. By taking support of the two implants in the mandibular region, the prognosis of the mandibular prosthesis becomes better. Recognizing this, some authors have considered a two-implant-retained overdenture to be the standardized goal for better prognosis. Appropriate treatment planning is required for an implant-supported overdenture.1,2

There should be adequate interarch space for mandibular overdenture attachments. Otherwise the prosthesis will have complications like overcontoured prosthesis, increased vertical dimension of occlusion, separation of attachments, fracture of the prosthesis, and patient might not be satisfied.

Therefore, analysis of prosthetic space is very critical while planning successful mandibular overdenture. Implant-supported fixed prostheses are costly as compared with implant-supported overdentures. Advantages of overdenture are: they support both soft and hard tissues, are easy to construct, and are aesthetically more satisfactory.3

The mandibular overdentures can have retention by bars or individual attachments. However, mandibular overdenture bars are little technique-sensitive and have complicated procedure for fabrication, so the cost of the prosthesis increases and requires more interarch space. Only advantage of the bar attachments is that these can be used in nonparallel implants, but individual attachments can be used for such implants.

There are controversial issues regarding the maintenance of two types of attachment. Some authors studied that a bar attachment requires less maintenance whereas others

Keywords

► attachments
► implant-retained mandibular overdenture
► overdenture

Abstract

The prosthodontic management of a patient with long-term edentulism is challenging. Conventional dentures have been the traditional standard of care for the longest time. However, most patients experience difficulty in adapting to their mandibular dentures due to lack of stability and retention. From the past two decades, implant-supported overdentures have been offering numerous advantages over the traditional complete dentures and removable partial dentures with predictably good clinical results. These advantages include increased oral function, decreased bone resorption, decreased prosthesis movement, better aesthetics, and maintenance of occlusal vertical dimension. This article presents a case report of fabrication of two-implant overdenture in mandibular knife edge ridge in the anterior mandible opposing conventional maxillary complete denture.

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suggest the opposite. Additionally, proper hygiene around the bar is more difficult than for individual attachments.\(^4\)

This case report describes the treatment planning of a mandibular overdenture, for location of implants, and discusses step-by-step procedure for fabrication of implant-supported overdenture with ball attachments for an edentulous mandible opposing a maxillary complete denture.

**Case Report**

A 77-year-old male patient reported to the Department of Prosthodontics with missing teeth in maxilla and mandible. The extraction of teeth was performed due to severe periodontal disease in the past and he had been wearing the denture for a year. Patient complained about existing ill-fitting lower denture. Patient was screened according to a protocol that took into account his general health and treatment possibilities. The maxillary ridge was favorable for complete denture construction. Radiographic examination revealed severe bone loss and height and width of bone was less in mandible. Patient was informed about the treatment plan. After due consent, it was decided for conventional complete denture in the maxillary arch and a two-implant-supported overdenture in the mandibular arch. Thereafter, impressions making the jaw relations were recorded. Teeth arrangement was done and try-in was done to assess whether the available restorative space is adequate for a cast bar superstructure or ball attachment. Later on, dentures were fabricated.

**Surgical Phase**

After denture fabrication, two gutta percha points were heated and placed under the mandibular canine region on the tissue surface of the denture, and radiograph was taken to assess the location of the mental foramen. Evaluation of the interarch space and available bone width (bone mapping and soft tissue mapping) was done using bone gauge and assessed on the diagnostic cast before implant placement (►Fig. 1). Endosseous root form implants (ADIN dental implant solutions, 2nd floor Plot No. 20/21 New Sneh Nagar wardha Nagpur India 440015) measuring 3.75 x 11.5 mm and 3.75 x 10 mm were placed at B and D positions respectively following standard protocol (►Fig. 2). Implant in the B position was deeply placed due to knife edge bone in that region. Abutment was placed and sutured around it in position B. After 2 weeks, patient was given an interim complete denture. The tissue surface of mandibular denture was relieved and relined using temporary soft denture liner (GC Reline Soft India, Plot No. 233, Phase III, IDA Pashamylaram, Pattancheru Mandal, Isnapur, Medak District, Telangana India 502307) according to the manufacturer’s directions and the excess of the material was removed.

