



ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2020; 6(3): 757-760
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www.oraljournal.com
Received: 24-05-2020
Accepted: 28-06-2020

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Prosthetic rehabilitation of an edentulous mandible by two implants-retained Mandibular Overdenture: A case report

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DOI: <https://doi.org/10.22271/oral.2020.v6.i3k.1034>

Abstract

Conventionally, complete denture therapy has been considered as the standard of care for prosthetic management of edentulous jaws. However, it is very well recognized that not all patients are able to tolerate or adapt themselves to the prosthesis and frequently complain of discomfort, lack of retention, stability and inability to chew food. Such problems are more pronounced with mandibular dentures due to the anatomy of the mandible, faster resorption rates and close proximity of the residual alveolar ridge to the various muscle attachments which often interferes with the formation of adequate peripheral seal at the denture borders. With the recent developments in the dental implantology, Implant- Retained Mandibular Overdentures have emerged as an alternate treatment modality for prosthetic rehabilitation of edentulous mandibles and have achieved encouraging results in terms of enhanced retention, support and stability contributing to greater patient acceptance and hence improvement in their quality of life. This article describes a case report where a Implant- Retained Overdenture was planned for a patient with edentulous mandible by placement of two endosseous implants.

Keywords: Implant-retained overdenture, maladaptive denture behaviour, O-ring attachments, prosthetic rehabilitation, edentulous mandible

Introduction

Prosthetic Rehabilitation of edentulous jaws through complete denture therapy has been a standard treatment protocol with satisfactory and predictable outcomes in most patients. Nevertheless, clinical experiences do confirm that quite a few number of such patients experience great difficulties in adapting to their prosthesis. Such problems are more often pronounced with the mandibular dentures and the patients frequently complain of discomfort, lack of retention, stability and inability to chew their food^[2, 3]. These patients are said to be exhibiting a Maladaptive Denture Behavior^[1].

In the past few decades, Mandibular Implant Overdentures have emerged as an effective treatment modality addressing such patients. Placing endosseous implants in the mandible to which an overdenture can be attached enhances the support, retention and stability of the prosthesis. This results in higher bite force, better chewing efficiency and less discomfort to the patient^[5, 6, 7]. Besides, the dense quality bone (mainly D2 & D3 type) of the mandible contribute to the success of the Mandibular Implant Overdentures. Studies have calculated the overall survival rates of 94.5% for implants and 100% for prosthesis in cases of Mandibular Implant Overdentures^[8, 9]. In addition, the tissue coverage and extension of the prosthesis can be reduced to combat the low gagging threshold of some denture wearers and to prevent the impingement of borders. These manifold advantages of Mandibular Implant Overdentures have led to their wide popularity and acceptance. Mc Gill 2002 consensus statement concluded that the quality of life is significantly higher for patients who receive Mandibular Implant Overdentures compared to those who are given conventional dentures and hence Mandibular Implant Overdentures should be the first choice of treatment for edentulous mandibles^[10].

There are five overdenture treatment options for edentulous mandible (OD-1 to OD-5). These treatment options range from primarily soft tissue support and implant retention (RP-5 prosthesis) to a completely implant supported prosthesis (RP-4) with rigid stability.

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In order to derive long term benefits and for preservation of maximum possible bone volume, while planning Mandibular Implant Overdentures, a RP-4 prosthesis involving placement of five implants (at A, B, C, D, E positions) should be the restoration of choice [4]. However, it has been found that financial considerations from the patient's side do come in the way of planning such extensive restorations. This has been identified as the prime reason for the selection of limited treatment which consists of two or three implants in the interforamen region to retain the mandibular overdenture. According to Mc Gill 2002 consensus statement, Mandibular two-implant overdenture are significantly superior to conventional dentures because they are more stable, comfortable while speaking and the ability to chew food is better thereby improving the nutritional status in patients [10].

