ATTACHMENT RETAINED OVERDENTURES-A PREVENTIVE PROSTHODONTIC CONCEPT THAT NEEDS RENAISSANCE

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ABSTRACT
Prosthetic dentistry is one of the fundamental pillars of dentistry. The most important step in prosthetic prophylaxis is the prevention of causes leading to tooth extraction. In presence of natural teeth, occlusal forces in the form of tensile stress are transferred to the alveolar bone thereby stimulating additional bone formation. Tooth supported overdenture has been a proven mainstay of conservative prosthodontic treatment. Despite the recent developments in dental implantology, overdenture is considered as versatile and conservative means of achieving long term restoration. They are superior to the conventional complete denture in terms of esthetic and functional efficacy and have a big impact on a person’s psychological well being. Various aids in the form of attachments are used for the fabrication of overdentures to achieve improved retention. Irrespective of the type of attachment used primary objective should be to provide cost-effective treatment with the best functional efficacy. This clinical report describes a novel method of fabricating tooth-supported maxillary overdenture retained with custom made ball attachments using orthodontic separators as a female component and mandibular overdenture retained with prefabricated magnet attachments.

KEYWORDS – Over-denture, Attachment, magnet, MAGFIT, root keeper, orthodontic module.

INTRODUCTION
Prosthodontics is a broad dental specialty catering to a wide range of oral rehabilitative treatment\(^1\). It is not only a knowledge-based specialty but also a skill-based specialty, which has continuously evolved over the years due to advances in biomaterials, clinical and laboratory techniques\(^2\).

As the elderly population increases, their need for dental treatment also increases\(^3,4\). Once the tooth is extracted, bone resorption gets initiated. Modern prosthodontics in the form of dental implants can be an excellent solution to oral rehabilitation but they cannot be superior to a healthy natural tooth. The healthy retained root can itself serve as a natural implant. The Last two decades of literature on implant prosthodontics are increasing exponentially and if this continues it is predicted that there would be slack of literature on conventional prosthodontics in the years to come\(^5\).

Overdentures are superior to the conventional complete denture in many aspects. Also, technical advancements in the form of attachments have greatly increased the retention stability and support of overdenture when compared with conventional complete denture prepared on abutment teeth. The concept of overdenture may not be a catholicon but it delays the process of complete edentulism\(^5,6,7\). This case report describes step by step fabrication of tooth-supported overdenture using prefabricated magnet attachments on the mandibular arch and custom made ball attachments on the maxillary arch where male and female attachments were fabricated by using an innovative method, fulfilling the criteria of preserving the periodontium and the alveolar bone.

CASE REPORT
A 50-year-old man reported to the Department of Prosthodontics and Crown and Bridge of College of Dental Sciences, Davangere with a chief complaint of difficulty in mastication. Intraoral examination revealed multiple missing teeth in both maxillary and mandibular arch, presence of decayed teeth as well as those with poor
periodontal health. There was no relevant medical history that could affect the prostodontic therapy. By taking into consideration the prognosis of remaining teeth, different treatment options were given to the patient. Treatment options available for this patient were - extraction of the remaining teeth followed by a conventional complete denture, implant-supported overdenture, or tooth-supported overdenture. The patient rejected the option of an implant-retained prosthesis because of the need for additional surgery, the longer duration of the treatment phase, and related expenditure and opted to improve the masticatory function by retaining the sound natural teeth. Diagnostic impression and mounting were made and after taking into consideration the health of remaining teeth, oral hygiene maintenance, and amount of vertical space available for the selection of attachments, it was planned to construct a maxillary tooth supported overdenture with customized ball attachments and mandibular tooth supported overdenture with magnet attachments. The treatment plan was explained to the patient and the required consent was obtained from the patient for the proposed treatment.

Treatment Procedure

Surgical therapy

Following clinical and radiographic examination, it was decided to retain 15 and 25 in the maxillary arch and 34 and 44 in the mandibular arch respectively, and all other remaining teeth were extracted (Figure 1 a,b).

Endodontic therapy

Since overdenture prosthesis requires sufficient reduction of clinical crown, intentional endodontic therapy for the selected abutment teeth was done. An interval of 2-4 weeks was given before commencing prostodontic therapy to ascertain successful endodontic therapy.

Prosthodontic therapy

For the maxillary arch - Post space preparation was done up to 2/3 rd of the length of the canal by removal of root canal filling material with the help of low speed peeso reamer and canal shaping was done. Displacement cords were placed to accurately reproduce the intra crevicular margins. Inlay wax (BEGO, Germany) was used for the fabrication of post coping pattern by a direct-indirect method. Sectional pick up impression carrying post coping pattern was then made with addition silicone impression material (AQUASIL, Densply) using double mix single impression technique (Figure 2a). The impression was poured with type IV die stone material (ELITE ROCK, Zermack) and post coping pattern was completed in the laboratory.

