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International Journal of Current Research
Vol. 9, Issue, 12, pp.62051-62056, December, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

MAGNET RETAINED MANDIBULAR OVERDENTURE: A PREVENTIVE PROSTHODONTICS PARADIGM - A CASE REPORT

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ARTICLE INFO

Article History:
Received 28th September, 2017
Received in revised form
19th October, 2017
Accepted 12th November, 2017
Published online 25th December, 2017

Key words:
Overdenture,
Magnetic attachments,
Rare earth magnets,
Preventive Prosthodontics.

ABSTRACT

Prosthetic rehabilitation of patients with completely edentulous arches especially in mandibular arch is challenging. Over denture has been the choice of treatment modality in these patients due to the advantages associated with it mainly in the form of improved proprioception, enhanced retention, support and stability. Apart from better retention, overdenture are also superior in biting force distribution and chewing efficiency than conventional dentures. What makes the overdenture special is the combination of mucosal and periodontal support. Preservation of healthy retained roots in overdentures acting as natural implants improves the quality of life of patients. New innovative techniques in over denture treatment modality incorporates various attachments in abutment tooth to enhance retention with intraoral magnets being one of them. In patients of over denture, removable partial denture, obturators, maxillofacial prosthetics magnets are used as retentive aids as they can be manufactured in small dimensions. Attached magnets to the remaining root structure transfers no detrimental lateral forces to the supporting element as they transfer the occlusal load to the bone through periodontal ligament of the remaining root. In this article fabrication of conventional maxillary denture and magnet retained mandibular overdenture is discussed.

Citation: Dr. Abhinav Gupta, Dr. Gaurav Singh, Dr. Shakeba Quadri and Dr. Bhumika Kapoor, 2017. "Magnet retained mandibular overdenture: a preventive prosthodontics paradigm-a case report", *International Journal of Current Research*, 9, (12), 62051-62056.

INTRODUCTION

Edentulism is very common throughout the world; there are millions of people who are edentulous**.** According to the World Health Organization (WHO) criteria edentulous people comes under the category of physically impaired as they have lost a body part, up to 32 body parts to be exact (Bouma *et al*., 1987; Feine *et al*., 2002)**.** Mastication becomes more difficult with reduced tooth number**.** Because of these reasons oral impairment occurs, patients are more likely to practice restriction of diet and avoidance of food, in particular foods that are difficult to chew like hard and fibrous foods (Osterberg *et al*., 1982; Sheiham *et al*., 1991). In completely edentulous patients a continuing problem for dentists in clinical practice is obtaining an adequate retention and stability, especially this problem is associated with mandibular prosthesis due to the anatomy of mandible (Rutkunas, 2004; Saha *et al*., 2009). Sequelae of complete edentulism are loss of discrete tooth proprioception , progressive loss of alveolar bone, the loss of patient's self-confidence is the most depressing sequel (Renner *et al*., 1984). To improve the oral function in these debilitated patients use of overdenture has been be a treatment modality since long. "Perpetual preservation of what remains is more important than the meticulous replacement of what is missing" famous saying of De Van still rings true (Dhir, 2005). Treating and preserving several strategic teeth (overdenture) which can groove critical support to the prosthesis is better preventive treatment modality as it delays process of resorption because of the preserved periodontal ligament in comparision to extracting all remaining teeth and providing complete denture to these patients, also increased masticatory efficiency and improved denture foundation area is seen with the use of overdenture. Variety of different attachment systems that have been used to retain mandibular overdenture and proven both clinically effective and predictable results stud attachments, bar attachments, bar with clips, o ring attachments, and magnetic attachments. It has been shown that splinted attachments are more cumbersome to clean and are more technique sensitive than the non splinted solitary attachments (Cune *et al*., 1994). Due to the simple application of stud and magnetic attachments they have gained a wide popularity in clinical practice. The choice of attachment is an important factor, and usually, the choice is based according to certain criteria like number, distance, and location of the remaining natural teeth (Gilboa, 2009; Brkovic-Popovic *et al*., 2008) or at the discretion of the prosthodontist on his clinical experience.

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The introduction of rare earth- alloys like cobalt magnet has been used recently and its superior magnetic properties with a high field strength and an intrinsic coercivity many times than that of earlier alloys have increased the potential for its use in a prosthesis. The authors have shown that the recently developed hard magnetic samarium-cobalt @m-Co) magnet, is the best of the rare earth-cobalt magnets, can be used as a dental material (Tsutsui *et al*., 1979), and they can be reduced to the size range of millimeters which allowed there use for obtaining retention of maxillofacial prostheses, sectional dentures, and overdentures (Sasaki, 1976; Sasaki *et al*., 979). Denture retention element and a detachable "keeper" are the two components of magnetic retention unit. After the post preparation of tooth detachable keeper element which comes in the form of disk is fixed to tooth and the magnet which is the denture-retention element is cured into the overdenture base so that it grips the keeper element in the root magnetically with a force of approximately 250 gm. External magnetic field is eliminated by this magnet-keeper arrangement also almost doubles the retentive force. The size and shape of the retention and keeper elements to be used were dependent on requirements of retention, simplicity of manufacture, and ease of clinical application (Gillings, 1981). Thus use of overdenture comes under preventive prosthodontics which emphasizes the importance of any procedure that delay or eliminate the inevitable problems. Preserving the roots is an effective way to improve prosthesis retention and support (Pavlatos, 1998) and enhance patient quality of life (Morrow, 1978). This clinical report describes the fabrication of magnetic attachment supported mandibular overdenture and conventional maxillary complete denture to rehabilitate the patient.

