# A case rehabilitated using overdentures with magnetic attachments for a partially edentulous patient with severe periodontal disease

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#### **Abstract**

The patient was a 71-year-old partially edentulous patient suffering from masticatory disturbance caused by a reduction of occlusal contacts in posterior regions and severe tooth mobility with severe periodontitis. Treatment dentures were delivered to maintain oral functions and initial periodontal therapy was performed, followed by rehabilitation with maxillary overdenture and mandibular clasp-retained removable partial denture placement as the definitive prosthodontic treatment. By application of magnetic attachments incorporated in an overdenture, the disarranged occlusal plane was corrected and denture stability was achieved. Based on the oral health impact profile (OHIP-14) assessment, the oral health-related quality of life (OHRQoL) of the patient was improved with the prosthodontic treatment.

## Introduction

There are several factors that make a prosthodontic treatment clinically difficult as follows: abnormal bone resorption after tooth extraction with severe periodontitis; flabby tissue with combination syndrome <sup>1)</sup>; and difficulty in acquiring overdenture stability with severe displacements of remaining teeth. For the cases with those factors, an application of magnetic attachment would help to stabilize overdenture while saving remaining teeth and protecting residual ridge. In this case, magnetic attachments were incorporated into an overdenture to reconstruct a partially edentulous dental arch with severe periodontal disease, and the patient's satisfaction was obtained.

## Clinical history

The patient was a 71-year-old male without any systemic health problems who claimed difficulty in eating due to a reduction of occlusal contacts in posterior regions. Over the past 20 years, posterior teeth had been lost and the patient had undergone dental therapy. For several months, he had realized the remaining teeth mobility. Figure 1 reveals the intraoral views and Figure 2 reveals a panoramic radiograph at the first visit (8th July 2020), while the periodontal assessment is shown in Figure 3. The remaining teeth were #11, #12, #13, #16, #17, #22, #23, and #25 in maxillary and #31, #32, #33, #34, #41, #42, and #43 in mandibular (Eichner classification B4 and Miyachi classification Area B). #25 revealed severe caries without a tooth crown. Based on the Miller index of tooth mobility, a fixed bridge restoring #14 and #15 with abutment teeth of #13, #16, and #17 showed a mobility of Grade I as well as #11, #12, #13, #22, #23, #25, #31, #32, #33, #41, #42, and #43. Meanwhile, #44 revealed a mobility of Grade II. Additionally, the alveolar bone resorption was severe, resulting in a diagnosis of severe periodontitis. Especially in #16 and #17, the attachment loss

reached the root apex, while reaching at half or two-thirds of the root length in #22, #23, #25, and #44. The occlusal plane was disarranged with the extruded remaining teeth (#11, #12, and #22). The disease type classification of the Japan Prosthodontic Society was level II <sup>2)</sup>. Based on the lower facial height and freeway space, the occlusal vertical dimension (OVD) was diagnosed to be clinically acceptable. The overall diagnosis was masticatory disturbance caused by a reduction of occlusal contacts in posterior regions and severe tooth mobility with severe periodontitis.

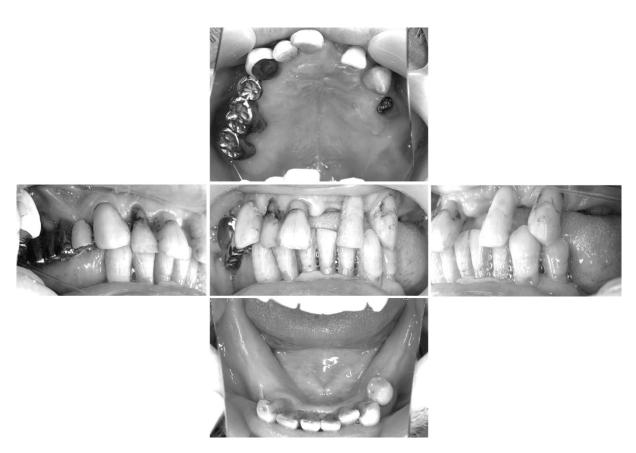


Fig.1 Intraoral views at first visit

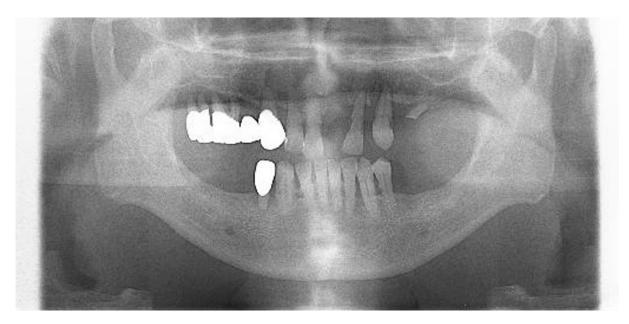


Fig.2 Panoramic radiograph at first visit

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Fig.3 Periodontal assessment at first visit

## **Treatment procedure**

Within the remaining teeth, #16, #17, #22, #23, #25, and #44 were diagnosed to be hopeless and planned to be extracted before the treatment denture delivery. Soon after the extractions of those teeth, periodontal treatment was begun and the treatment dentures were placed (Fig.4). The abutment teeth of the maxillary denture were #11 and #13, while those of the mandibular denture were #34 and #43. For each abutment tooth, the retainer consisted of a wrought wire clasp assembly without any rest. The OVD with the treatment denture placement was defined based on the original dimension.

