Implant Supported Overdenture: A Case Report

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Abstract: The prosthetic management of the edentulous patient has 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. Implant supported overdentures have proved to be one of the best alternative options in prosthetic rehabilitation of various cases of edentulism. They satisfy patient’s expectations, improve quality of life with their long term serviceability and predictable outcomes. Implant supported overdentures offer many practical advantages over conventional complete dentures and removable partial dentures. These include decreased bone resorption, reduced prosthetic movement, better esthetics, improved tooth position, better occlusion, increased occlusal function and maintenance of the occlusal vertical dimension. This paper describes a case report in which a partially edentulous patient with compromised periodontal health was rehabilitated with an implant supported mandibular overdenture and a conventional maxillary complete denture.

Keywords: Overdenture, Implant supported mandibular overdenture, Conventional denture

1. Introduction

The transition from dentulous to edentulous state poses different challenges to the patient as well as the clinician. Bone resorption especially in mandible is an important factor to be considered during rehabilitation. Traditional removable prostheses need continuous adjustments. Implant borne prostheses 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. By placing implants in the edentulous mandible and subsequently loading them, bone resorption can be limited as light irritative stimuli leading to changes in bone architecture, shape and volume resulting in subperiosteal growth [1]. This is supported by Wolff’s law, which states that a change in function leads to a change in structure [2]. The reduced degree of rotational freedom of overdenture diminishes the forces applied on the distal part of themandible while still having mucosal support. Feine and Carlsson advocated that 2-implant retained overdenture as the standard of care for the edentulous mandible in a consensus conference held in 2002 [3-5]. Implant supported overdenture (IOD) is also a cost-effective treatment option as compared to implant supported fixed prostheses. They provide facial support, are relatively simple to construct, can restore both dental and alveolar tissues and are esthetically more satisfactory. Implant supported overdentures vary in design according to the method of attachment and amount of support to be desired from implant and ridge mucosa. The selection of an attachment system whether it is stud, magnet or bar depends on a number of factors such as type of prosthesis, number of implants, patient’s expectations, amount of retention required and cost. Bar attachment provides superior retention and stability as compared to stud attachments. It also allows splitting of implants and better distribution of forces. Laboratory technician can position attachments parallel to each other even if the implants are not parallel. Incorporating clips on the bar allows movement of denture, thus reducing forces on implants, less screw loosening and less crestal bone loss. Bars can be prefabricated or casted. Due to improved retention and stability of the bars as compared to stud attachments, denture extensions can be kept to the minimum especially in patients with an exaggerated gag reflex. This case report depicts a step by step procedure for fabrication of implant supported over denture with cast bar and clip attachments for an edentulous mandible opposing a maxillary complete denture.

2. Case-Report

A 73 year old male patient presented to the department of Prosthodontics with multiple missing teeth in maxilla and mandible. Remaining teeth had severe periodontal disease (fig1-preoperative orthopantomogram, figure2-intraoral maxillary arch, figure3- intraoral mandibular arch).

Figure 1: Preoperative Orthopantomogram

Figure 2: Intraoral Maxillary arch (Preoperative)
Patient had no previous experience of any removable denture. Patient was screened and explained all treatment possibilities. The maxillary ridge was favourable for complete denture construction. Preoperative radiographs show severe bone loss and deficiency in height and width in mandible. He was informed about the implant-based treatment strategies that could be followed. After obtaining consent from the patient, it was decided to get all the teeth extracted and replace them with a conventional complete denture in the maxillary arch and an implant-supported overdenture in the mandibular arch. Impressions were made and jaw relations were recorded. Diagnostic teeth setup was done at an appropriate vertical dimension to assess the available restorative space for a cast bar and superstructure attached to denture with indirect technique.

**Surgical phase:**
4 implants (MIS Implants, 3\(\{\frac{4.2}{2}\) mm in diameter and 13 mm in length\) and 1\(\{\frac{5}{2}\) mm in diameter and 13 mm in length\) were placed at A, B, D and E positions (suggested by Carl E Misch) following standard protocol \[6\] (figure 4—surgical implant intraoral).