**Prosthodontic Phase**

Second-stage surgery was performed after 4 months and gingival formers were placed and relief was given by trimming the denture in the area of gingival former. After 14 days, final impression of the mandibular arch was made. Open tray impression copings were screwed on the implants. The stock tray was perforated to see access hole of each impression coping.

Polyvinyl siloxane (condensation type, Zeta plus; Zhermack, Italy) type-O putty consistency impression material was used. Implant analogs were screwed to the impression copings after removing the set impression material and the master cast was fabricated using die stone (Kalabhai, 43/ 44, Kalabhai House, L. B. S Adj HDFC Bank, Vikhroli West, Lal Bahadur Shastri Rd, Vikhroli West, Mumbai, Maharashtra India 400079).

Bar and clip attachment was planned initially considering the sufficient interarch space. A plastic bar pattern was cut to the desired length and attached to the abutments and trial was done. But considering patient compliance and ease of cleanliness, ball attachments were considered.

Two ball attachments of same diameter but different collar height were used. Collar heights of attachment were 4 mm and 2 mm (NP Ball Attachment, Ti-Grade 5) in B and D positions respectively. Denture markings on the tissue
surface were obtained using colored pencil. Seating of the abutments was verified. The ball attachments were placed and metal housing was blocked-out on the abutments. Denture base material was removed from the tissue surface in the region of implants for passive fit of the denture with the mucosal tissue. There should be no contact of the denture base with the implant components. A No. 6 round bur was used to create the space. The holes were lingually placed to the denture teeth in the canine region. After filling half space created for autopolymerizing denture base material, denture was placed over the implant superstructure (►Fig. 3). The complete seating of the denture was checked and verified. The patient was asked to close in the centric relation with light occlusal pressure while the material set. After setting, the denture was removed, trimmed, and polished, and inserted (►Fig. 4).

Discussion
In the past, mostly two-implant overdenture positioned the implants immediately anterior to mental foramen in the A and E positions. Positioning of implants in B and D positions is a much better prosthetic option. For a two-implant-retained mandibular overdenture, for better mechanical advantage and better stability, location of the implant in canine region is the best option. The implants create a fulcrum with two potential lever arms, one posterior and one anterior, which produce rotation of the denture. However, the primary and secondary stress-bearing areas of the overdenture counter occlusal forces placed on the posterior lever arm, but anterior lever arm causes rotation of the denture. Independent implants in A and E positions are implants located in premolar region, which is more posterior to anterior fulcrum line of anterior teeth and allow a greater amplitude of rocking of the restoration. The opposing arch for a two-implant-retained mandibular overdenture treatment option should be a traditional complete denture. The bite forces are reduced when patient is completely edentulous before treatment. The maxillary denture has some movement during function and acts as a stress reliever.

The freestanding attachment abutments can be rigid and allow for both implant and soft tissue support concurrently or allow for soft tissue support up to 0.6 mm, which protects the implants from being overloaded.

Different types of attachments are available. It is there in literature that for better retention and stability of the mandibular overdenture, the location of the implants in the jaw as well as types of attachments are important factors. An in vitro study was done to evaluate the retention and stability of two simulated implant-supported overdentures, and it was also compared between four different types of attachments (ball, O-ring, locator, ERA attachments). Comparison showed highest level of retention and stability: ball attachment > locator > O-ring > ERA attachments.

Various in vitro and in vivo studies have concluded that the ball and O-ring attachments transfer less stress to implant bone interphase as compared with bar and clip attachment.

Conclusion
Restoration of edentulous mandible can be challenging for a prosthodontist. The patient’s primary advantage of a two-implant-retained mandibular overdenture treatment option is less cost. If connecting bar is used, there will be more prosthetic appointment and laboratory costs as compared with individual attachments. In some cases, existing denture can be used with an intraoral rebasing and pick-up procedure for implant attachments. Though there are different controversies regarding use of different types of attachments, still this is a widespread, best accepted line of treatment. Primary drawback is related to patient’s desire. Some patients want implants only because they do not want to remove prosthesis. An overdenture would not satisfy their psychological need. Rarely, lack of interarch space makes fabrication of overdentures difficult, but in such cases osteoplasty could be done to increase the space.

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Conflicts of Interest
None declared.
References