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A simple and innovative low cost technique for fabricating magnet retained overdentures- A case report

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Abstract

Various attachments have been used in overdentures to increase the retention. Application of rare earth magnets such as Sm-Co and Nd-Fe-B, for improving retention have been widely used in the field of prosthodontics, as they can be manufactured in small dimensions as retentive devices for complete dentures, removable partial dentures, obturators and maxillofacial prosthesis. However they are expensive as these attachments are not manufactured locally, so they increase the cost of treatment hence cannot be afforded by all patients. This article presents a simple and cost-efficient method of fabricating mandibular over denture retained by magnets in a patient whose mandibular residual ridge was severely resorbed with few remaining teeth and opposed by maxillary conventional removable partial denture.

Keywords: Overdenture, tooth supported, magnet-retained, retention, stability.

1. Introduction

Edentulous patients have always been the biggest challenge for all Prosthodontists. It is the prime reason which promoted the development of dental implants [3].

The majority of problems arise with the mandibular complete dentures, as the anatomy of the mandible often fails to provide adequate support, retention and stability. In an attempt to help these patients, a variety of retentive aids and materials have been tried such as springs, suction cups, adhesives, implants of various types, and magnets [4].

The concept of preserving remaining roots and covering them with denture base has been used since more than a century ago [2]. Overdentures have gained popularity and are found highly effective in the mandible. As the crown /root ratio is improved, prognosis of remaining teeth also becomes more favorable, also the presence of a healthy periodontal ligament helps to maintain alveolar ridge morphology. Tooth-retained overdentures help reduce the impact of some of complete denture wearing consequences: residual ridge resorption, loss of occlusal stability, undermined esthetic appearance, compromised masticatory function [3].

Dental magnetic attachment systems have been increasingly utilized in prosthodontics due to the development of hard magnetic substances such as samarium-cobalt and iron-neodymium-boron magnets ($Fe_{14}Nd_2B$) [5, 6]. Conventional overdenture placement involves embedding the magnetic assembly in the denture base and inserting its corresponding keeper into the abutment root. The magnetic assembly holds the keeper with a retentive force [7]. Even though it resembles a complete denture externally the combination of periodontal and mucosal support in the prosthesis is what that makes overdentures special. In addition to retention and support that can be gained from the retained roots, overdentures are actually superior to conventional complete denture in biting force, chewing efficiency and force discrimination. Healthy retained roots are natural implants and although some may have limited length of usefulness, using them will improve the quality of patient lives. The present article demonstrates the rehabilitation of partially edentulous patient with the help of magnetic assembly mandibular overdenture and maxillary conventional removable partial denture using innovative and low cost materials.

The advantages of magnetic attachments are

1. Magnetic attachments are shorter compared to mechanical attachments so can be used in cases of reduced inter-arch space ^[4].
2. They can be used in moderately nonparallel abutments since they do not follow a particular path of insertion ^[5].
3. Laboratory procedures associated with castings are not necessary
4. They are more resilient and allow for free movement of the prosthesis.

Disadvantages are

1. Attachment needs to be removed before taking magnetic resonance imaging because it causes streaking.
2. Less retention, when numbers of abutments are relatively few, retention is not as good as when ball attachments are used.
3. Heating during sterilization leads to decrease in retentive forces in long-term use ^[5].

Case Report

A 45 year old woman was referred to the department of Prosthodontics at Chandra Dental College and Hospital, Barabanki with the chief complaint of difficulty in chewing due to missing teeth.

Extraoral examination showed tapered facial form, concave profile, mouth opening was adequate. Mandibular movements were smooth with normal TMJ. Intraoral evaluation revealed partially edentulous maxillary arch and partially edentulous mandibular arch. Remaining teeth in the mandibular arch (33, 44) were vital and periodontally sound and moderate resorption was recorded in relation to bilateral mandibular posterior ridge. In the maxillary arch teeth present were (22,21,11,12,13 and 17).

Patient was made aware of the clinical condition and she was willing to preserve the remaining teeth as long as possible, but as she had limited income she could not afford expensive treatment.

Clinical Procedures**Endodontic treatment and abutment teeth preparation for mandibular teeth**

Abutment teeth (33, 44) were endodontically treated and prepared with diamond rotary instruments, reduced slightly above the gingival margin (2mm), followed by removal of two- third of the root canal filling material with a rotary drill instrument (pees- reamer) to prepare the post space to accommodate the post and copings.

Fabrication of magnetic copings

For (33, 44) canals were prepared for magnetic copings. Inlay wax was used to make impression for the post space. After recording the post space., pick – up impressions were made in polyvinyl siloxane impression material. Cast was poured using cold cure resin (as the model kept breaking when using die stone).

Since the patient was of low socio-economic status, it was decided to utilize a novel and low cost alternative approach. The copings were fabricated by melting and casting an old 1 rupee coin as the alloy was found to be highly magnetic as well as corrosion resistant too. The customized post and core magnetic copings for (33) and (44) were checked for their final fit.

Try –in, and definite impression of mandibular arch

The copings were place parallel to the occlusal plane after

their final try- in the final cementation was done with glass ionomer cement. After the cementation border moulding was done and the final impression was made in polyvinyl siloxane impression materials and definite cast was poured.

Now occlusal rims were fabricated on definitive upper and lower cast. Jaw relation, teeth arrangement and try- in was done. After the approval of try - in by the patient, the dentures (Upper Removable Partial Denture and Lower Complete Denture) were processed using Heat cure acrylic resin. The waxed up dentures were flaked and dewaxing was done.

