Abstract

Scientific evidence of both constructive and destructive movements of teeth has influenced the design and selection of attachments for mandibular overdentures. Dowel designs for normal copings are reconsidered in view of the mechanical effectiveness. Coping designs for attachment overdentures provide retention, resistance to rotation, and bulk when joined with the dowel and attachment, without negating the advantage of the reduced crown-root ratio. A bar-type attachment has advantage of greater long-term retention and support over traditionally used coping overdentures. Yet, the cost of the prefabricated patterns and hygiene considerations of prosthesis still remain to be a disadvantage and a point of concern.

In this paper, two case reports of mandibular tooth borne overdentures are discussed with different types of abutment preparation and retentive mechanisms.

Key words: Overdentures, attachments, copings, bar and clip.

Introduction

Preventive Prosthodontics emphasizes the importance of any procedure that can delay or eliminate the future Prosthodontic problems. Miller (1958)\(^1\) gave special emphasis on preservation of oral tissues with support of remaining natural teeth. The use of teeth as support for dentures is aimed at reducing the load on the osseous portions of the denture bearing area and thus minimizing the process of resorption. Longitudinal studies have shown that patients wearing mandibular overdentures demonstrated less alveolar bone reduction in anterior part of mandible on comparison with conventional complete denture wearing patients.\(^2\)

The overdenture is a logical method for the Dentist to use in Preventive Prosthodontics, as it provides both: aesthetic and functional results. The ultimate objective of the Prosthodontic service is to return the patient to as near a normal function as possible and the overdenture concept achieves this.
Mechanical stabilization of dentures can be improved by incorporating the use of attachments and retentive devices along with the basic principles of complete denture design.

Heartwell classified overdentures based method of abutment preparation along with contemporary clinical terminology. Essentially, there are three different abutment categories as:

I. Non-coping
II. Coping- long, medium, short.
III. Attachments

In the first category, the selected abutment teeth are endodontically treated, reduced to coronal height of 2-3 mm and contoured to a convex or dome-shaped surface and restored with amalgam or composite filling. In the second category, cast metal copings with a dome-shaped surface are fabricated and cemented on the prepared abutments. Short copings are 2mm long and a post is attached to this type of coping. They are indicated when endodontically treated teeth are used as abutment, osseous support is limited and inter-occlusal clearance is less. Long copings are 5-8 mm long; an attempt is made to circumvent endodontic therapy by a conservative reduction of tooth and also needed is an availability of greater osseous support. The end result is a long-ellipsoid shaped coronal coping and a larger crown-root ratio. Short copings are fabricated to conform to the curvature of the alveolar ridge, with a very low profile. It is best to select abutments that are in an acceptable state of periodontal health but, often it is necessary to use teeth that are less than ideal. Abutment should have minimum mobility, have adequate bone support and be amenable to any indicated periodontal treatment. Periodontal pockets, inflammation, bony defects and poor zone of attached gingiva must all be eliminated before commencing the treatment.

Prefabricated attachments are versatile and may provide considerable retention and stability. A variety of attachments are available that range from traditional mechanical units to those in which retention is given by magnetic forces. Most attachments are secured to the abutment by a cast coping. Bar attachments provide a splinting mechanism between the abutment teeth and increase the stability and retention of the prosthesis and in turn stabilize and strengthen the abutment teeth allowing the forces of mastication to be shared by the abutment teeth. A common bar attachment assembly for overdenture is the one-piece cast bar, connecting to the copings that are luted to abutment teeth. Several bar attachment systems have been described in the dental literature. Among them, the Dolder bar and the Hader bar are most often used for overdentures. In a study it was concluded that, the more retentive the bar and the more is the stress concentrations around the abutments and the Hader bar produces less torqueing forces.

It has been rightly stated that when selecting an attachment it is essential to consider the skill of the dentist – laboratory team as well as dexterity of the patient and to use the easier system that will still improve stabilization. This article describes the issues related to the selection of natural teeth as potential abutments for mandibular overdenture and use of two different types of attachments.

**Case 1**

A 56 year old partially edentulous female patient, reported to the Department of Prosthodontics and Crown & Bridge, Mahatma Gandhi Dental College, Jaipur with a complaint of generalized sensitivity in all her teeth & inability to chew food. The patient was keen on getting full mouth restoration with removable complete dentures.

The patient was suffering from Diabetes Mellitus from 8 years and had also been taking anti-depressants along with anti-hyperglycemic medication from the past 2 years. Intra-oral clinical and radiographic examination revealed a partially edentulous condition with many teeth showing compromised periodontal status with mobility and root stumps in the posterior region indicated for extraction. A metal cantilever fixed partial denture on non vital teeth 44,45 was associated with sensitivity and needed removal and evaluation of the underlying teeth.
The treatment planning involved extraction of all teeth except 33, 44, followed by fabrication of a conventional maxillary complete denture and a tooth borne overdenture for the mandibular arch with root canal treatment & medium short copings (cast metal) with root extensions on 33, 44. The decision was also based on the economic & medical condition of the patient and thus simpler attachments were planned. After sufficient time for healing was given post extractions, a root canal treatment was done for 33, 44.