The OD-1 treatment option in which two implants are inserted at B and D positions resulting in a RP-5 prosthesis is indicated primarily when cost is the most significant patient factor and the problems associated with the existing denture relates primarily to the amount of retention. The overall ridge form should be good for support and stability. The two implants should remain independent of each other and are not connected with a superstructure. The most common type of attachments used in OD-1 are the O-rings. O rings are elastomeric retentive attachments usually made of silicone and shaped like the 'inner tube of a tyre'. They are mainly held within the metallic housings with undercut grooves. These metallic housings are embedded within the denture base resin during laboratory processing procedures. The O-ring abutment consists of a ball shaped head that attaches to a post and cuff with groove or undercut area between the two parts that hold the metallic housings.

Case report

A 60 years old edentulous patient reported to the Department of Prosthodontics, Dr. Z.A. Dental College, AMU, Aligarh with the chief complaint of looseness of his lower set of denture. Dental history revealed that the patient suffered from periodontal problems in the past which gradually culminated in loss of teeth of upper and lower arch. The patient has been a denture wearer since last 1.5 yrs. Medical history was non-significant.

Oral examination and radiographic findings revealed slight to moderate maxillary and mandibular ridge resorption (Figure 1) and a poorly retentive mandibular denture



Fig 1: Slight to moderately resorbed edentulous maxillary and mandibular ridge

The patient was given the treatment option of placing two implants to support her existing lower denture. The treatment plan was accepted by the patient and it consisted of placing two implants at the B and D positions in the mandible and using ball abutments to retain the existing mandibular overdenture. Preliminary diagnostic evaluation and blood investigations were performed. Pre-operative antibiotics were prescribed and the patient was prepared in the sterile environment. Local infiltration of lignocaine with adrenaline was done and bilateral mental nerve block was given to secure complete nerve block bilaterally.

A mid crestal incision was given and a full thickness mucoperiosteal flap was reflected to expose the underlying bone (Figure 2).



Fig 2: Mid-crestal incision given to expose the full thickness mucoperiosteal flap

Two ADIN (Touarag™) – implants of dimensions 3.3 D x 13 L each were placed at B & E locations (Figure 3).

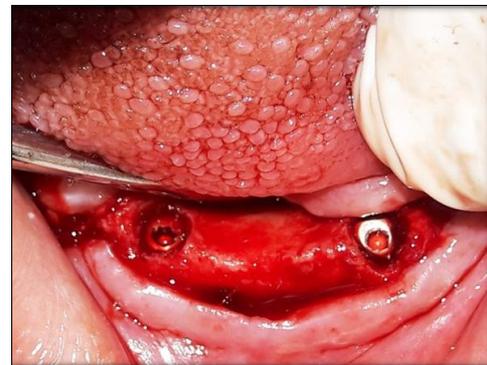


Fig 3: Two implants placed at B & E locations

Cover screws were placed and the incisions were sutured using 3-0 black braided silk suture (Figure 4).



Fig 4: Interrupted suturing done to approximate the flap

An Orthopantomograph (OPG) was done to verify implant angulations and position (Figure 5).

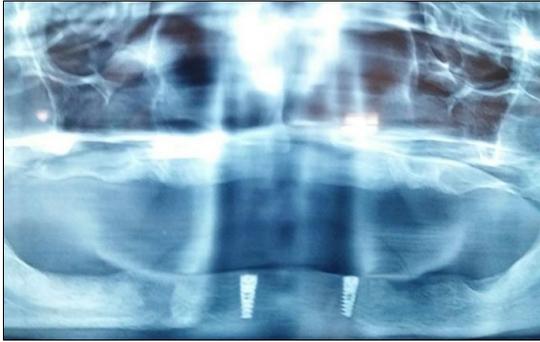


Fig 5: OPG done after implant placement at B & E position to verify its position and angulation

Medications were prescribed and post operative instructions were given to the patient. The patient was recalled after one week for suture removal and subsequently after 15 days for relining the mandibular denture to improve its fit. After 3 months of healing phase, 2nd stage surgery was performed and cover screws were replaced with gingival formers (Figure 6).

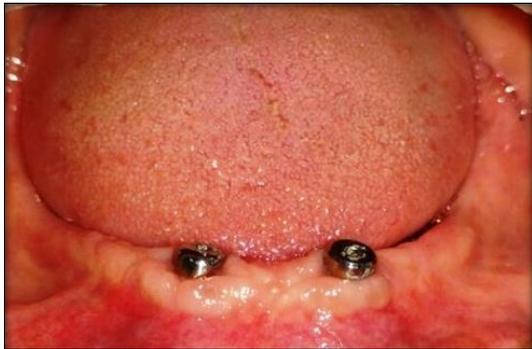


Fig 6: Gingival formers in place two weeks after their placement.

