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CASE REPORT

Metal frame overdenture retained with metal medium coping and magnet

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Keywords: Magnet, Medium coping, Metal frame overdenture

ABSTRACT

Overdenture is a removable denture that replaces partial or complete tooth loss and rests on remaining natural teeth or implants. The overdenture concept of avoiding bone resorption can be used as a continuation of root canal treatment so that the alveolar bone remains well preserved. This case report describes prosthodontic rehabilitation with coping and magnet overdentures to increase retention, stability, and reduce bone resorption that will occur due to tooth extraction. A 65-year-old female patient wanted to have new dentures because the old dentures were loose and unaesthetic. Overdentures with metal medium coping and a magnet were made to increase retention for the new upper denture. A metal medium coping with a length of 3–4 mm on the second upper molar can increase retention by the friction force between the coping and the denture. A fabricated magnet, 3.6 mm in diameter with an attractive force of 700±50 gf, was mounted on the denture base, and the keeper was cemented to the second upper premolar as a supporting tooth. The metal frame overdentures provided excellent retention, stability, functionally, and aesthetics. Metal frame overdentures can be treatment of choice to increase the retention and stabilization of dentures. (IJP 2025;6(1):26-30)

Introduction

The success of a treatment is inseparable from adequate planning in managing edentulous patients so that the results obtained can satisfy the patient aesthetically and functionally.[1] Overdentures are removable dentures that replace missing teeth partially or completely, where the denture is supported by one or more natural teeth, tooth roots, and/or dental implants.[2,3] Broadly, overdentures consist of two types: tooth-supported overdentures and implant-supported overdentures.[2,4,5] Implant-supported overdentures depend on the alveolar bone anatomy, the patient's financial status, and the patient's systemic condition which may hinder the patient from choosing this treatment option.[3,6,7] Meanwhile, tooth-supported overdentures are more preventive, simpler, and more cost-effective.[8] The concept of overdentures is to prevent alveolar bone resorption and is performed as a continuation of root canal treatment to ensure the alveolar bone remains well-preserved.[5,6] Overdentures are commonly used today because periodontal treatment, endodontic treatment, and caries control techniques can be relied upon.[7] The benefits of maintaining natural teeth and/or their roots include increased stability and retention of dentures, improved chewing efficiency, preservation of the periodontium which acts as a shock absorber, maintaining the elastic modulus of teeth near the bone and preserving bone, preserving alveolar bone and muscle patterns, as well as maintaining sensory stimulation and vertical dimension.[9,10] Overdentures can be the best treatment alternative because they can provide additional support to the denture, prevent alveolar bone resorption, and maintain the proprioceptive ability of the periodontal tissues. This case report describes prosthodontic rehabilitation with metal medium coping and magnet overdentures to increase retention, stability, and reduce bone resorption that will occur due to tooth extraction.

Figure 1. Intra oral examination

Case Report

A 64-year-old woman came to the Prosthodontics Department at RSGM Prof. Soedomo wanted to have dentures because many of her teeth were missing, and the existing dentures (thermoplastic nylon) were uncomfortable, leading to a decrease in appearance and difficulty chewing food. Multiple teeth had been extracted, affecting both aesthetics and function. Intraoral examination revealed missing teeth in the upper jaw (18, 16, 14, 13, 12, 11, 21, 22, 23, 24, 25, 26, 27, 28) and lower jaw (48, 47, 46, 45, 34, 36, 37, 38) figure 1.

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Figure 2. Pre-treatment extraoral examination

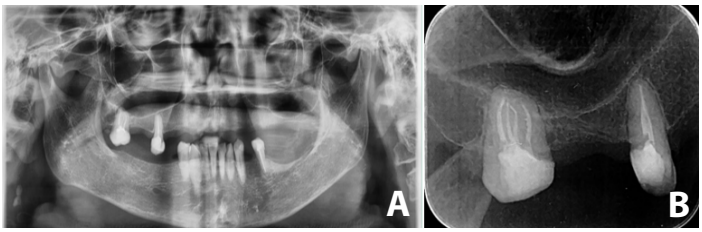

Figure 3. A. Panoramic radiograph, B. Periapical radiograph

Figure 4. The impressions to fabricate study model

Figure 5. The tooth color with shade giude

Figure 6. Try in keeper magnet

The patient's general condition was normal, with no history of systemic diseases or allergies. Patient was not under medical care or taking medication regularly. The patient had undergone root canal treatment (endodontics) on 17 and 15. Teeth 15 and 17 extruded of approximately ± 2 mm. Extraoral examination, the patient exhibited a symmetrical and normal facial appearance figure 2.