Transfer copings were splinted with the help of used tooth preparation burs and pattern resin (figure 5). Window was created on the border moulded tray and tray is checked for the passive orientation. Edentulous mandibular ridge impression and implant site impression made with polyether, and pick up this impression by stock tray with putty elastomeric material (figure 6—final impression). Implant analogues were attached to the impression copings and the impression was poured in die stone. After that jig was fabricated to verify the position of an implant was replicated or not. Jig trial was done and radiographically verified (figure 7—jig intraoral, figure 8—radiographically verification).
UCLA abutments were screwed to the implant analogues and cut to appropriate height according to the available restorative space. A castable bar system was used (Figure 9 - bar pattern). The plastic bar pattern was cut to the desired length and attached to the UCLA abutments. The height of the bar was adjusted to facilitate easy oral hygiene beneath the bar. The bar-abutment pattern assembly was then cast. The bar was finished, polished and checked in patient intra-orally for passive fit (Figure 10).

**Jaw relation:**
An autopolymerizing acrylic resin record base was fabricated. Wax occlusal rim is adapted on the recorded base and maxillo-mandibular relations recorded. Maxillary cast was mounted on the Hanau’s Wide View Articulator with face bow transfer. The mandibular cast was then mounted on the articulator in centric relation. Teeth setting was carried out and tried for patient approval.

**Fabrication of overdenture:**
The finished bar was placed on the articulated master cast. The space was provided for the bar assembly over the tissue surface of the trial denture base. The undercuts were blocked and the whole assembly was duplicated to get the working cast. The trial denture base along with positioner was taken not to disturb the position of the anterior teeth. The under surface of the metal housing was blocked out with dental stone to avoid flow of resin between clip and bar. The dentures were processed by conventional technique. The final prosthesis had the metal housings incorporated in the tissue surface and to prevent its appearance effect opaque layer of ceramic layered (Figure 11). The positioner clips were discarded and yellow retentive clips were used at their place and clip and metal-housing were placed on the working cast.

**Denture insertion appointment**
Finished bar was placed in patient’s mouth. Abutments were screwed with a final torque of 35 N/cm. The screw openings were blocked with gutta-percha points. The denture was inserted in the patient’s mouth and checked for proper extensions and occlusal contacts. The retentive clips clicked into place on the bar providing sufficient retention. Instructions were given to the patient regarding the insertion and removal of the denture. (Post-operative photographs)
3. Discussion

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 [6-9].

The design of the implant-retained overdenture can be carried out in two ways [6,7,10]. In the first approach, implants are splinted with a rigid interconnecting bar that incorporates an attachment mechanism for the overdenture retention. 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. However, in case of the misaligned or malpositioned implants, stock abutments may not provide the desired compensation, and the splitting of the implants with the interconnecting bar can overcome these problems. 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. Performance data of the implant-retained overdenture indicate that most of the complications and prosthetic maintenance are related to the attachment components of the overdenture [7-11,13]. Another dilemma associated with overdenture treatment is the technique of incorporating the attachment matrices into the overdenture literature. One approach includes incorporation of the matrices into the overdenture in the dental laboratory. This is an extremely important step and, if not performed correctly, can negatively influence overdenture fit or contribute to the dislodgement of the matrix from the overdenture. This method ensures acceptable fit of the overdenture. However, it requires additional clinical time and is technically sensitive. The other approach is pick-up intraorally in the clinic [14-16]. In this case four free-standing implants were placed in A, B, D and E position. As the posterior ridge was resorbed, it was thought that it would not offer any support to the denture. In two implants retained overdenture the rotational movement is of PM6 type which is harmful for the implant as well as to the residual ridge. Therefore, support was obtained from four implants. Due to financial constraints the patient was not ready for the fixed type of restoration immediately. The same implants can be used for the fixed restoration in future after placing the implant C position. As with any treatment modality, aftercare and maintenance is vital for the overdenture to be successful. The patient must be advised of this and reviewed regularly. Optimal surgical implant positioning is essential for the success of implant supported restorations. An implant-retained overdenture requires meticulous treatment planning than a conventional complete denture. Final placement of the implants should follow the principles of ideal implant parallelism and maximum initial stabilization and path of placement and removal.

4. Conclusion

Restoration of the edentulous mandible is a challenge. Among different treatment options, an implant-retained overdenture is a simple, cost effective solution in the rehabilitation of the edentulous mandible. This clinical report described the successful management of edentulous patient with implant supported overdentures with cast bar and clip attachment with indirect laboratory technique. It can become an excellent and profitable addition to every prosthodontic practice.

References