Two weeks thereafter, gingival formers were removed. ADIN RP Ball Attachment 2mm were inserted on the two implants (Figure 7) and ADIN Stainless Steel Ball Cap are placed onto the ball attachments (Figure 8).



Fig 7: Gingival formers replaced with ball attachments

The holes are prepared through the tissue surface of the denture at the implant sites and denture try-in is done for passive seating over the ridge with Ball Caps in place. The undercut underneath the Ball Caps are blocked using thick glove sheath to prevent the self-cure resin flowing down and getting blocked in the undercut (Figure 9)



Fig 8: Stainless Steel Ball Caps placed on ball attachments.



Fig 9: Undercut underneath the Ball Caps blocked with thick glove sheath.

The self-cure resin is mixed and filled into the tissue surface of the denture. The denture is seated over the metal housings in the patient mouth and the patient is asked to bite the dentures in occlusion. Once the self cure resin has set, the denture is removed with the Ball Caps embedded in it (Figure 10).



Fig 10: Ball Cappings incorporated in mandibular denture

The denture is then finished, polished and both maxillary and mandibular denture are seated into the patient mouth (Figure 11). A greater degree of retention was exhibited by the mandibular denture now and the patient was satisfied with the treatment outcome.



Fig 11: Maxillary and mandibular denture seated into patient's mouth

Discussion

Placing the implant at B & D position instead of A & E position provided the leverage benefit in this case by bringing the fulcrum line close to the prosthetic anterior teeth such that during loading of the anteriors, the amplitude of the rocking movement of the denture base is considerably reduced. Such prosthesis may even act as a splint for these two implants during the anterior biting force. However, the stress relieving attachments used in these cases permit movement of the prosthesis in multiple planes. Subsequently only one implant is loaded at a time in most situations, thereby, preventing the prosthesis to act as a true splint^[4].

Such approach could be quite effective when the patient's chief complaint is related to lack of retention of the mandibular denture. To address to the needs of such patients, the additional retention is gained by placing two implants at B and D position in the mandible and attaching the mandibular denture base to these implants by means of retentive elements embedded in the mandibular denture base. However, it needs to be emphasized that the stability and support of such prosthesis is still dependent on ridge form and prosthesis design as in complete denture. So, a good anterior and posterior ridge form is one of the basic criteria that needs to be evaluated beforehand in order to achieve predictable outcomes.

The patient's primary advantage gained from this OD-1 (implants in B and D position independent of each other) treatment approach as opposed to OD-5 (implants in the A,B,C,D and E positions, rigidly joined by a bar cantilevered distally about 15mm) treatment approach is cost-benefit. An additional indication for this OD-1 approach could be a tapering arch shape where a connecting bar would be cantilevered too facially or placing it lingually would cause interference with speech and mastication. Nevertheless, the patient needs to be convinced that the ideal approach for the long term health of the edentulous mandible is always a complete implant supported prosthesis and placing additional implants in the mandible i.e. gradually transiting towards the

OD-5 system is necessary to preserve the posterior bone volume and enhance the efficiency of the prosthesis.

O-rings embedded in metal housings are generally preferred as attachments in the OD-1 system because of simplicity in design, good retention and ease in use and maintenance. However, O-ring attachments wear and consequently lose retention. O-rings generally last for 6-9 months depending upon the complexity of the prosthesis, the chewing & dietary habits of the patient, and the ease of insertion and removal of prosthesis.

Conclusion

Mandibular Implant Retained Overdenture is one of the most beneficial treatment option that can be rendered to the patient when it comes to the prosthetic rehabilitation of edentulous mandible. Apart from having superior retention, support and stability than the traditional complete denture therapy, placement of dental implants provide the necessary physiologic stimulus to the bone required for its maintenance thereby preserving the bone volume, masticatory muscle activity, esthetics and psychological health of the patient on a long term basis.

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