The abutment preparations were modified to receive short copings with root extensions limiting up to coronal 1/3rd of the roots. The height of the metal copings was kept 3 mm above the tooth and thus the abutment height was reduced up to 2 mm above the gingiva. With a chamfer gingival finish line the final preparation of the teeth resulted in a dome shaped abutment. Sufficient tooth structure was removed facially to make room for the coping and set up of the anterior teeth, thus ensuring a more esthetic result.

A putty–wash final impression was made for preparing the pattern for casting the metal copings with the indirect pattern technique. In a stock tray, first a putty impression (Aquasil, Dentsply) was made and a 22 gauge orthodontic wire was cut into two pieces which formed the root extensions and carried impression material into the prepared root area.

The final impression material light body consistency (Aquasil, Dentsply) was hand mixed and the two cut wires were coated with it and immediately seated in the abutments for making root impression. After the wires were stabilized the stock tray putty impression with light body was inserted for picking up the final impression with the wires embedded in it.

Final impression was poured in Type IV stone, and copings were fabricated on it. After finishing the copings were check intra-orally and cemented using GIC-Type I. An alginate primary impression was made and poured to fabricate a custom tray with a spacer for making final impression with medium body elastomer (Aquasil, Dentsply). Single stage border molding was done using putty material and wax spacer was removed. Universal tray adhesive was applied to the tray and final impression was made. Impression was poured in type III stone. Jaw relations & teeth selection was done and a try in for maxillary and mandibular complete denture was carried out. The complete dentures were processed, finished, polished and delivered.
Patient was educated about the oral and denture hygiene maintenance and home care of dentures. During final stages of the treatment & on wearing the prosthesis, the patient’s mental attitude & behavior also improved, resulting in better acceptance and compliance towards maintaining the dentures.

Case 2

A 32 year old woman was referred to the Department of Prosthodontics and Crown & Bridge, Mahatma Gandhi Dental College & Hospital, Jaipur with a complaint of missing teeth and desired to get them replaced. Patient was psychologically depressed as she was unable to eat food, since most of her teeth became loose and underwent natural exfoliation and only two teeth remained, they served no purpose. Patient also complained that as her natural teeth were lost her face appeared to have an aged appearance.

The diagnostic impressions was made and tentative jaw relations were done to check the interarch relationship, available interocclusal space and amount of reduction required in abutment height.
An alginate impression was made and cast was poured with type III stone, a custom tray with spacer of 2mm was constructed. The border molding using stick impression compound (green) was done for the mandibular arch. The wax spacer was removed; universal tray adhesive was applied and allowed to dry for 5 minutes. Carding wax was packed below the Hader bar intra- orally to prevent the impression material from entering the undercut and getting locked. A final impression was made using medium body monophase impression material (Aquasil, Dentsply).

Impression was poured in Type IV stone. The maxillary complete denture impressions were made conventionally and the jaw relations were done. A try-in of the complete dentures was done and occlusion was checked. After patient’s approval the dentures were processed and finishing, polishing was carried out. At the insertion time the clips and metal housings were fixed at the two appropriate sites of the Hader bar, petroleum jelly was applied to the bar near the clips to prevent any acrylic adhesion. The finished mandibular overdenture was slightly hollowed from the areas corresponding to the attachment clips fixed on the Hader bar. A mix of self cure acrylic resin was applied to the metal housings on the top and denture was inserted. Within one minute the mandibular denture was removed and checked if the plastic clips and metal housings had settled in the impression surface of the denture. The material was allowed to set, denture was inspected for any discrepancies and final insertion check was done. The complete dentures were delivered and patient’s facial appearance was checked which was showing as improvement by supporting the fullness of face and giving a youthful appearance to the patient.

**Discussion**

Despite recent developments in dental implantology, the conservative approach to root preservation wherever possible is still valid. In view of increased root caries rate in the elderly and lax oral hygiene habits of most overdenture wearers, placing protective copings on root abutments, when economically feasible, is the preferred method of treatment. Retention of overdentures is increased by including clip attachments between the bar joined abutments. The structure of the bar and clip articulation supplies retention to the denture and permits the denture a certain degree of freedom of movement. The attachments in overdenture hinder the destructive horizontal displacements of the denture and permit a partial load transmission onto the abutment system. In both these clinical cases, retention of the roots made it possible for mandibular overdentures in providing support, retention, stability, and comfort superior to that of a conventional complete denture. The rate of alveolar bone resorption was expectedly slowed down and preserved due to presence of natural teeth, the occlusal vertical dimension and centric relation would be maintained. The bar joint denture offers a transitional solution between the clasp removable partial denture and the complete denture. The bar-joint denture improves the emotional situation of a patient at the brink of needing complete dentures. Significantly, in both cases facial and lip changes were minimized, while the ability to eat food was
increased. Both the female patients experienced a sense of security and felt that they had comfortable set of dentures with good looking teeth leading to a much better and younger appearance.

Conclusion

Overdenture stabilization appears to be an efficient and effective long-term treatment modality in partially edentulous mandibles. Particularly in geriatric patients, this concept provides advantages in terms of handling and long-term satisfaction, permits better biting and chewing function than conventional complete dentures. Yet, routine maintenance is required to ensure successful long-term outcomes. Prevention of caries is of paramount importance, as it is the most common reason for abutment loss & treatment failure.

References