Case Report

A 56 yr – old man reported to the clinic with chief complaint of difficulty in chewing ad mastication and replacement of missing teeth. Medical history of patient was non contributory. Dental history revealed history of edentulism since last 3 yrs due to gum disease. Intraoral examination revealed completely edentulous maxillary arch. Mandibular arch presented with bilateral mandibular canines (Fig 1).

Fig 1. Preoperative completely edentulous upper and partially edentulous lower arch

Periodontal condition of these mandibular canines was sound enough to justify its use as abutment for overdenture. While the mandibular ridge was moderately resorbed posteriorly, maxillary residual ridge revealed favorable palatal form with adequate bone height and width, to fabricate a conventional maxillary denture opposed by mandibular overdenture. Extraoral examination revealed healthy temporomandibular joints (Fig 2).

Final treatment plan was discussed with the patient after clinical and radiographic evaluation (Fig 3). Proposed treatment plan included mandibular overdenture supported by magnetic attachment assembly on mandibular canine and conventional maxillary complete denture.

Fig 2. Extraoral features

Fig 3. OPG of patient

Clinical procedure

Endodontic treatment

After taking the informed consent from patient, endodontic treatment of abutment teeth 33, 34 was done. This was followed by post space preparation for attachment of keeper into the canal, root canal filling material was removed by rotatry drill instrument (peeso reamer; Dentsply), leaving one third of the gutta percha in the apical portion of root canal. (Fig. 4). The tooth was reduced in size, slightly above the gingival margin (2mm) for more favorable crown root ratio. (Fig . 5,6) Dyna Spiral drill was used to drill a shaft in the root, and seat was prepared by using Dyna seat drill to anchor the keeper into radicular space. (Fig 7, 8, 9). Before cementing the keeper into prepared canal fit of the keeper and its parallelism was evaluated after adequate space was created on mandibular

canines bilaterally. The keeper was then cemented into root space using self adhesive resin cement (RelyX^{TM} U200). (Fig 10)

Fig 5, 6. Mandibular abutment teeth preparation post space preparation, tooth preparation

Fig 7, 8, 9. Seat drill and spiral drill used to prepare the seat area

Prepration of the denture component impression procedure

First primary impression was made for both mandibular and maxillary edentulous arches and diagnostic models were made. (Fig 11) On the diagnostic model, custom tray was fabricated to record border moulding and make final impression. Border moulding was done with green stick compound for both maxillary and mandibular arch. Final impression was made by using zinc oxide Eugenol (Fig 12,13). Temporary record base and occlusal rim was fabricated on the master cast to record the jaw relations. Maxillomandibular relation record was then transferred to hanau articulator and teeth arrangement was done (Fig 14). Centric occlusion and esthetics were verified at the try in stage (Fig 15). After verification using the conventional method of processing denture was cured. To freely incorporate the female magnetic component into the intaglio surface of the lower denture, intaglio surface of canine area was relieved (Fig 16). Before fixing the magnetic assembly all interceptive occlusal contacts were eliminated.

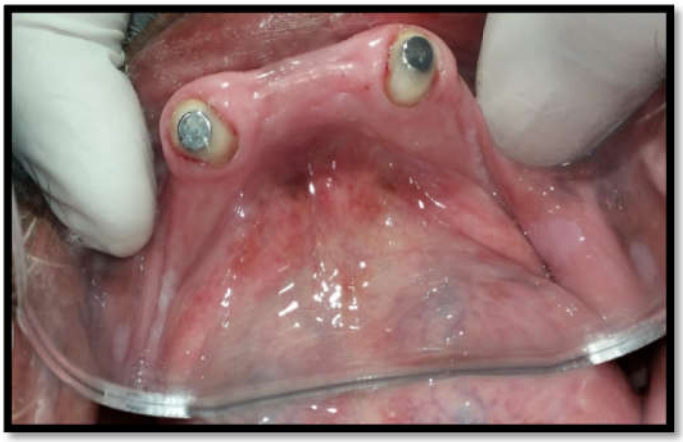

Fig 10. Keeper cemented in the mandibular canine

Fig 11. Primary diagnostic impression and diagnostic model of mandibular arch

For securing the attachments on the tissue surface of the mandibular denture autopolymerizing resin was used. Cavity prepared on the intaglio surface of the denture was filled with autopolymerizing resin to pick up the magnetic attachment assembly. Denture was then inserted in the patient's mouth and asked to occlude in centric (Fig 17). Trimming and finishing of the excess resin was performed after removing the denture from patient's mouth. After polishing of the denture, final prosthesis was inserted into patient's mouth (Fig 18). Patient was recalled for post insertion checkup after 4 hrs.

