Implant-supported Overdenture using Resilient Reliner

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ABSTRACT

Fixed and removable implant-supported prostheses successfully address problems associated with complete dentures in edentulous mandibles. Implant-supported overdenture (IOD) improves retention, stability, function, proprioception, and comfort. This case report depicts step-by-step procedure for fabrication of IOD with castable bar and modified resilient reliner. The bar was fabricated from readily available castable bar system, and resilient silicone-based relining was done by using a pickup impression at the time of trial. The shortcomings of direct technique are overcome by this procedure. It is a relatively simple and easy technique to produce an accurate prosthesis and devoid of wear and tear of elastic components.

Keywords: Customized bar-supported complete denture, Implant-supported overdenture, Overdenture, Resilient reliner.


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INTRODUCTION

The loss of teeth results in adverse esthetic and biomechanical sequel “the edentulous predicament.” Three treatment options are available, which include complete denture, implant-supported overdenture (IOD), and implant-supported fixed denture. The choice between use of different treatment modalities depends on ridge condition, soft-tissue contour, and patient compliance. The use of endosseous dental implants as a treatment modality for mandibular edentulism is well documented for both fixed and removable prosthodontic reconstructions.1,2 The placement of implants enhances the support, retention, and stability. Both fixed and removable implant-supported restorations successfully address problems associated with complete dentures in edentulous mandibles.1,3 Ideally, a prosthesis that is completely supported, stabilized, and retained by implants should be designed when the soft- and hard-tissue contours of the patient demand the use of an overdenture instead of a fixed restoration, as the thickness of flanges can be managed only in removable prosthesis. In such circumstances, an IOD is a cost-effective and good treatment modality. Implant-supported overdentures are the restoration of choice in complex restorative situations where facial support is needed and are relatively simple to construct; they can restore both dental and alveolar tissues and are economical and able to satisfy the esthetic demands of complex restorative situations. Various multicenter studies were carried out on clinical performance of IOD and results showed that success rate was approaching near to 100%.4,6 Implant overdentures vary in design, according to the method of attachment and amount of support to be derived from implant and ridge mucosa.7 In general, IOD attachments can be classified as studs, magnets, and bars. No absolute rules have been established for overdenture case design with dental implants while the determinants for attachment selection include type of prosthesis, the length of the bar, the number and inclination of implants, dexterity, expectation, and financial capabilities of the patients.8 Out of various attachment systems, bar attachment along with clips/Molloplast gives improved retention and stability, allowing splinting of implants. A variety of bar designs exist, including prefabricated, custom-made, and castable bar. Incorporating an attachment system of choice is another advantage of using this bar design. There are no scientific data that support the use of one attachment system over another one.9,10

In this case report, a patient was presented with limited denture stability and retention. The prosthetic rehabilitation consisted of mandibular IOD with a castable bar and resilient heat cure silicone-based reliner attached to denture with indirect technique. The design incorporated use of Molloplast-B for retention.

CASE REPORT

A 74-year-old, completely edentulous male patient reported to our outpatient department of prosthodontics, with the chief complaint of ill-fitting lower denture. The patient had trouble while eating, and his speech was impaired due to constantly dislodging lower denture.
Diagnosis and Treatment Planning

Treatment options:
- Relining of lower denture
- Conventional new upper and lower balanced denture
- Implant supported prosthesis
  - Removable prosthesis
  - Fixed prosthesis

Clinical and radiographic evaluation revealed edentulous maxillary and mandibular arches (Figs 1A and B). The posterior mandibular ridges exhibited bone loss and deficiency in height and width. Diagnostic impressions were made. Diagnostic teeth setup at appropriate vertical dimensions was done to assess the available restorative space, jaw relationship, and teeth position for the best esthetic and functional results. Based on the diagnostic workup, a class I skeletal relationship existed and 13 mm of restorative space was available. After discussing the clinical and radiographic findings with the patient, the following decisions were made: Placement of three implants in the interforamina region, i.e., A, C, and D (Misch) of the mandible and fabrication of maxillary denture along with a bar-supported mandibular overdenture as a definitive prosthesis.