Radiographic examinations (panoramic radiograph figure 3A and periapical radiograph figure 3B revealed that the periodontal tissues around teeth 15 and 17 were in good condition, with hermetic root canal treatment. In this case, the patient had previously worn upper dentures but rarely used lower dentures, resulting in extrusion of the remaining upper teeth due to the loss of many antagonistic teeth. The prognosis for this treatment is good, as the remaining teeth will be utilized as support for the overdenture, thereby enhancing retention and stability of the prosthetic teeth. The treatment plan involved providing a single complete overdenture supported by teeth in the upper jaw (magnet on 15 and medium metal coping on 17) and a metal frame removable partial denture incorporates a lingual bar major connector, with RPY clasp applied to teeth 33, akers clasp with mesial occlusal rest applied to teeth 44, and mesio-distal clasp on teeth 45 in the lower jaw. The patient had agreed to undergo the treatment.

During the first treatment visit, a study model was created using a stock tray no. 2 and alginate impression material for the maxilla and mandible figure 4. The tooth color was determined to be A3.5 Ivoclar shade guide figure 5.

The second visit, crown cutting was performed on teeth 15 and 17 to create an overdenture magnet on tooth 15 and an overdenture short-medium coping on tooth 17. Gutta-percha removal from tooth 15 was done using a peeso reamer, along the length of the keeper to be used. The root preparation process involves reaming until a red band is reached, at a depth of approximately 7mm, to accommodate the root keeper, followed by a trial placement of the keeper and reclosure using temporary filling material figure 6. Crown preparation was performed on tooth 17 to fabricated an overdenture coping, leaving approximately ± 3 mm of the tooth crown. Gingival retraction with retraction cord and adrenaline was then followed by the impression of the working model using a perforated stock tray and polyvinyl siloxane impression material for the fabrication of the metal coping figure 7.

The third visit, after the overdenture coping was ready, a trial placement was done on tooth 17, and the accuracy of the coping's edge was checked. The coping was cemented onto tooth 17 using glass ionomer cement luting figure 8A. Impression was taken using Hydrophilic Vinyl Polysiloxane Impression material (monophase) with a custom individual impression tray previously made for the fabrication of the metal framework overdenture base for the maxilla figure 8B and the removable partial denture with metal framework for the mandible.

During the fourth visit, after the metal framework base plate and the bite rim were ready figure 9, recording of the maxillomandibular relationship (MMR) was performed by measuring the patient's vertical dimension and determining the centric relation

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Figure 7. The impressions to fabricate metal medium coping

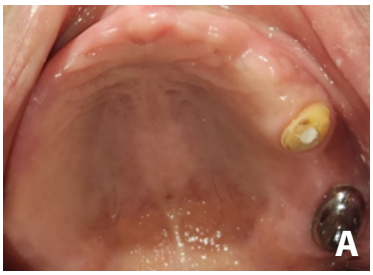

Figure 8. A. Metal medium coping cementation, B. The impressions to fabricate work model

Figure 9. Metal Framework Base plate and bite rim Maxilla and Mandible

Figure 11. A. Camper's line with oclusal guide plane, B. Trying the bit rimes and recording MMR, C. Fixation

figure 10A and figure 10B. Subsequently, the midline (by drawing a line from the philtrum to determine the midline), canine line (to determine the mesiodistal width of the anterior teeth), and smile line (created at 2/3 length of the anterior teeth/upper incisors) were established. After the correct bite and VDO recorded by the bite rim, fixation was applied to both sides of the bite figure 10C, and then the correct bite was removed from the patient's mouth. Next, tooth arrangement were done on the articulator based on our bite rim record figure 11A.

