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Save the bone the overdenture way: A case series

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Abstract

Dentistry revolves around maintaining the health of the oral tissues and preserving the integrity of the dentition. The branch of prosthodontics aims at preserving what remains rather than meticulously replacing what is lost. This dictum by M. M. Devan has led to development of various treatment modalities which involve salvaging as many teeth as possible and preserving all associated structures. One of these include the concept of overdentures. It deals with providing a prosthesis to a patient by using maximum support from the tissue, bone and the remaining teeth. This article is a case series discussing rehabilitation of patients by using various types of overdenture techniques.

Keywords: overdentures, implants, bar attachment, ball attachment

Introduction

According to the FDI, oral disease affects 3.9 billion people worldwide, with untreated tooth decay (dental caries) impacting almost half of the world's population (44%), making it the most prevalent of all the 291 conditions included in the Global Burden of Disease Study. Globally, about 30% of people aged 65–74 years have no natural teeth, a burden expected to increase in the light of ageing populations^[1]. Considering these statistics, a large number of older people have seen to be left with few or no teeth which may or may not be strong enough to provide support to a removable prosthesis.

In 1856, Ledger encouraged the dental profession to leave 'stumps' under artificial teeth. Atkinson (1861) in his article on 'Plates over Fangs' also gave similar advice. During World War II, many dentists in the military service used overdentures in the treatment of inadequate or mutilated dentitions. Boos (1948), Miller (1958), Lord and Tee1 (1969, 1974), Reitz *et al.* (1977) and Welker *et al.* (1978) have all reported successful treatment with overdentures.^[2] According to the Glossary of Prosthodontics, and overdenture is defined as any removable dental prosthesis that covers and rests on one or more remaining natural teeth, the roots of natural teeth, and/or dental implants; a dental prosthesis that covers and is partially supported by natural teeth, natural tooth roots, and/or dental implants.

Rationale for retaining teeth or roots

Retention of roots and teeth for overdentures offers the patient several advantages from (a) a functional and (b) a physiological standpoint.

From the functional standpoint the benefits are good retention and stability. Support from the remaining roots helps to protect the residual ridge from force placed on the denture. The retained roots also offer assistance in stabilizing the denture as it resists lateral displacing forces.

From the physiological viewpoint, it is worth considering if the retention of teeth might conceivably offer the advantages of the preservation of the proprioceptive mechanisms associated with the periodontal membrane of natural teeth and reduced ridge resorption^[2].

Overdentures can be classified based on the vertical space available^[3]:

- Class I arch: available vertical restorative space equal to or greater than 15 mm.
- Class II arch: available vertical restorative space of 12 to 14 mm.

- Class III arch: available vertical restorative space of 9 to 11 mm.
- Class IV arch: vertical restorative space less than 9 mm.

They are also dependent on the kind of attachments used. According to retentive means the attachments can be classified into:

- frictional
- mechanical
- frictional and mechanical
- magnetic attachments^[4].

Depending on the method of fabrication of attachments:

- machine milling an alloy or precision attachments
- custom casted from plastic patterns or semi precision attachments.^[5, 6]

These attachments further include stud, bar, magnets, and telescopic attachments.

Advantages of overdentures^[7, 8, 9, 10]

- Preservation of alveolar bone
- Proprioception
- Enhanced stability and retention
- Maintenance of vertical dimension of occlusion.
- Psychological benefit of having patient's own teeth.
- It is also useful for patients with congenital defects such as oligodontia, cleft palate, cleidocranial dystosis and class III occlusion.
- Overdenture can be easily converted to complete denture over a period of time.

Disadvantages of overdentures

- Meticulous oral hygiene is required to prevent caries and periodontal disease.
- The over-denture tends to be bulkier and overcontoured.
- There is encroachment of inter-occlusal distance.
- This treatment modality is an expensive approach with frequent recall check-ups of the patient than a conventional removable complete denture^[11].

Overdenture treatment options are boundless and there are innumerable options to choose from for different cases. In this paper three cases are presented where overdenture with different attachments was given as prefabricated nylon cap post system, bar and single piece ball attachment overdenture. Each case was differently selected on the base of number of abutment teeth present, their alignment, available bone width and intra-arch space present.