Surgical Implant Placement

Optimal surgical implant positioning is essential for the success of implant-supported restorations. A detailed description of the proposed implant positions and distribution was considered prior to surgical procedure, and a surgical guide was fabricated from the diagnostic workup. The position, distribution, and number of implants to be placed were determined based on the predesigned restoration, the available ridge dimension, and the limitation of the anatomical structures. In stage 1 surgery, three implants (3.75 × 10) (Adin Dental Implant System Ltd; Afula, Israel) were placed in the anterior mandible at #41, #44, and #32 regions (Figs 2A and B). A second stage surgery was carried out to place healing abutments 3 months after the primary implant surgery. Healing abutments were fastened to the implants to allow undisturbed soft-tissue healing. The patient’s pre-existing denture was relined (Visco-gel Temporary Soft Denture Liner; Dentsply Caulk, USA) to accommodate the healing caps. The intaglio surface of the denture was relieved, to allow enough room for the application of the soft-tissue conditioning material while avoiding direct contact between the denture acrylic and the healing abutments. The denture was finished, polished, and inserted into the patient’s mouth.

Prosthodontic Procedures

Accurate transfer of the implants position to the master cast is a primary requirement to ensure a passive fit restoration. An impression procedure that implements
a ridge splinting of the impression coping is therefore recommended.11,12 A primary impression was made with irreversible hydrocolloid material (Tropicalgin; Zhermack, Badia Polesine, Rovigo, Italy) (Figs 3A and B).

For an accurate master impression, impression copings were mounted on the primary cast implant analogs and splinted with autopolymerized acrylic resin (GC PatternResin; GC Corp, Tokyo, Japan). The resin splint then sectioned vertically between the impressions copings to allow accurate reassembly in the patient's mouth. A custom tray was fabricated with occlusal window openings to allow individual access to each impression coping. At the time of making the master impression, the open tray impression coping with the acrylic index was brought to the patient's mouth, screwed to the corresponding implant, and reassembled with the addition of an autopolymerized resin (GC Pattern Resin; GC Corp, Tokyo, Japan) (Fig. 4).

The resin was allowed to reach final setting and a rubber base impression (Aquasil Ultra XLV; Dentsply Caulk, USA) was made with light body material (Fig. 5). The guide pins were loosened and the impression was removed from the patient's mouth. The implant analogs (Adin Dental Implant Systems Ltd; Afula, Israel) were placed and the impression poured in die stone (Diestone; Kalrock Kalabhai Karson Pvt Ltd, Mumbai, India). An autopolymerized acrylic resin record base was then fabricated by salt and pepper technique. Record base was stabilized over the healing abutments with the help of Addison silicone material (Aquasil Ultra XLV; Dentsply Caulk, USA). Maxillary cast was mounted on Bioart-2000 articulator with facebow transfer. Jaw relation was recorded by manipulating the patient’s mandible into a centric relation position. The mandibular cast was then mounted on a semiadjustable articulator and evaluated again. A modified occlusal concept given by Misch13 was incorporated, which included raised occlusal plane to upper one-third of tragus, medial positioning of teeth relative to retromolar pad and linguualized occlusion.14 Teeth arrangement was completed and tried for patient’s approval (Fig. 6).

Esthetics, phonetics, and vertical dimension of occlusion were evaluated. An occlusal silicone tooth position index incorporating the incisal edges and the occlusal half of the mandibular denture teeth setup was fabricated.15 The occlusal silicone index was cut exactly in the center by joining incisal edges and central grooves of molars. Each half of index would be used during bar fabrication procedures to facilitate accurate repositioning of the denture teeth in relation to the master cast.

**Bar Fabrication**
- Tooth position index was used to determine available vertical height for bar.
• University of California, Los Angeles (UCLA) abutments were screwed to the master cast implant analogs and cut to appropriate height.
• A castable bar system (OT Bar Multiuse; Rhein 83, NY, USA), consisting of castable bar, castable box, positioned clip, and retentive clip, was used. The bar was attached to abutments and casted (Fig. 7). The amount of the available restorative space, hygiene requirements, and biomechanical principles govern the developed bar dimension.
• Castable boxes were then invested and casted to get metal superstructure.
• The bar was finished and polished and checked in patient for passive fit (Fig. 8). After verification of passive fit, overdenture was fabricated.

Placement of Completed Prosthesis
• Finished bar was placed in patient’s mouth and the abutment screws torqued down to 32 Ncm according to the manufacturer’s directions (Fig. 9). The screw openings were blocked by gutta-percha points.
• Resilient reliner (Molloplast-B) was applied on the intaglio surface of the denture (Fig. 10).
• The denture was checked in patient for proper extensions.
• The intimate fit of the intaglio surface of the denture to the bar provided enough retention for the prosthesis during this procedure (Fig. 11).

