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CASE REPORT

MANDIBULAR OVERDENTURE USING A BAR AND CLIP ATTACHMENT: A CASE REPORT

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ABSTRACT

The problem of stability and retention of conventional mandibular complete dentures is far from a solution that is universally satisfactory. However, the use of overdenture therapy preserves the sensation of proprioception, preserves the edentulous ridge, maintains the border seal and provides the patient with good speaking ability and chewing efficiency. The retention and stability of such prosthesis is enhanced greatly in bar-supported overdentures. This case report depicts the step by step procedure for the fabrication of a canine splint bar for a bar and clip-retained mandibular overdenture. The bar was fabricated from readily available castable bar system and female clips were attached by an indirect technique. The mode of retention was primarily through frictional resistance. It is a relatively simple and easy technique, overcoming the limitations of the direct technique for clip attachment.

INTRODUCTION

Ever since the advent of dentistry, it has been a daunting task for a dentist to fabricate a stable and retentive prosthesis to rehabilitate the completely edentulous patient. The job becomes even more difficult and challenging when the ridges are grossly resorbed and contribute very little to the retention and stability. Standard treatment for the edentulous patient has been the provision of complete denture. However, complete denture wearers frequently report problems with oral function, typically caused by compromised retention and stability of the mandibular prosthesis as they rest on the moving foundation provided by the mandible and its associated musculature. Many patients presenting themselves as a candidate for complete denture usually have few retained natural teeth. By applying the basic principles of "preventive prosthodontics," a seemingly inevitable completely edentulous situation can be avoided and becomes a very successful rehabilitation by the use of the procedure called "overdenture therapy."[1,2]

Overdenture is any removable dental prosthesis that covers and rests on one or more remaining natural teeth, the roots of natural teeth and/or dental implants (GPT-8).[3] Overdentures provide a better function than conventional complete dentures through a variety of factors, such as improved biting force, chewing efficiency and increased speed of controlled mandibular movement.[4] In addition, they minimize the downward and forward settling of a denture, which otherwise occurs with alveolar bone resorption.[5]

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Retention of the complete denture can also be increased by using attachments that can be extraradicular or intraradicular. The use of attachments can redirect occlusal forces away from weak supporting abutments and into soft tissue, or redirect occlusal forces toward stronger abutments and away from the soft tissues. They act as shock absorbers and stress redirectors as well as providing superior retention. Attachments used to retain overdenture prosthesis are physically classified as studs and bars. Bar attachment retainers have the dual role of acting as splints for root spanning the edentulous space and providing overdenture retention. Because the bar is positioned close to the mandibular alveolar bone, torquing forces applied through the bar will be less than the torquing forces applied through the occlusal rest of a mandibular partial denture.[6] Overdenture attachments can also be functionally classified as rigid or resilient. Because the periodontal support has been lost, the resilient attachment is used more often for overdenture therapy. The resilient attachment spreads the functional load over both the retained root structure and the edentulous ridge.[7] Attachments have been ignored in the past by most dental professionals mainly because of cost and inadequate grasp of their application. However, with the increasing public awareness, together with technological improvement and good armamentarium, it becomes important to combine what is actually feasible with the patient's expectations of tooth-borne mandibular dentures.

This case report describes tooth-supported overdenture with castable Hader bar metal superstructure attached to the lower denture with an indirect technique. The design incorporates use of plastic retention clips inside a metal superstructure. This gives the added advantage of plastic clip removal and

replacement with new clip after wear or loosening of the existing clip.

Hader bar

The Hader bar is a pear shaped bar when viewed in cross-section. Thayer and Caputo[8] studied the various tissue bar attachments and concluded that the Hader bar produced less torquing force and distributed the forces more evenly between the posterior edentulous area and the contralateral abutments in comparison with the other tissue bar designs.

Clinical indications for Hader bar attachment supported overdenture

- Firm retained abutment
- Square shape dental arch.

Case Report

A 63-year-old male patient reported to the Department of Prosthodontics with the chief complaint of difficulty in chewing food and poor appearance.