Case reports

Case 1

A 65-year-old patient reported to the Department of Prosthodontics with a chief complaint of ill-fitting dentures. On examination, it was observed that the maxillary and mandibular arch was partially edentulous with root pieces present in the canine region which were endodontically treated and submerged under the denture. [Fig.1] No mobility and periapical pathology was noticed in the clinical and radiographical examination. The patient wanted a prosthesis with good retention as compared to her previous dentures.

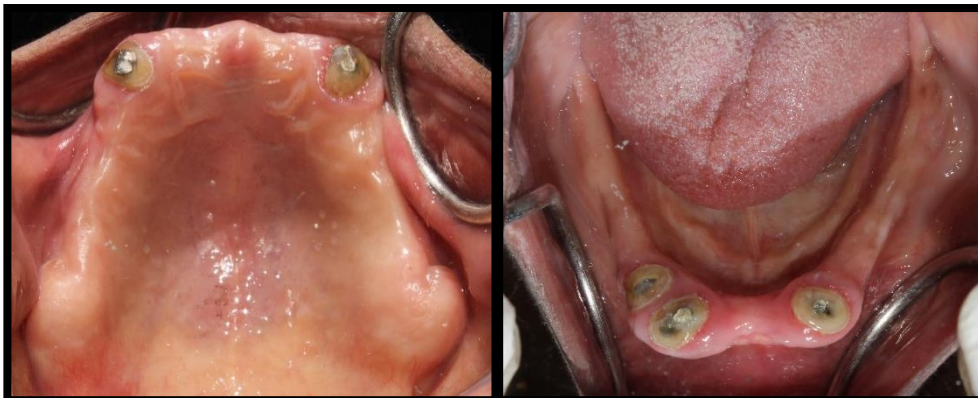


Fig 1: Pre-operative pictures

Treatment Plan

A tentative jaw relation of the diagnostic casts was done to assess the inter-arch space. It was found to be sufficient for an overdenture with intra-radicular ball attachments.

Primary impressions for the maxillary arch and mandibular arches were made with Alginate irreversible hydrocolloid. The impressions were poured and special trays were fabricated with self-cure acrylic resin. Border molding was done for both the arches with low fusing impression compound and final impression was made with light body elastomeric impression material. [Fig. 2] Following this, maxillomandibular relations were recorded and transferred onto the semi-adjustable articulator with the help of face-bow. Teeth setting was done, evaluated in the patient's mouth for

phonetics, vertical and centric relation and finally esthetics. Vertical dimension was verified and centric and eccentric contacts checked. Patient's approval was taken, and the curing of the final denture was done in heat-cure acrylic resin. The root pieces with 13, 23, 33, 43 were prepared to accept a prefabricated post with a ball attachment (EDS AccessPost Overdenture). The intraradicular posts were cemented using resin modified glass ionomer cement, the denture was relieved in this area, delivered to the patient and post insertion instructions were given. [Fig. 3, 4] After a period of 24 hours, the nylon caps were picked up in the maxillary and mandibular dentures with the help of autopolymerizing resin. [Fig. 5]

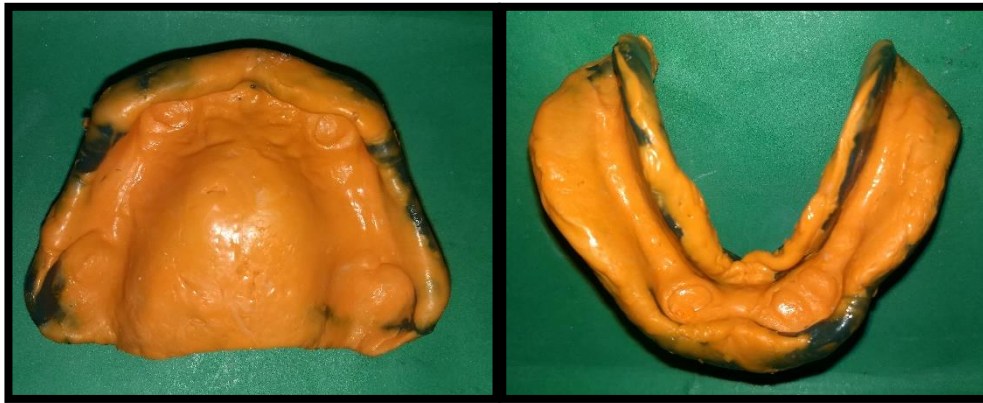


Fig. 2: Final impression



Fig. 3: Processed denture



Fig. 4: Cementation of prefabricated post with a ball attachment



Fig. 5: Nylon caps picked up in the dentures.

