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## Prophylactic Dentures

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### Abstract

The prosthetic management of the edentulous patient has long been a major challenge. Complete maxillary and mandibular dentures have been the traditional standard of care. However, most of the patients report problems adapting to their mandibular denture due to a lack of comfort, retention, stability and inability to masticate.

Overdenture provide many advantages over conventional complete denture. These include decreased bone resorption, reduced prosthesis movement, better esthetics, improved tooth position, better occlusion, increased occlusal function and maintenance of the occlusal vertical dimension. This article presents design and fabrication technique of the implant-retained overdenture that uses two freestanding mandibular implants and bar retained tooth supported overdenture.

**Keywords:** Overdenture, implant-supported overdentures, bar retained dentures

### Introduction

Preventive prosthodontics emphasizes the importance of any procedure that can delay or eliminate future prosthodontic problems <sup>[1]</sup>. The problem of retention and stability is more pronounced with mandibular denture as compared to the maxillary denture because the covered surface area is approximately half to that in the maxillary arch <sup>[2]</sup>. The loss of teeth, especially mandibular teeth, frequently leads to:

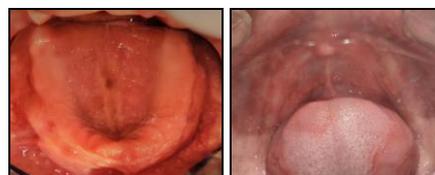
- Resorption of basal bone.
- Decline in the patient's neuromuscular function.
- Decrease in proprioceptive response <sup>[2]</sup>.

The overdenture is a logical method for the dentist to use in preventive prosthodontics. The overdenture is a complete or partial denture prosthesis which is constructed over an existing teeth or a root structure or over an implant. Implant borne prostheses and tooth supported overdenture have proven to be an effective alternative as they have many beneficial effects like preservation of bone volume, improved retention, stability, function, proprioception and comfort respectively <sup>[3]</sup>.

### Case 1

A 58 year old male patient reported to the department of prosthodontics, crown and bridge in CDSH, Rau with a complaint of loose mandibular denture. Clinical examination showed completely edentulous maxillary and resorbed mandibular arch (Figure 1 and 2). Radiographic examination of the patient presented dense compact bone in mandibular anterior region without any pathology.

With various option available and cost constraint the patient was explained about the various treatment options, implant supported overdenture (OD-1) was planned as follows:



**Fig 1**

**Fig 2**

**Treatment procedure**

Conventional Maxillary and mandibular dentures were fabricated. Bilateral balanced occlusal scheme was selected. Interferences in both centric and dynamic parafunction were eliminated. Patient was instructed regarding the maintenance at the time of denture insertion.

Post CBCT analysis two implants of size 3.75 × 13 mm (NORIS implant system) were selected.

Mandibular complete denture was duplicated and radiographic stent was fabricated. Gutta-percha markers were place in stent at proposed implantation site. With the help of surgical stent the implant sites were marked in patient mouth (Figure 3 & 4).

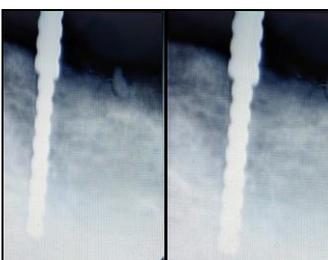


**Fig 3.**



**Fig 4.**

Implant surgery was carried out in a 2-stage surgical protocol. Surgery was performed under local anaesthesia. The osteotomy sites were prepared in the B and D region with the help of surgical template. A guide pin was used to ensure that the second implant was as parallel as possible to the first. The selected implants were placed at the prepared sites. Surgical cover screws were placed. The flaps were approximated with primary closure (Figure 5,6 & 7).



**Fig 5.**



**Fig 6.**



**Fig 7.**

The patient was told not to wear the lower denture for two weeks following surgery. The sutures were removed after satisfactory healing assessed clinically.

The intaglio surface of the denture was relieved. Soft tissue conditioning material Relinewas applied to the intaglio surface of the denture according to the manufacturer's directions and the excess liner material was trimmed. The denture was finished, polished and inserted into the patient's mouth. This allowed the patient to wear the removable prosthesis during the period of osseointegration without transmitting excessive forces to the surgical sites. The patient was seen on a regular follow-up visits and the denture was relined as needed.

After three months and after confirmation of the osseointegration, the second stage surgery was performed. At this stage, the implants were exposed, the surgical cover screws were removed and the sites were irrigated with sterile normal saline and premucosal attachment were placed, and the gingival tissues was allowed to mature for two weeks (Figure 8 and 9).



**Fig 8.**



**Fig 9.**

After two weeks maxillary primary impression and mandibular diagnostic impression made. For mandibular a customized impression tray was fabricated and open tray impression copings were used to make the final impression with monophasic impression material (Figure: 10). The abutment analogue was then connected to the transfer coping inside the impression and the master cast was poured. The remainder of the procedures up to try-in was carried out as the conventional method for complete denture. Two locator abutment of 4mm height were selected. The abutments were tightened to 25-30 N with a torque wrench (Figure: 11).