Diagnosis and treatment planning

The maxillary arch was completely dentulous and the mandibular arch was partially edentulous for the past 1 year. He was facing the problem of difficulty in chewing food. The patient was diabetic from the past3 years, a vegetarian by diet and had no abusive habits.

Intraoral examination showed completely dentulous maxillary and partially edentulous mandibular arches with intact canines (33, 43). The patient did not want his remaining tooth to be extracted.

Fig 1 Pre-operative intraoral view

Considering the patient's desires and treatment needs, it was decided not to extract the teeth and to perform an overdenture therapy in the lower arch. A panoramic radiograph supplemented with IOPA (intraoral periapical radiograph) showed that in the mandibular arch, adequate bone support was present in relation to 33, 44. Thorough oral prophylaxis was carried out for the remaining teeth and a diagnostic set up (for tentative jaw relations) was prepared. This was performed to assess the interocclusal space, and it was found to be adequate and satisfactory. The neuromuscular control of the patient was good.

The different treatment options available for this patient were:

- Extraction of the remaining mandibular teeth followed by conventional mandibular complete denture
- Extraction followed by implant-supported overdenture
- Tooth-supported overdenture.

Depending on the existing condition of the remaining dentition and financial status of the patient, it was decided to use the remaining teeth as abutments and fabricate a bar attachment supported overdenture for partially edentulous mandibular arch owing to the obvious advantages of the retention of the roots.

Clinical procedure

- Intentional root canal therapy was carried out for the abutments (33, 43)
- Tooth preparation was carried out on both the mandibular canines and chamfer finish line was prepared, which resulted in optimal crown–root ratio and adequate clearance for overdenture prosthesis.

Fig 2 Tooth preparation on 33 and 43

- Border moulding was carried out using a green stick compound in a custom tray. Impressions were made using light body polyvinyl siloxane impression material.
- Beading and boxing was carried out and the impression was poured in a die stone.
- Casts were fabricated using a die stone and an inlay wax pattern coping was fabricated for the prepared mandibular canines.
- The two wax copings on the mandibular canines were connected with a pre-fabricated plastic bar of 2 mm thickness and 3 mm height. It is known that splinting two or more teeth with a bar produces stability similar to that obtained with a rigid stud-type attachment when overdenture is in place.

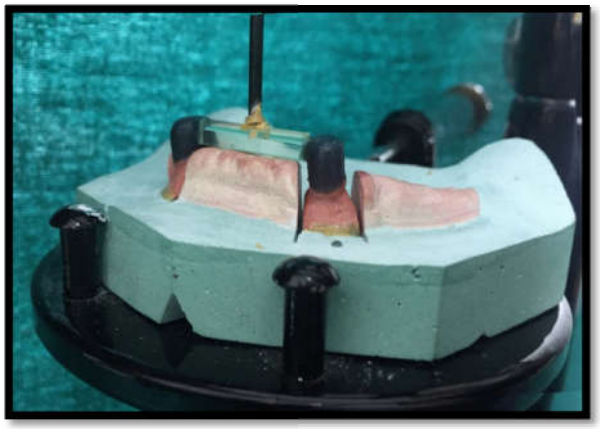

Fig 3 Plastic bar attached to the coping wax pattern using surveyor

- The wax pattern was cast in a Ni–Cr alloy using standard technique. Casting was than retrieved, finished and highly polished. To avoid any plaque accumulation along the bar.

- Then, the metal bars with retainer copings were tried first on the cast and then intraorally to check for the passive fit.

Fig 4 Trial of the bar assembly

- After the metal try-in, the bars, with their respective copings, were again placed intraorally and the under surface was blocked on the mid-surface of the bar and a plastic positioner clip was placed.
- The whole assembly was duplicated with the rubber base impression material and cast was poured.
- After this step, the bar, along with the metal copings, were luted onto the respective preparations and onto the respective tooth preparations with the help of glass ionomer cement
- The remainder of the procedures up to try-in was carried out as the conventional method for single complete denture.
- After de-waxing of the investment, the metal superstructure was placed on the duplicated master cast. The under-surface of the metal superstructure was blocked to avoid flow of resin between the positioned clip and the bar. Complete prosthesis consisted of metal superstructure incorporated in complete denture
- Positioner clips were discarded and yellow-colored medium retention clips were used at their place.