The fifth visit, the trial placement of tooth arrangement was performed on the patient figure 11B. The anterior tooth arrangement on the articulator was then tried on the patient. Overjet, overbite, midline, canine line, smile line, and phonetics were good and patient was satisfied. Subsequently, the arrangement of posterior teeth was continued and tried on the patient, followed by checking occlusion, retention, stability, phonetics, and aesthetics. The procedure was then continued with laboratory packing and processing, culminating in a polished and refined the denture.

During the sixth visit, the metal framework overdenture for the maxilla and the removable partial denture with metal framework for the mandibular teeth were inserted. The magnet keeper was attached to tooth 15 using resin cement figure 12A, and the magnet was embedded in the base plate using self-cured acrylic figure 12B. The magnet was a fabricated magnet (Magteeth™ RK 700), 3.6 mm in diameter with an attractive force of 700±50 gf. Following this, the keeper and magnet surfaces are sandblasted to improve bonding. Monobond primer (Monobond®, Ivoclar) is then applied onto the root keeper, and specific bonding agents are used on the tooth root canal surface. During the cementation process, it's crucial to ensure that the keeper's surface remains free from contamination. This is achieved by attaching the magnet along with the keeper, thereby preventing any obstruction to magnetic attraction. Checks on retention, stability, occlusion, phonetics, aesthetics, and patient comfort while wearing the dentures were. Grinding was performed in areas experiencing traumatic occlusion.

The patient did not have any complaints after the overdenture placement figure 13. The patient reported no issues with retention, stability, occlusion, phonetics, and aesthetics while using the dentures. The patient expressed satisfaction with the treatment outcome. Instructions were given to the patient to remove the dentures, maintain denture hygiene, remove the dentures before sleeping and soak them in clean water in a covered container, promptly contact the dentist if there are any complaints or pain, and attend scheduled check-ups. The patient was also instructed on how to wear and remove the dentures.

The follow-up appointment was scheduled for the seventh visit or 1 week after insertion. During the subjective examination, there were no complaints, and the patient

Figure 11. A. Arranging the Anterior and Posterior teeth, B. Try in

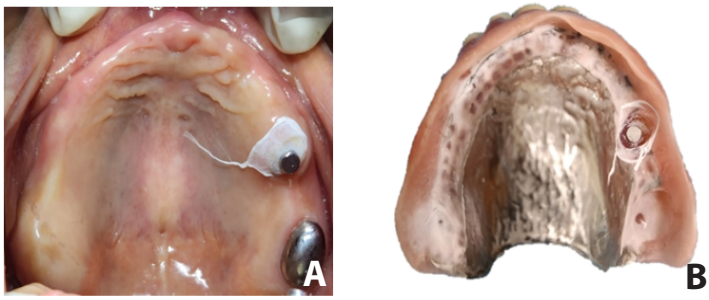

Figure 12. A. Magnet keeper was attached, B. Magnet was embedded in the base plate

Figure 13. Denture Insertion

Figure 14. Post-treatment extraoral examination on control day

expressed satisfaction with the new dentures in terms of retention, stability, and aesthetics. In the objective examination, there were no signs of inflammation in the gingiva, no food impaction, and good retention, stability, and occlusion. The patient was instructed to continue maintaining oral hygiene and to attend regular check-ups.

One month after the insertion, a follow-up appointment was scheduled. The patient had no complaints and was satisfied with the results of the dentures. The surrounding tissues of the dentures were healthy, and the patient's oral hygiene was maintained. The patient was instructed to visit the dentist regularly every six months.