**Fig 10.**



**Fig 11.**

The plastic resilient caps with the metal housing can be processed into the denture by indirect laboratory technique or can be directly picked up chair side with the spacers provided

with the locator attachment. This allows denture to be snapped into the locator abutments. In the above treatment, chair side pick-up procedure with auto polymerizing resin was performed and yellow resilient caps were utilized for the denture. (Figure 12, 13 and 14).



Fig 12.

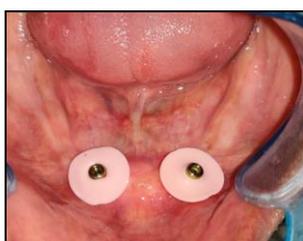


Fig 13.



Fig 14.

**Case 2**

A 52-year-old male patient visited the Department of Prosthodontics and crown and bridge implantology, College of dental sciences and hospital, Rau came to get his missing teeth replaced. Clinical findings presented with an edentulous maxilla and partially edentulous mandibular arch with 33, 34, 43 and 44 present (Figure 15 and 16).



Fig 15.



Fig 16.

Diagnostic casts were articulated at the anticipated vertical dimension of occlusion. The diagnostic articulation helped in assessing the available inter-arch space. Proposed abutment teeth 33, 34, 43 and 44 were prepared on the diagnostic cast, and the ability to accommodate bar and cast copings was assessed. After careful planning, a final treatment plan was given to the patient with the fabrication of a mandibular overdenture with customized bar between 34, 33, 43 and 44 with copings. A bar is especially useful when abutments are

misaligned or nonparallel to one another, making it harder to develop a common path of placement between the abutments and the denture base. The bar attachment provides a separate, parallel path for placement of retentive bar-clips located in the denture base. Since more than two abutments were present, parallel placement of the prosthesis was difficult to achieve thus a bar attachment was a better choice.

**Treatment Procedure**

After diagnosis and treatment planning, Elective endodontic procedure was carried out with teeth 33, 34, 43 and 44. Abutment teeth were prepared in a dome-shaped contour and hemi spherically rounded in all dimensions to receive the bar attachments. The height of the abutment teeth was 3-4 mm projecting just above the gingiva (Figure 17)



Fig 17.

The impression was made with polyvinyl siloxane elastomeric impression material in putty and light body consistency by double step putty wash technique and poured in die material to obtain the cast on which a wax pattern of the copings was fabricated with blue inlay wax. The distance between the two abutments was measured and marked on the Hader plastic bar. The bar was cut to the desired length and attached to the wax pattern of the copings with blue inlay, after adjusting the length and height of the bar. The height of the bar should be adjusted according to the availability of the vertical space. The bar should either be in passive contact with ridge or there should be 2-4 mm of space between the bar and underlying mucosa for maintaining proper oral hygiene.

The bar and wax pattern of the copings were casted with base metal alloy and the try in of the finished and polished cast bar assembly was done in the patient's mouth and the marginal fit of the copings and relationship of the bar with the underlying ridge was evaluated. After evaluation and required adjustments, the bars with their respective copings, were again placed intraorally and the under surface was blocked out on the mid-surface of the bar and a plastic positioner clip was placed (Figure 18 & 19).



Fig 18.



Fig 19.

Border moulding was carried out using a low fusing compound in a custom tray. Pick – up impressions were made using poly vinyl siloxane in light body consistency, and the impression was poured in a die stone and a master cast was fabricated (Figure: 20).



Fig 20.

The remainder of the procedures up to try-in was carried out as the conventional method for complete denture. After wax up, investing and dewaxing of trial dentures, the metal superstructure was placed on the duplicated master cast (Figure: 21). The undercuts of the retentive bar adjacent to the metal housings were blocked with dental stone and packing was done with heat cure acrylic resin, the dentures were processed, finished and polished (Figure: 22).

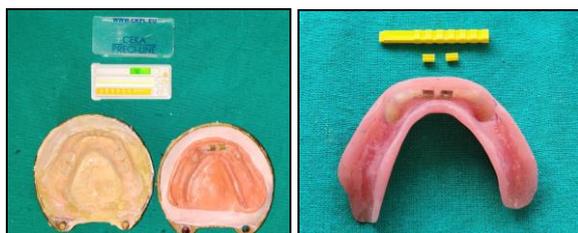


Fig 21.

Fig 22.

The retention sleeves/clips were then placed in the metal housing with the help of a special seating tool supplied in the attachment kit. There should be a snap when the clips are pushed into the position. The special shape of the metal housing provides secure retention of the clips while providing leeway space in the labiolingual direction to allow the clips/riders some flex during insertion or removal of the prosthesis. The final prosthesis was delivered to the patient.