DISCUSSION
Thorough evaluation and treatment planning that addressed the patient’s needs, expectations, clinical, and radiographic findings resulted in a provision of the final
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restoration design that met our patient’s functional and esthetic needs. The need to have an overdenture design of superior stability and retention was recognized at an early stage of the treatment plan, allowing implant placement with optimal distribution. The bar-supported overdenture is an advantageous option as it got several advantages of implant splinting—improved retention and stability, reduced forces on implant, less screw loosening and crestal bone loss, also laboratory can position attachments parallel to each other. Incorporating resilient reliner provided the patient with sufficient retention to prevent vertical movement of the denture.

Modifications were carried out in the prosthodontic protocol to help the case:

- Splinting of impression coping for accurate positioning of implant analog over final impression.
- Fabrication of stabilized record bases by adding Addison silicone.
- A modified occlusal scheme was incorporated to stabilize the weak component of removable prosthesis (maxillary denture).
- Fabrication of occlusal index for teeth arrangement modification and vertical height determination.
- The implant placement in this particular case is done at A/C/D regarding the bone condition. However, the bar was fabricated from A to E to make it more bilaterally symmetrical and also to strengthen the whole attachment assembly as a unit.
- The option of using Molloplast-B is to reduce the wear and tear of elastic components like clips used otherwise and also enhance the retentive surface area on the bar.
- Resilient reliner are much better than clips as these are really long-lasting and time-tested. This is Molloplast-B which is silicone-based permanent resilient reliner, if required it is to be changed after 4 to 5 years.
- Here bar attachments were preferred over locator attachments because locator attachments are non-splinted, and they provide only retention, where as bar attachments provide retention, stability, and support as they are splinted.

The McGill Consensus Statement (2002)\textsuperscript{16} recommended two implants to support a mandibular denture as a minimum standard of care, citing the poor fit and function of many mandibular dentures that were not implant supported. In 2007, some of the authors of the McGill Consensus Statement\textsuperscript{17} attempted to evaluate this question by reviewing the literature. They found that there was no evidence to support fixed or removable being superior. In 2011, De Kok et al\textsuperscript{18} published a pilot study comparing fixed vs removable dentures in the mandible. Their findings suggested equivalence; patients were equally happy and functional with either an overdenture or a fixed denture. This was further evaluated in 2014 by Oh et al who published a prospective-controlled study comparing fixed implant-supported prostheses, removable implant-supported prostheses, and complete dentures. They found that implant-supported prostheses, fixed or removable, were equivalent and superior to conventional dentures for improving oral-health-related quality of life. The same was true with patient satisfaction; patients were equally pleased whether or not their prosthesis was fixed or removable. Therefore, the choice of whether a patient should have a fixed or removable prosthesis is a patient-specific one, dealing more with psychology and cost, rather than superior esthetics or function.

Various types of attachment systems are currently available to restore IOD. The IOD attachment systems used are stud or ball, cast bar and clip, locator (Zest Anchors, Escondido, CA, USA), or resilient attachment and magnet. Clinicians have selected IOD attachment systems based on factors, such as durability, patient demand, cost-effectiveness, technical simplicity, and retention.\textsuperscript{19} The successful outcome of IOD therapy is well documented, and different types of attachment systems have been compared regarding implant survival, marginal bone loss, soft tissue, retention, stress distribution, maintenance, and complications. Many systematic reviews have concluded that type of attachment system does not significantly influence the factors associated with the overall success of implant overdenture therapy.
However, the decision-making process to prescribe certain types of attachment system still remains unclear. A review by Andreiotelli et al.\(^\text{20}\) in 2010 has suggested that clinicians seem to use attachment systems based on preference, rather than scientific evidence, due to the high success rate of implants, regardless of attachment system.

**CONCLUSION**

The clinical and laboratory steps for fabricating an IOD with a castable bar and resilient reliner (Molloplast-B) have been presented in this article. This is cost-effective, simple, and provides an exceptional stability and excellent retention. Although the suggested method involves additional laboratory procedures during fabrication, it offers several advantages of the indirect techniques.

From the evidence presented in the article, it can be summarized that the edentulous patient restored with an implant-supported mandible overdenture experienced more satisfaction with their prostheses as it improved masticatory ability and nutrition along with improvement in psychosocial aspects of life. Prospective randomized studies with longer follow-up periods are required; it can also be concluded that the patients restored with an implant-supported mandible overdenture had expansive improvement in quality of life.

**REFERENCES**