Fig 5 Intaglio surface of the finished mandibular prosthesis

Home care instructions were discussed with the patient and she was then trained for insertion and removal of her new denture. The use of a soft tooth brush with fluoride toothpaste, frequent use of mouthwash and denture care/hygiene with mild soap/denture was explained. At 1-week follow-up, the patient was satisfied with the amount of retention and stability.

Fig 6 Post-rehabilitation intraoral view

DISCUSSION

The overdenture therapy is basically a "preventive prosthodontic concept" because it endeavours to prevent a completely edentulous situation and preserves the last remaining tooth/roots and also their associated supporting structures. The earliest reference to the use of roots for providing support was by Prothero[9] in 1916; he stated, "Oftentimes two or three widely separated roots or teeth can be utilized for supporting a denture."[10] The teeth considered hopeless for routine restorative procedures can be rendered useful by suitable modification and can be used as overdenture abutments. It is a well known fact that the residual ridge resorption is an inevitable patho-physiological phenomenon. The mandibular ridge resorbs almost four times faster than the maxillary ridge according to the previously reported literature.[11,12] It is also proven that the bone/supporting structures around the retained teeth or implants are maintained for a longer duration of time and, thus, result in increased stability and retention of the denture.

Further increase in retention of the overdentures can be achieved by using attachments. Overdentures require particularly careful assessment of vertical space, especially with the attachments, i.e. there must be sufficient room for roots, copings and possible attachments, together with an adequate thickness of denture base material and artificial teeth, without jeopardizing the strength of the denture.[13] The bar joint denture offers a transitional solution between the clasp-retained removable partial denture and the complete denture. This case involved the preservation of two canines and for mandibular overdenture in providing support, retention, stability and comfort superior to that of a conventional complete mandibular denture. In this clinical case, the mandibular anterior ridge was relatively straight, which allowed easy fabrication of the bar joint. A metal bar was used in this case with a female component embedded in the tissue surface of the denture by the indirect technique. The use of two canines as abutments splinted together with a bar is more advantageous than using the individual abutments separately. This is due to the splinting effect of the bar. Both teeth become firm and are safer abutments. It also reduces torquing of the remaining root structure because the crown–root ratio is decreased. Two methods are available for clip insertion - direct technique and indirect technique. A direct technique is a chair side procedure using autopolymerizing

resin, whereas the indirect technique is a laboratory procedure where heat‑activated acrylic resin is used. The direct technique is most 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 autopolymerising resin.[14]

The procedure with the indirect technique has several advantages - minimal damage to the final prosthesis as clip attachment is incorporated by the indirect technique, wherein the final prosthesis will have adequate strength, clips can be easily incorporated into the receptacles of the metal superstructure with an accurate fit, patients can easily replace the retention clips, future relines and repairs will not compromise the prosthesis and risk of denture base fracture is minimized. The only disadvantage of the technique includes the extra steps during fabrication and limited applicability in patients with reduced interarch space.

CONCLUSION

The mandibular tooth‑supported overdenture is one of the best and most comfortable modalities of treatment for the edentulous patients with very few remaining teeth. The use of attachments can further increase the retention of the overdenture prosthesis, but is usually limited by the insufficient space available and cost factors. The availability of different types of attachments has enabled a wide variety of treatment options. Therefore, the modern clinician must consider use of overdentures whenever possible. This case report describes the clinical and laboratory steps for fabricating a tooth‑supported overdenture with a castable bar and clip attachment by the indirect technique to help the dentists adequately select, plan and deliver a bar overdenture to their patients. This procedure is cost-effective and 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.

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