Fig 23.



Fig 24.



Fig 25.

## Discussion

The overdenture therapy is basically a "preventive prosthodontic concept" because it endeavours to prevent a completely edentulous situation and preserves the last remaining tooth/roots and also their associated supporting structures<sup>[4]</sup>. The earliest reference to the use of roots for providing support was by Prothero in 1916; he stated, "Often times two or three widely separated roots or teeth can be utilized for supporting a denture.". It is a well-known fact that the residual ridge resorption is an inevitable pathophysiological phenomenon. The mandibular ridge resorbs almost four times faster than the maxillary ridge according to the previously reported literature<sup>[5]</sup>. It is also proven that the bone supporting structures around the retained teeth or implants are maintained for a longer duration of time and, thus, result in increased stability and retention of the denture<sup>[4]</sup>.

The implant-supported overdenture remains in place during mandibular movements which allows the tongue and perioral musculature to resume a more normal function since they are not required to control mandibular denture movements<sup>[5]</sup>. The design of the implant-retained overdenture can be carried out in 2 ways. In the first approach, implants are splinted with a rigid interconnecting bar that incorporates an attachment mechanism for the overdenture retention<sup>[6]</sup>. In the other approach, implants are not connected to each other, and the retention mechanism is provided by an abutment that incorporates some form of retentive mechanism. A major advantage of the freestanding implants is the fact that they allow for the use of the prefabricated stock retentive abutments. The use of the interconnecting implant bar requires additional laboratory and clinical procedures for its fabrication and the associated increase in treatment cost<sup>[6]</sup>.

Another advantage of the prefabricated stock abutments is that the abutment itself can be easily replaced in case of abutment failure. Because stock abutments are identical, their replacement does not require remaking the overdenture. On the other hand, if the implant interconnecting bar has to be remade in the case of failure, it usually requires remaking the overdenture<sup>[7]</sup>.

This procedure allows fabrication of lower overdenture with Locator Attachments, which have the highest retention and stability followed by ball and then finally magnets as recommended by Sadig.

According to Cakar *et al.* it was found that the locator system showed superior clinical results than the ball and the bar attachments. This was further supported by a clinical study conducted by El-Sheikh *et al.* They came to a conclusion that the use of two narrow bone level implants with locator attachments appears predictable and can adequately support an overdenture in cases of mandibular atrophy.

Further increase in retention of the overdentures can be achieved by using attachments. Overdentures require particularly careful assessment of vertical space, especially with the attachments, i.e. there must be sufficient room for roots with tooth supported over dentures, copings and possible attachments, together with an adequate thickness of denture base material and artificial teeth, without jeopardizing the strength of the denture<sup>[4]</sup>. The bar joint denture offers a transitional solution between the clasp-retained removable partial denture and the complete denture.

Bar and clip attachments present a reliable and simple solution to denture retention and stability problems by improving the level of satisfaction of patients wearing

denture. Bar and clip attachments can be effectively used to retain and support a complete denture, when a bar is attached to periodontally sound abutments through metal copings. Two abutments, one in each quadrant must be present for bar attachments & is attached to periodontally sound abutments through metal copings<sup>[8]</sup>.

Hader bar can be used as a retainer for tooth as well as implant supported prostheses. The bar is available as prefabricated plastic patterns that are adapted on the master cast and then can be cast in the alloy of choice.

The bar should be positioned directly above the crest of the ridge. This position makes it easy to clean the bar and fabricate the prosthesis above the bar. If the bar is positioned lingual to the crest of the ridge, it will interfere with tongue space and its function and the patient's speech. If the bar is positioned labial to the crest of the ridge, it will interfere with teeth arrangement and lip support which might affect the aesthetics<sup>[9]</sup>.

One of the most important requirements for use of any bar attachment is the availability of sufficient vertical and buccolingual space which limits their applications in many instances.

This case involved the preservation of two canines and two premolars for mandibular overdenture in providing support, retention, stability and comfort superior to that of a conventional complete mandibular denture.

A metal bar was used in this case with a female component embedded in the tissue surface of the denture by the indirect technique. The use of two canines and two premolars as abutments splinted together with a bar is more advantageous than using the individual abutments separately. This is due to the splinting effect of the bar.

### Conclusion

The mandibular overdenture is one of the best and most comfortable modalities of treatment for the edentulous patients. The use of attachments for both implant and tooth supported overdenture can further increase the retention of the overdenture prosthesis, but is usually limited by the insufficient space available and cost factors. The availability of different types of attachments has enabled a wide variety of treatment options. Therefore, the modern clinician must consider use of overdentures whenever possible. These attachments improve the chewing efficiency and comfort of the patient by reducing the forward sliding of the mandibular denture, maintain the occlusion and minimising the trauma of the underlying supporting tissues.

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