



RESEARCH ARTICLE

REHABILITATION OF THE EDENTULOUS MANDIBLE WITH IMPLANT-SUPPORTED  
OVERDENTURE USING BALL ATTACHMENTS - CASE REPORT

\*Swati Mittal, Dr. Ashish Choudhary and Dr. Aparajita Mitra Prakash

School of Dental Sciences, Sharda University, Greater Noida

ARTICLE INFO

Article History:

Received 12<sup>th</sup> April, 2018  
Received in revised form  
21<sup>st</sup> May, 2018  
Accepted 19<sup>th</sup> June, 2018  
Published online 30<sup>th</sup> July, 2018

Key Words:

Edentulous Mandible, Interforaminal  
Implants, Implant Supported Overdenture,  
Ball Attachments.

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Citation: Swati Mittal, Dr. Ashish Choudhary and Dr. Aparajita Mitra Prakash. 2018. "Rehabilitation of the edentulous mandibles with implant-supported overdenture using ball attachments - Case report.", *International Journal of Current Research*, 10, (07), 71254-71256.

ABSTRACT

A common condition in geriatrics patients is the occurrence of edentulism. According to the United Nations Population Division (UN 2011), the share of India's population aged 60 and older is projected to climb from 8% in 2010 to 19% in 2050. One therapeutic approach directed at improving oral function in elderly is use of implant supported overdentures. According to McGill and York consensus statements it is accepted that the two implant overdenture is not the gold standard of implant therapy, it is the minimum standard that should be sufficient for most people, taking in account performance, patient satisfaction, cost and clinical time (Thomason *et al.*, 2012). The use of two interforaminal implants with an overdenture can provide long-term neuromuscular benefits for edentulous patients (Spitzl *et al.*, 2012).

INTRODUCTION

A 67-year-old male patient reported for the prosthodontic rehabilitation of his edentulous jaws. The chief complaint of the patient was loose fitting mandibular denture. Past medical history was not significant. His dental history included extraction of the periodontally involved teeth and their replacement with maxillary and mandibular dentures. These dentures were relined on several occasions. Clinical examination included an evaluation of size and shape of the edentulous ridge, palpation for undercut and an assessment of condition of the mucosa. Clinical examination revealed completely healed maxillary and mandibular edentulous ridges. Mandibular ridge exhibited a moderate degree of alveolar ridge resorption in posterior region. Overlying mucosa was healthy and normal. Temporomandibular joint examination was found to be normal. Orthopantomograph was advised to evaluate bone availability and architecture (Fig-1). The inter-ridge distance was assessed. Routine blood examination revealed no abnormal findings. A treatment plan was prepared after a standard protocol. It included fabrication of a conventional complete denture for the maxillary arch and implant supported overdenture was planned with two implants along with independent ball type attachments for the mandibular arch.

Position B and D were selected for implant placement. This decision was taken considering the resorption of the posterior region. This treatment plan was explained to the patient and was approved by him. Informed consent was taken after discussing the treatment procedure with the patient and the bystander. Irreversible hydrocolloid impression was made and pre-surgical diagnostic casts were prepared. Inter-occlusal distance was measured in the diagnostic casts. The implant location was marked at B and D positions independent of each other.

**Surgical Phase:** Under antibiotic prophylaxis and standard aseptic protocol, the region was anaesthetized and full thickness flap was raised. Two surgical implants (Adin (Touareg TM) 3.3 x 13 mm) were inserted and cover screws were placed. Post operatively after 3 months, osseointegration was evaluated clinically and radio graphically (Fig. 2). The second stage surgery was performed in which cover screws were removed and healing abutments were inserted into the implants. After a time period of two weeks, the healing abutments were removed and ball and socket over-denture abutments of 2 mm diameter (NP-0022) were placed onto each implant (Fig. 3). A transferable mark with an indelible pencil was placed on top of each ball abutment and old denture was seated to ideally determine the location for attachment housings. It was followed by preparation of recesses in the intaglio surface of the denture to accommodate the housings.



Fig. 1. Pre-operative orthopantomograph

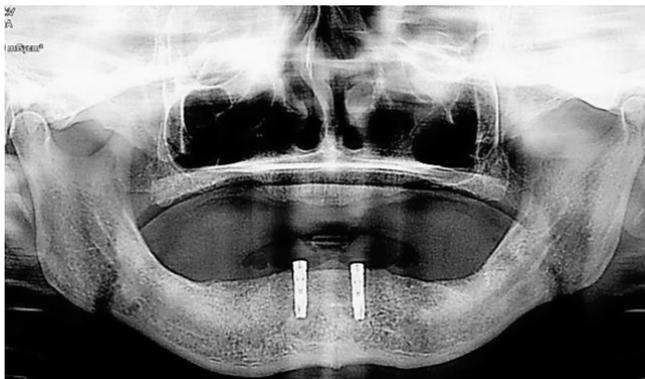


Fig. 2: Orthopantomograph taken after 3 months of placement of implants which shows presence of osseointegration



Fig. 3. After 2 weeks, healing abutment were replaced with ball abutments



Fig. 4. After the acrylic has cured, removal of denture is done and polished



Fig 5. Final placement of the removable complete denture prosthesis

Placement of nylon processing insert into each of the housings was done with insert seating tool. Seating of the attachment housing onto each ball type abutment was done (Fig. 4). Undercuts were blocked out under the housing and soft tissue to prevent acrylic resin from locking the denture onto the abutment. Application of self-curing acrylic was done into recessed area. Denture was inserted and the patient was trained to close in centric occlusion with the opposing arch. After the curing of acrylic, denture was removed. Excess acrylic was removed around the housings and later it was polished (Fig. 5). Processing inserts were replaced by nylon inserts into the housings. Over denture was seated over the ball abutments (Fig. 6). Proper instructions were given to the patient on insertion and removal of prosthesis. The patient was recalled for follow up appointments.

## DISCUSSION

Various attachment systems are available, and they vary from one another in their ability to provide retention. It is documented that not only attachment type but also position of implants in the jaw influences the retention and stability of the prosthesis. An *in vitro* study was done to evaluate the retention and stability of two simulated implant supported overdenture, and it was also compared between four different types of attachments (Ball, O-ring, Locator, ERA attachments). The results showed that the vertical retention and horizontal stability of the implant increased with its distal placement up to second premolar. Antero-posterior stability also increased with distal placement of implants. Comparison among different attachments showed that ball attachment produces the highest level of retention and stability followed by Locator, O-ring, and ERA attachments (Scherer *et al.*, 2014). Various *in vitro* and *vivo* studies have concluded that the ball and O-ring attachments transfer less stresses to implant bone interphase as compared to bar and clip attachment (Geng *et al.*, 2001; Kenney, 1998; Tokuhisa, 2003; Rutkunas, 2004). In this report, ball attachments were applied because, it is reported that they are less costly, less technique sensitive (Cune *et al.*, 1994), and easier to clean than bars (Schmitt, 1998) and less wear or fracture of the component than that of gold alloy bar (Krennmaier, 2001). Patient must maintain standard protocol of overdenture hygiene and follow-up visits. Posterior bone loss can be an issue, which requires relining procedure of the lower denture. Nylon inserts might require changing in case of loss of retention, which can be carried out by simple chair side procedure. As with any treatment modality, aftercare and maintenance is vital if the overdenture is 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.

### 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. Despite widespread acceptance of this treatment, some controversies still exist with regard to the design of the over denture, selection of the appropriate attachment system, and the most optimal techniques for the over denture fabrication. Clinicians and dental technicians have to adhere to sound design principles such as simplicity in fabrication, ease of maintenance and repair and cost control.

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