ABSTRACT

Fixed and removable implant-supported restorations successfully address problems associated with complete dentures in edentulous mandibles. Implant-supported overdenture improves retention, stability, function, proprioception and comfort. This case report depicts step-by-step procedure for fabrication of implant-supported overdenture with castable bar and clip attachment. The bar was fabricated from readily available castable bar system and clips were attached to denture by indirect technique. The shortcomings of direct technique are overcome by this procedure. It is relatively simple and easy technique to produce an accurate prosthesis.

Keywords: Implant-supported overdenture, Castable bar, Lingualized occlusion and indirect technique.

INTRODUCTION

The loss of teeth results in adverse esthetic and biomechanical squel ‘the edentulous predicament’. Three treatment options are available which includes complete denture, implant-supported overdenture and implant-supported fixed denture. The use of endosseous dental implants as a treatment modality for mandibular edentulism is well-documented for both fixed and removable prostodontic 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.1,5 Ideally a prosthesis that is completely supported, stabilized and retained by implants should be designed. The major limiting factor for fixed treatment is financial constraint. In such circumstances implant-supported overdenture is cost-effective 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, can restore both dental and alveolar tissues, are economical and are able to satisfy the esthetic demands of complex restorative situations.4 Various multicenter studies were carried out on clinical performance of implant-supported overdenture and results showed that success rate was approaching near to 100%.3,4,6 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, implant-supported overdenture attachments can be classified as studs, magnets, and bars.8 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 and clip attachment 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. No scientific data that support the use of one attachment system over another one.9,10

In this case report, patient was presented with limited denture stability and retention. The prosthodontics rehabilitation consists of mandibular implant-supported overdenture with a castable bar and metal superstructure attached to denture with indirect technique. The design incorporates use of plastic retention clips inside metal superstructure. This gives added advantage of plastic clip removal and replacement with new clip after wear or loosening of existing clip. Moreover, plastic clips are cheaper compared to metal clips.

CASE REPORT

A 74-year-old lady presented with worn out maxillary and mandibular denture with limited stability and retention with existing mandibular denture.

Diagnosis and Treatment Planning

Clinical and radiographic evaluation revealed edentulous maxillary and mandibular arches (Figs 1A and B). The posterior mandibular ridges exhibited severe 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
Based on the diagnostic work-up, 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 interferoramin region 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 work-up. 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 one surgery two implants (3.75 × 10) (Adin Dental Implant System Ltd; Afula, Israel) were placed in the anterior mandible at #21 and at #28 region while third implant (3.3 × 10) was placed between #24 and #25 maintaining a 10 mm distance (Fig. 2). 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 patients 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) (Fig. 3). For an accurate master impression, impression copings were mounted on the primary cast implant analogs and splinted with autopolymerized acrylic resin (GC Pattern Resin, GC Corp, Tokyo, Japan). The resin splint then sectioned vertically between the impressions copings to
allow accurate reassembly in the patient 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 System 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 silicon material (Aquasil Ultra XLV; Dentsply Caulk, USA). Maxillary cast was mounted on Hanau H2 articulator with face-bow transfer. Jaw relation was recorded by wax check bite method while 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 that included raised occlusal plane to upper one-third of tragus, medial positioning of teeth relative to retromolar pad and lingualized 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 silicon tooth position index15 incorporating the incisal edges and the occlusal half of the mandibular denture teeth setup was fabricated. The occlusal silicon 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**

1. Tooth position index was used to determine available vertical height for bar.
2. UCLA abutments were screwed to the master cast implant analogs and cut to appropriate height.
3. A castable bar system (OT Bar Multiuse; Rhein 83, NY, USA) consisting of castable bar, castable box, positioner 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.
4. Castable boxes were then invested and casted to get metal superstructure.
5. The bar was finished and polished and checked in patient for passive fit (Fig. 8). After verification of passive fit overdenture was fabricated.
Overdenture Fabrication

1. Place finished bar along with positioner clip and metal housing on articulated master cast.
2. The teeth arrangement was modified to provide space for heat cure acrylic resin. Anterior teeth were removed and window was made in record base to provide the space for bar assembly (Figs 9A and B). Tooth position index was used to place the teeth in the same location.
3. Bar was placed on master cast and undersurface was blocked. The whole assembly was duplicated with rubber base impression material (Zetaplus; Zhermack, Badia Polesine, Rovigo, Italy) and cast was poured (Figs 10 and 11).
4. On final cast positioner clips were placed along with metal superstructure. The undersurface of metal superstructure was blocked with the help of type III gypsum product to avoid flow of resin between positioner clip and bar.
5. The complete denture was processed by conventional technique (Fig. 12).
6. Complete prosthesis consisted of metal superstructure incorporated in complete denture. Positioner clips were discarded and medium retention clips were used at their place (Fig. 13).

Placement of Completed Prosthesis

1. Finished bar was placed in patient’s mouth and the abutment screws torqued down to 32 Ncm according to the manufacturer’s directions (Fig. 14). The screw openings were blocked gutta-percha points.
2. Yellow-colored medium retention clips were placed over intaglio surface of metal superstructure.
3. The denture was checked in patient for proper extensions.
4. The intimate fit of the intaglio surface of the denture to the bar provided enough retention for the prosthesis during this procedure (Fig. 15).
5. Centric relation records were obtained and a clinical remount for final occlusal refinement was done.
6. Home care instructions were discussed with the patient and she was then trained for insertion and removal of her new denture. At a 1 week follow-up the patient was satisfied with the amount of the retention and stability provided with new denture (Fig. 16).

**DISCUSSION**

Thorough evaluation and treatment planning that addressed the patient’s needs, expectations, clinical and radiographic
findings resulted in a provision of the final 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 clip attachment 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:

1. Splinting of impression coping for accurate positioning of implant analog over final impression.
2. Fabrication of stabilized record bases by adding Addison silicone.
3. A modified occlusal scheme was incorporated to stabilize the weak component of removable prosthesis (maxillary denture).
4. Fabrication of occlusal index for teeth arrangement modification and vertical height determination.

Two methods are available for clip insertion—direct technique and indirect technique. A direct technique is a chairside procedure using autopolymerizing acrylic resin. Indirect technique is a laboratory procedure where heat-activated acrylic resin is used. The direct, most commonly practiced has got several disadvantages of autopolymerizing acrylic—blocking out all undercuts during the clinical procedure, the retention clips that will not hold if free monomer is present, shrinkage, water sorption, and voids within the autopolymerizing resin. This procedure with indirect technique has several advantages—minimal damage to final prosthesis as clip attachment is incorporated by indirect technique; final prosthesis will have adequate strength; clips can be easily incorporated into the receptacles of the metal superstructure with an accurate fit; patient can easily replace the retention clips; future relines, repairs, will not compromise prosthesis; risk of denture base fracture is minimized. The only disadvantages of the technique include the extra steps during fabrication and limited applicability in patient with reduced interarch space.

Moreover, the subsequent reduction in the number of clinical visits needed for attachment maintenance is more convenient to the patient. Due to the exceptional stability of bar system and the adequate number of implants used, the extension of the overdenture base was kept to the minimum, which can be especially beneficial to patients with a gag reflex.

**SUMMARY**

The clinical and laboratory steps for fabricating an implant-supported overdenture with a castable bar and clip attachment has 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.

**REFERENCES**

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