Case 2

A 70-year-old patient reported to the Department of Prosthodontics with a chief complaint of missing teeth. On

examination, it was observed that the maxillary arch was completely edentulous and mandibular arch was partially edentulous with canines present which exhibited Grade III

mobility. The patient wanted a prosthesis with good retention and ease of handling.

Treatment Plan

A tentative jaw relation of the diagnostic casts was done to assess the inter-arch space. It was found to be sufficient for an overdenture with ball attachments. The canines were extracted

and primary impressions for the maxillary arch and mandibular arches were made with Alginate irreversible hydrocolloid. After border molding and final impressions were made [Fig. 6], jaw relations were recorded and a trial denture was fabricated and evaluated in the patient's mouth for phonetics, vertical and centric relation and finally esthetics. After

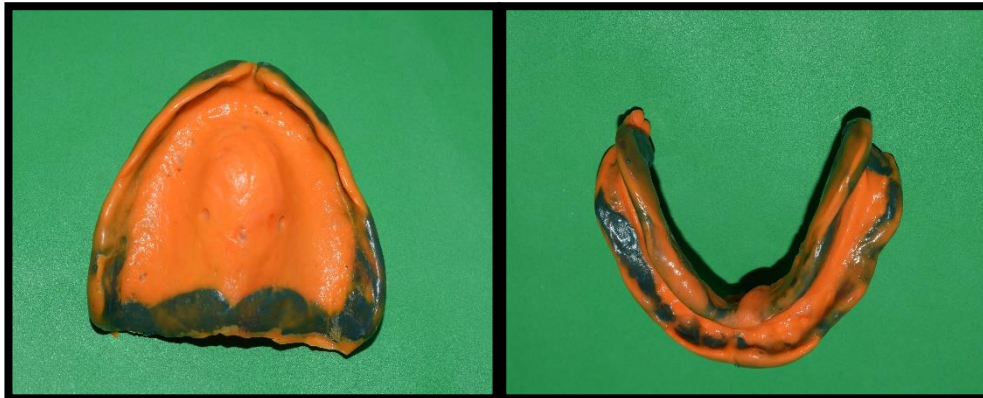


Fig. 6: Final impression



Fig. 7: Processed denture

the denture was fabricated, [Fig. 7] it was duplicated and used as a stent to plan the placement of two ball head single piece implants in the canine region. The implants were placed and the denture was relieved and relined with a soft lining material. After a period of three months, the implants were evaluated for osseointegration. [Fig. 8] A metal housing was picked up along with an O-ring in the denture using an autopolymerizing resin. [Fig. 9]



Fig. 9: A metal housing picked up along with an O-ring in the denture



Fig. 8: Single piece implants with ball head attachments placed

Case 3

A 48-year-old patient reported to the Department of Prosthodontics with a chief complaint of missing teeth. On examination, it was observed that the maxillary arch was completely edentulous and mandibular arch had two implants placed with a bar attachment present. [Fig.10]

Treatment plan

After border molding and final impressions were made, jaw relations were recorded and a trial denture was fabricated and

evaluated in the patient's mouth for phonetics, vertical and centric relation and finally esthetics. After fabrication of the denture, [Fig. 11] plastic retentive clips were picked up in the mandibular denture using autopolymerizing resin. [Fig. 12]