Placement of magnets in the denture

Lowcost refrigerator magnets bought online from Amazon were used in this case (Best Price Ever 100 Pieces of 5mm X 1mm Magnets Nickel Coated Round Premium Brushed Refrigerator Magnet for Science and School Projects). The size selected was 5 mm X 1 mm to be small enough to be incorporated easily during wax-up of the denture.

The magnets were placed on the top of the magnetic copings on the master cast with little bit of adhesive after dewaxing, to stabilize and fix them in proper position to coincide with both central axes of the copings, and heat cure resin was packed into the mould and cured.

The dentures were deflaked and carefully trimmed and polished, the dentures were then inserted in patient's mouth and the necessary adjustments were made.

Border extensions and occlusion were checked and adjusted, after polishing, the dentures were again placed intra-orally and checked for comfort, occlusion and retention. The patient was instructed on how to wear and remove the denture, and its care. Patient was recalled after 24hrs, after 7 days for follow up. On recall it was observed that patient was satisfied with her new dentures and was able to masticate properly.

Discussion

Despite the many advantages of implant supported overdentures, they too have limitations.

Patients who could benefit from implant therapy may reject them due to fear of oral surgery or other psychological issues ^[4]. Cost plays a major role for some patients, systemic diseases can restrict operative procedures, and a long duration of treatment is undesirable, especially for the elderly ^[5].

Furthermore, the dimensions of standard implants limit their use, particularly in cases involving narrow ridges ^[6].

Dental magnetic assembly of various types and sizes are commercially available, these systems although excellent are all imported hence expensive. In a developing country like India most patients will be unable to afford them. These systems, consisting of a magnet and a keeper, used to retain removable complete and partial dentures and maxillofacial prosthesis. Magnetic system can also be used in an implant supported overdenture, with magnets incorporated into the denture acting upon the keeper attached to the implant abutments.

Advantage of intra oral magnets include easy incorporation into the denture involving simple clinical and technical procedures, ease of cleansing, ease of placement for both dentist and

Patient ^[5]. There are typically useful for patient with restricted interocclusal space, can also accommodate a moderate divergence of alignment between two or more abutment and dissipate lateral functional forces. On the other hand, poor corrosive resistance of magnets within oral fluid requires encapsulation within a relatively inert alloy such as stainless steel or titanium ^[8].

Early attempts at using magnets for denture retention were unsuccessful, mainly because of the large size of magnets at that time and the inadequate forces that they provided. However, since the introduction of rare earth magnets such as Sm-Co and Nd-Fe-B it has become possible to produce magnets with small enough dimensions to be used in dental applications and still provide the necessary force.

Magnetic attachments used to retain dentures are typically shorter than mechanical attachments, which is particularly useful for patients with restricted Interocclusal space and challenging esthetic demands. Magnetic attachments can also accommodate a moderate divergence of alignment between or more abutments, since they do not depend on a particular path of insertion; in this respect, magnetic attachments are unlike most mechanical attachments, which generally require minimal divergence for best function. Furthermore, patients with physical disabilities such as those experienced by frail older adults, have reported that magnet-retained dentures are relatively easy to place and remove [9, 10].

In this case a novel low, cost approach was tried due to the low socio-economic status of the patient. Instead of using a commercially available system we improvised using the alloy of a 1 rupee coin for casting the coping/keeper and used generic refrigerator magnets bought online. Since the alloy of

the coin used for the coping/keeper itself is magnetic there is no risk of loss of magnetism over time also it is corrosion resistant, similarly the refrigerator magnets are available in packs of 100 hence they will be very easy and cheap to replace if required. The results so obtained were quite satisfactory with good retention and stability observed in the prosthesis. The patient has been using the denture since past 1 year without any complaints.



Fig 1: Post space and tooth preparation done i.r.t. 33, 44

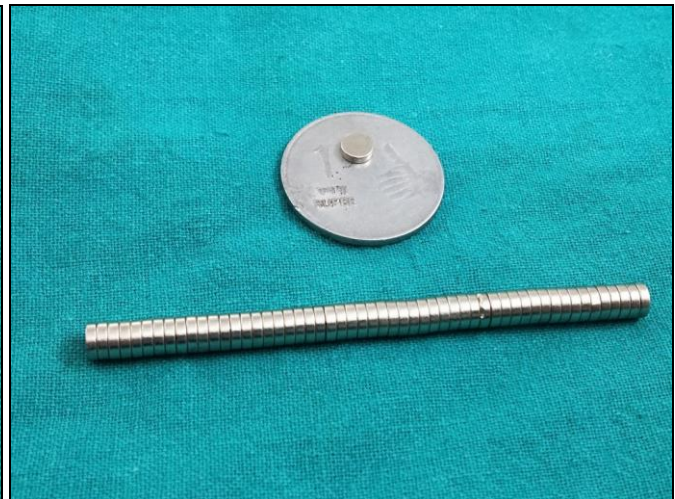


Fig 2(a, b) 1. Rupee coin Used for Fabricating the Magnetic Copings and Refrigerator Magnets 5x1mm size



Fig 3: Magnetic copings fabricated



Fig 4: Copings cemented in mouth



Fig 6: Jaw relations recorded



Fig 5: Final impressions made



Fig 7: Magnets placed and stabilized on top of copings after Dewaxing



Fig 8 (a, b): Final dentures after finishing and polishing



Fig 9(a b): Dentures inserted

Conclusion

In this case we successfully rehabilitated the patient at a fraction of the cost when compared to overdenture with implants, when cost and time factors were considered. Magnet retained overdenture preserving natural teeth has better proprioception and satisfaction, and also is psychologically beneficial as the patient had not undergone extraction.

Overdenture treatment thus achieves much greater satisfaction, retention, stability and effortless removal and reseating of the denture than conventional dentures. Since in this case we used a low cost alternative approach in this case replacing the components will be very inexpensive and easy in the future.

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