Discussion

The incorrect treatment plan resulted in errors in determining the type and material of the denture for the patient.[11] Errors in the material or type of denture can lead to resorption of the alveolar bone.[11,12] This continuous resorption has the potential to cause major prosthodontic issues and challenges for both the patient and the dentist.[13,14] Maintaining the natural teeth that are still present has a positive impact on denture durability and retention.[2,6] Additionally, this metal framework overdenture can increase the stability of the prosthetic teeth, thus reducing the risk of resorption of the underlying alveolar bone.[1,15] The fabrication of overdentures is an effective approach to preserving the patient's remaining teeth, thus preventing tooth loss.[9,10] This is done to prevent alveolar ridge resorption, maintain proprioceptive abilities of the periodontal tissues, and enhance support for the dentures.[3,6,7]

The patient's dental condition serves as the basis for selecting magnet overdentures. The remaining teeth in the upper jaw, specifically teeth 15 and 17, have experienced extrusion, making them the primary consideration for retention teeth in the overdenture.[11,16] These teeth meet the criteria for magnet overdenture retainers or copings, as they are in good health, have minimal mobility, normal sulcus depth, well-attached gingiva, and healthy periodontal tissues.[10,17,18]

The magnet used in this case is a combination of stainless steel and neodymium magnets, forming a magnetic circuit between the magnet, keeper, and housing, thereby enhancing the attraction force.[9,11] Stainless steel is soldered using micro-laser methods to ensure the magnet's resistance to corrosion.[12] The magnet design employed for overdentures in this case is a closed-field system to ensure that the level of magnetic leakage at the gingival margin remains within normal limits.[11] The magnet is embedded only in the denture base facing the keeper, while the keeper is made of ferromagnetic material.[15] The surface of the keeper is coated with chromium to protect it from oxidation during the casting process. The magnet support has an elliptical shape to withstand rotational forces and is fixed onto the denture base.[19,20] The magnet is embedded in the denture base using self-cured acrylic material.[11,21]

The Magteeth™ keeper and magnet system employs an innovative manufacturing process that contributes to increased magnetic retention force, greatly improving the functionality of dentures and the comfort of patients. Through advanced manufacturing techniques, strong retentive force, and self-reseating capabilities, this attachment ensures stable support

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during chewing and oral movements.[12] Its resistance to displacement, decreased risk of seal breakage, and long-term durability address common issues encountered by denture wearers. By offering consistent retention and seamlessly adapting to denture movement, the attachment improves chewing efficiency, speech, and overall oral function, ultimately enhancing the quality of life and satisfaction of patients with their prosthetic solution.[19]

The benefits of magnetic attachments include their shorter length compared to mechanical counterparts, making them suitable for situations where there's limited inter-arch space.[12] Additionally, they can accommodate moderately nonparallel abutments as they don't require a specific insertion path.[15] Unlike castings, fabricated magnetic attachments eliminate the need for certain laboratory procedures.[12] Furthermore, they offer increased flexibility and enable unrestricted movement of the prosthesis.[5,22]

In this case, an overdenture is fabricated with a medium metal coping on the right maxillary molars. Reducing the height of tooth 17 by 3 mm above the gingival margin increases the crown-to-root ratio, reduces pressure on the tooth, and provides space for the overdenture. As a result, the patient can effectively use the denture for chewing and speaking.[2] The medium metal coping provides additional support and enhances retention.[1,17] Moreover, this design reduces horizontal torque and allows for proper load distribution along the ridge.[9,22]

The fabrication of this overdenture includes adding a cobalt-chromium metal framework to the base. This is done to provide better stability to the denture.[2,13] Additionally, overdenture fractures often occur in regions where there are copings.[1,8] To prevent fractures in the denture base, a reinforcement with an additional metal framework is added. Moreover, this metal framework overdenture can enhance the stability of the denture, reducing the risk of alveolar bone resorption underneath.[7,16] One crucial requirement for the success of overdentures is that the patient understands the importance of maintaining oral hygiene for both the retained teeth and the denture.[16,17] This includes using fluoride-containing toothpaste and regular dental visits every six months.[18] The success of overdenture treatment also depends on the patient's awareness of maintaining oral hygiene and the patient's ability to maintain dentures.[18,22]

Conclusion

The use of magnet and metal medium coping with a tooth-supported overdenture is an easy and affordable alternative therapy. Metal frame overdentures retained with metal medium coping and magnet provides additional support to the denture to increase retention, stability, and reduce bone resorption that will occur due to tooth extraction.

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