A small plastic bead of 1.5 mm was used for customizing the male component of the ball attachment. The Diameter of the bead was in accordance with the diameter of orthodontic separators (American Orthodontics, North America) to be used. Bead was attached to inlay wax post coping pattern (Figure 2b) and casting was done using Ni-Cr base metal alloy (WIROCER, BEGO, Germany). Surveyor was used for assessing the parallelism of the beads before casting.

The customized post with cast coping and ball attachment was finished and polished and checked for its final fit. Confirmatory radiograph was taken following which the cementation of the same was done using type 1 GIC cement (GC Fuji I, GC America Inc., USA) (Figure 2c).
For the mandibular arch- It was decided to fabricate magnet retained overdenture. Dental magnetic systems of various types and sizes are commercially available in the market. In this case report, we chose to use MAGFIT RK-DXFS (Magfit root keeper; Aichi Steel Corp.) as an attachment to be used for the overdenture fabrication, selected according to the cross-section of the retained roots. The height and diameter of the magnetic assembly and the keeper are shown in the figure (Figure 3).

Figure 3 : Dimensions of MAGFIT RK - DXFS

Post space preparation of abutments was done similar to maxillary abutment teeth after considering the dimensions of the root keeper. Keepers were then cemented parallel to the occlusal plane using type I GIC cement (Figure 4a).

The complete denture was fabricated conventionally. The preliminary impression of both the arches was made by using irreversible hydrocolloid impression material. Special trays were fabricated on the primary cast after block out using acrylic resin tray material. Border molding was done following basic prosthetic principles, using low fusing impression compound. Light body elastomeric impression material was syringed into the tray and around the attachments and a final impression was made (Figure 4b,c). Impression was poured using conventional techniques. Relief wax of 2mm was placed over the attachment mechanism of the master casts. Wax rims were then fabricated and the maxillomandibular relationship was recorded. Teeth arrangement was done (ACRYROCK) following its selection and tried in the patient's mouth considering the factors of phonetics and esthetics. The record base was trimmed to create a perforation window in the area of attachments and teeth arrangement was done directly over the tin foil. Vertical and centric relations were verified and centric and eccentric contacts were checked. Following the patients' approval, the waxed up dentures were processed using heat cure acrylic resin (DPI HEAT CURE).

Processed dentures were trimmed and polished. Vent holes were created in the space maintained for the attachments. It was decided to use orthodontic elastic modules as a female component for the ball attachment as they act similar to simple elastic O – ring, and help in smooth removal and insertion of the denture. Orthodontic separators were placed over the custom made ball attachments of the maxillary abutments and magnetic assemblies were placed over the root keepers of the mandibular abutments. Relief areas of dentures were increased in its size with straight fissure bur so that the denture passively fits over the attachments Elastic modules and magnetic assemblies were then replaced in the intaglio surface of the denture by using auto polymerizing acrylic resin (COLTENE) that chemically bonded to the denture base (Figure 5a,b). The patient was asked to occlude in centric for about 8-10 min till the curing of resin took place. Excess resin flash was
trimmed and the denture was polished. Occlusion was checked to remove interceptive occlusal contacts, and the denture was inserted (Figure 5 c). The patient was asked to remove and reinsert the denture a few times. Postoperative instructions were given that included maintaining oral health, the use of fluoridated toothpaste, and a six-month recall schedule.

**DISCUSSION**

Overdenture is essentially a preventive prosthodontic concept that emphasizes the psychological concept of not being completely edentulous. It has innumerable advantages and applications compared with conventional complete denture 5,7,8. After abutment loss, an overdenture can be converted into a conventional denture. Many studies have proven overdenture as an effective treatment option for restoring completely edentulous arches, with high success rates ranging from 94% to 100%. Rissin et al., in 1978 compared masticatory performance in patients with natural dentition, complete denture, and overdenture. He found that patients with overdenture had a chewing efficiency that was one third higher than that of conventional denture wearers 10. Also, the time required for the practitioners to fabricate implant supported prosthesis differs significantly from that required to fabricate conventional complete denture or an overdenture depending on the surgical protocol followed during the treatment. In the present case, the remaining teeth were not in sufficient health, quantity, or position to be suitable for fixed or removable partial denture treatment. Radiographic and clinical evaluation of proposed abutment teeth was done and after taking into consideration the aforementioned factors, following diagnosis, it was decided to fabricate tooth supported overdenture.