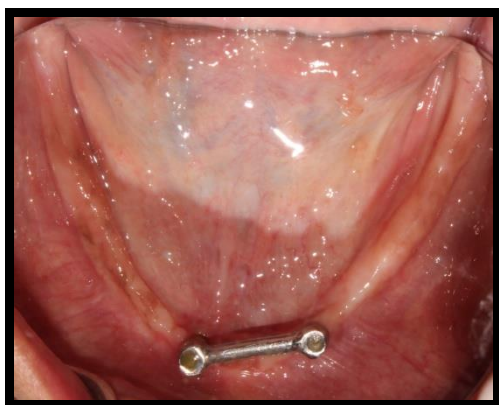


Fig. 10: bar attachment on implants



Fig. 11: Processed final denture



Fig. 12: Retentive clips in the final denture

Discussion

The idea of losing all teeth can be very disturbing for a patient. It has a psychological effect on the patient's well-being and appearance. In such conditions, the option of overdentures as a preventive prosthodontic treatment modality should be considered because of its innumerable advantages. Crum and Rooney [12] observed that an average loss of 0.6 mm of vertical bone occurs in the anterior part of the mandible of overdenture patients through cephalometric radiographs as opposed to 5.2 mm loss in complete denture patients in a 5 years study.

Miller [13] showed through his study that alveolar bone resorption depends upon three variables:

1. The character of the bone.

2. The health of the individual.

3. The amount of trauma to which the structures are subjected.

Overdenture helps reduce resorption of surrounding bone and reduces pressure on the alveolar ridge. It helps in maintaining proprioception, directional sensitivity, dimensional discrimination, canine response and tactile sensitivity.^[14] Rissin *et al.* in 1978 compared masticatory performance in patients with natural dentition, complete denture and overdenture. They found that the over-denture patients had a chewing efficiency one-third higher than the complete denture patients^[15].

Overdenture with attachments can redirect occlusal forces away from weak supporting abutments and onto a soft tissue or redirect occlusal forces toward stronger abutments thereby resulting in superior retention.^[16] Attachments are often used in overdenture construction by either connecting the attachments to cast abutment copings or intra-radicularly.

For the first case, access posts were chosen. Access posts occupy a small vertical space and the male units on the different roots do not require parallelism.^[17] The ball and socket attachment of Access post allows rotation of the denture attachment. Small head of the attachment limits the amount of material that has to be removed from the denture and thus the strength of the denture is not jeopardized. The technical work can be carried out easily chairside^[18, 19, 20].

A similar principle works in the second case where single piece ball head implants were placed in order to enhance the retention of the denture. For the third case, there was sufficient inter-arch space, so the use of the customized bar joint with snugly fitting plastic sleeve offers increased stability and retention. As the bar is close to the alveolar bone, forces of mastication exert much less leverage to the implants. The bar joint offers slight vertical and rotational movement of the denture as well as a stress breaker action. Bar exhibits more cross-arch involvement and allows occlusal forces to be shared between the abutments.^[21] Since there was adequate inter arch space, so the thickness of the acrylic denture over the copings and bar assembly was not compromised. Customized Bar assembly calls for perfection both at the dentist and technician level, so it is challenging to execute, but the results are worth the effort.

In cases with limited interarch space, reinforcement of the denture base with metal framework adjacent to the top of the coping would be effective in reducing overdenture fracture due to reduced thickness of acrylic resin because of the bulkiness of the bar assembly.^[22] Thus stress is reduced in the midline of the overdenture and around the copings, functional rigidity was improved. Occlusal stress to the underlying denture-bearing areas gets distributed evenly.

The success of the overdenture treatment depends upon the proper attachment selection for the particular case. Various factors for attachment selection include available buccolingual and inter arch space, the amount of bone support, opposing dentition, clinical experience, personal preferences, maintenance problems, cost and most important being patient's motivation. The decision must first be made to retain the teeth or location of the implants as overdenture abutments and then the attachments should be planned. The attitude of the patient to the treatment should be assessed. Only those who understand the limitations and benefits of attachments should be treated with attachment retained overdentures. Hence, patient selection is critical to the success of the treatment.

An overdenture is very much at the forefront as the treatment modality incorporating Preventive Prosthodontics concepts to the core. It helps to promote the idea of preservation of what is remaining rather than meticulous replacement of what is missing.

Conclusion

The concept of overdentures has been around for a century. It has allowed for preservation of teeth till their very "last breath". With the advent of implant technology, implant supported overdentures have become a go-to procedure for patients without any teeth. It gives a second chance for such patients for an attempt at preservation of the bone by retarding the resorption process. Thus, we can work with the basics hand in hand with the latest trends in treatment modalities and to save the bone, the overdenture way.

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