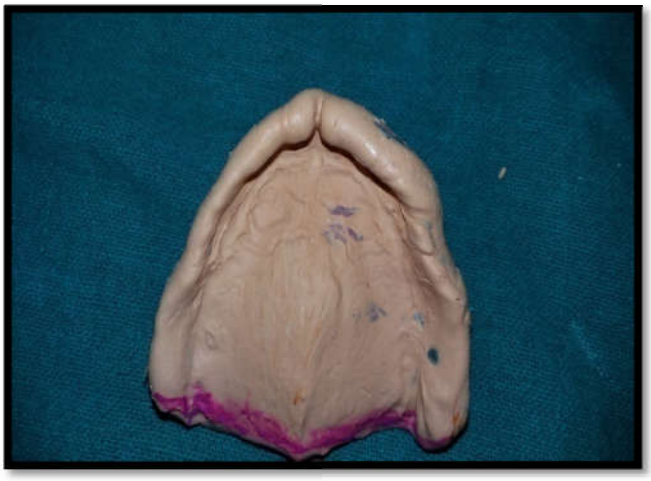

Fig 12. Border moulding and final impression of maxillary arch

Fig 13: Mandibular final impression

DISCUSSION

According to the reports in literature occurrence of periodontal disease and dental caries are very common, which ultimately leads to mutilated dentition. Strategic preservation of abutment teeth and covering them with denture base can greatly improve the final treatment results in terms of stability, support and retention of denture (Brewer, 1980; Verma, 2013). Advantage of preserving the natural teeth for overdenture is preservation of sensory inputs from the periodontal mechanoreceptors, muscles of mastication and thereby the cyclic temporomandibular joint movements are activated by the proprioceptive feedback mechanisms.

Fig 14. Teeth arrangement on hanau articulator

Fig. 15. Try in of the denture in patients mouth

To overcome the problems of retention associated with the conventional complete denture, attachment retained overdenture has become an integral part of prosthodontic treatment as an alternative treatment modality.

Fig 16. Intaglio aspect of lower denture

Fig 17. Denture placed in mouth and patient asked to occlude in centric

Fig 18. Final denture inserted into patient's mouth after polishing

Canine tooth because of its large root with a greater periodontal area for attachment and also due to its localization in the transition area between anterior and posterior teeth is the best tooth to be preserved for overdenture case. In this article, fabrication of overdenture using magnets was discussed**.** Dyna Direct magnetic attachment system was used in this case. The system consists of:

- Prefabricated keepers in two types, Ø4, 8 (standard) and 4 mm, produced from precious Dyna EFM alloy 4, 5, 6, 7, 8.
- Powerful, biocompatible mini magnets supplied in different types.
- A Spiral drill, a seating drill and an application instrument.

A chair-side magnetic attachment for both partial and full overdentures supported by natural elements. It can be applied directly by the dentist and is very easy to use. It resembles pre-fabricated core-post systems. After endodontic treatment the abutment tooth is decoronated and the final preparation made with two drills supplied together with the system. The Dyna Direct keeper is cemented with resin cement and finished with a composite. Then the magnet can be fixed into the denture. Compared with other attachments used in overdenture cases, use of magnet had many advantages. Magnetic system was time saving, simple, economical in terms of maintenaince. As for overdenture fabricated with attachments, abutments must be in same plane for attachments. Conventional ball attachments cannot be used in cases of non parallelism and diametric assemtry of the abutments. If attachments were used in such conditions where there is no parallelism between abutments, wear of the elastic housing may occur, which needs to be changed periodically. Resorption of the bone due to stress concentration around the abutment tooth can also occur and leading to fracture of root. Magnets by itself exert no deleterious effects in the tissues, since they are biocompatible in human body. Inert magnetic field is also harmless to the human body. In patients with cardiac pacemaker magnetic attachments can also be used, but magnets must not be brought closer than 1cm during trial procedures (Hiller *et al*., 1955). Patient recall and follow up for maintenance plays an active role in prosthesis success rates.

Conclusion

Magnetic retained overdenture is one of the best alternative treatment modality available for the edentulous condition. Despite recent developments in clinical implantology, the conservative approach of root preservation is still valid providing proprioception and a cheaper alternative to enhance retention, support , stability. For the attachment system to be successful in long run, oral hygiene instructions must be given to the patient with reinforcement of the same has to be done.

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