Since the overdenture sits on the teeth pilings, enabling the denture to withstand the greater occlusal load, the strategic selection of abutments becomes a prerequisite for its success 4,5,11. It is also beneficial if the selected abutment teeth undergo endodontic therapy so that the coronal aspect of abutment teeth can be removed without pulpal tissue interference 7. Among all possible roots that can be used to support the overdenture, the canines and premolars are the ones that better exhibits characteristics associated with retention and support 11. The remaining canines in this patient had poor periodontal support associated with grade III mobility. Hence it was decided to preserve the premolars bilaterally, located remotely from one another, to ensure symmetry and support for the prosthesis.

Attachments provide mechanical interconnection between the tooth roots and the denture base and help to further enhance the retention and stability of the prosthesis 7. Using attachments in dental prosthesis can improve patient esthetics and facilitate function. There are several attachment systems available to retain overdenture. Appropriate attachment should be selected based on the individual situation 9.

Though alveolar bone maintenance is certainly a positive feature of overdenture treatment, the presence of sufficient inter arch space is also an unavoidable requirement necessary to accommodate attachments in the overdenture prosthesis 7,12,11. Hence diagnostic mounting was done at the desired vertical dimension of occlusion and the possibility to incorporate abutment coping and attachments were assessed. When various attachments were compared in terms of patient satisfaction, prosthesis retention, prosthetic maintenance, and total costs, ball and socket system attachment is considered the simplest and most efficient of all attachments available 9. Hence it was decided to fabricate custom made ball attachment overdenture with orthodontic separators as a female component, as a cost effective alternative to the use of prefabricated attachments. As the denture is seated the ball passes beyond the module, keeping it unstretched and helps to achieve a snap-fit and mechanical interlocking.

For the mandibular arch, the magnetic attachment was chosen. They have several advantages that include simple clinical and technical procedures, ease of placement for the dentist, and ease of cleaning and maintenance for the patient, and are typically useful in patients with limited interocclusal space 6.
patient in this case had sufficient interocclusal space, we choose magnetic attachment (MAGFIT RK-DXFS) for
the lower arch since ball attachments were chosen to improve retention of the maxillary denture. MAGFIT RK
makes it possible for the direct adhesion of the keeper to the tooth roots. It eliminates the need for the casting
process. They are available in flat or dome-shaped with L size or S size. With the elimination of casting,
polishing to remove the oxidation layer is no longer necessary, resulting in an appropriate attractive force. It is a
closed field magnet with magnetic field leakage below the accepted US standard of 0.02 T. Keeper is designed
to have detachment prevention and ensure pulling strength of more than 12kgf.

Certainly, dental caries, periodontal disease, and tooth-related restorative issues as well as dexterity of
the patient are some of the concerns when tooth supported overdentures are made. One who understands the
benefits and limitations of using an attachment, as well as the importance of oral health on quality of life should
be the candidate of choice. Special attention towards meticulous oral hygiene practices and regular recall
appointments are critical in the success of overdenture therapy.

CONCLUSION

Overdenture is a practical treatment modality that incorporates preventive prosthodontics concepts to the core.
Hence, the resurgence of interest in the field of overdenture is necessary. Modern prosthodontics can be an
excellent solution to oral rehabilitation, but we should not let the advanced technology block the views of
conventional prosthodontics. We, as practitioners, should not forget, rather revivify the basics and make them a
part of regular dental practice.

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Consent to participate- Proper consent was taken from the patient and was explained the entire procedure.

Declaration of competing interest- None.

REFERENCES

2. Reframing the future of prosthodontics: an invitationalladership summit. American College of
Prosthodontists 2006; June 11-12.
3. Schuch C, Moraes A P, Onofre R S et al; An alternative method for the fabrication of a root-supported
4. Nassar H I; Patient satisfaction of tooth supported overdentures utilizing ball
Attachments; Future Dental Journal 2016; 2: 70-73
5. Samra RK, Bhide SV, Goyal C, Kaur T. Tooth supported overdenture: A concept overshadowed but
6. Ceruti P, Bryant SR, Lee JH et al; Magnet retained implant supported overdentures: Review and 1 year
8. Dable RA, Gaikwad BS, Marathe SS, et al; A simplified technique for custom made overdenture semi-
9. Wegoud M A, Fayyad A, Kaddah A et al; Bar versus ball attachments for implant-
2017;00:1–8.
10. Rissin L, House JE, Manly RS, et al; Clinical comparison of masticatory performance and
electromyographic activity of patients with complete dentures, overdentures and natural teeth J Prosthodont
11. Chakravarthy AK, Sharif KY, Mallikarjun M, Babu KM et al; Tooth supported overdenture with
13. Schuch C, Moraes AP, Onofre RS et al; An alternative method for the fabrication of a root-supported