Reassessment after initial periodontal therapy (July 2021) revealed that the pocket probing depth of all remaining teeth in the mandibular was less than 3mm, while deep pocket and increased mobility of Grade I remained in the maxillary remaining teeth (#11, #12, and #13) (Fig.5). Based on the periodontal reassessment, #11, #12, and #13 were judged to be too weakened to use as abutment teeth of clasp-retained removable partial denture (RPD). Therefore, the definitive dentures are designed as follows: an overdenture incorporating magnetic attachments in #11, #12, and #13 for the maxillary; and a clasp-retained RPD for the

#### mandibular.

To apply magnetic attachments, #11, #12, and #13 were endodontically treated and cut their crowns, followed by modification of the maxillary treatment denture to be an overdenture type with additional artificial teeth. After acquiring the denture stability, #13 was judged not to be accepted for a magnetic attachment abutment tooth due to its severe attachment loss and shortened root length. Therefore, only #11 and #12 were converted to abutment teeth of magnetic attachments (MAGFIT M400, AICHI STEEL CORPORATION, Aichi, Japan), whereas #13 was covered with a composite resin (ESTELITE UNIVERSAL FLOW, Tokuyama Dental Corporation, Tokyo, Japan) and used just as a resin coping. The magnetic attachments were fixed to #11 and #12 with an adhesive resin cement (Super-Bond, Sun Medical Co., Ltd., Shiga, Japan).

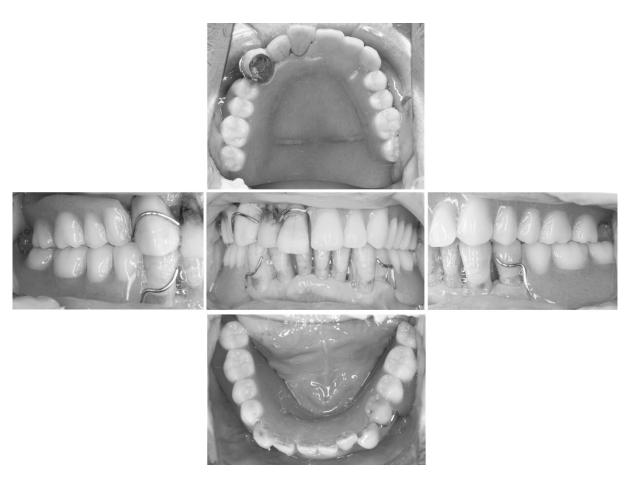


Fig.4 Intraoral views with treatment denture placement

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Fig.5 Periodontal reassessment after initial periodontal therapy

The OVD for the definitive dentures was set to be the same as that with the treatment dentures placement, while the occlusal position was set to coincide with the tapping point. After the maxillomandibular relationship record, the first try-in of wax dentures was performed only with artificial teeth, followed by the designing of internal and external finish lines as well as the outline of the frameworks. Then, the second try-in of wax dentures with both artificial teeth and frameworks was performed to confirm the aesthetics, the fitting of frameworks, and the validity of the maxillomandibular relationship. After the above-mentioned procedures, the definitive dentures were finalized and delivered (Fig.6). Regarding the framework design of the maxillary definitive denture, the metallic housing covering the occlusal and palatal surfaces of #11, #12, and #13 was designed to strength the denture structure. Meanwhile, the buccal surfaces of those teeth were covered with denture base resin materials to make it easy to put spillways for incorporating magnets into the denture using the acrylic resin material (UNIFAST II, GC Corporation, Tokyo, Japan) (Fig.7A-C). A bilateral balanced occlusion was used to help stabilize the dentures. After the confirmation of denture settling (two weeks after denture delivery), the magnets coated by an adhesive resin cement (Super-Bond, Sun Medical Co., Ltd., Shiga, Japan) were incorporated into the maxillary denture (Fig.7D).

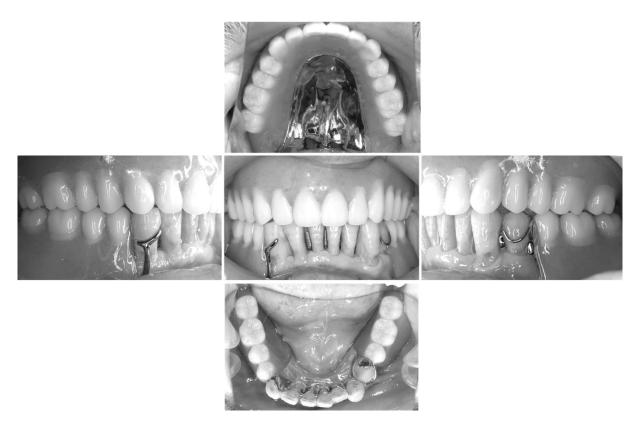


Fig.6 Intraoral views with definitive denture placement

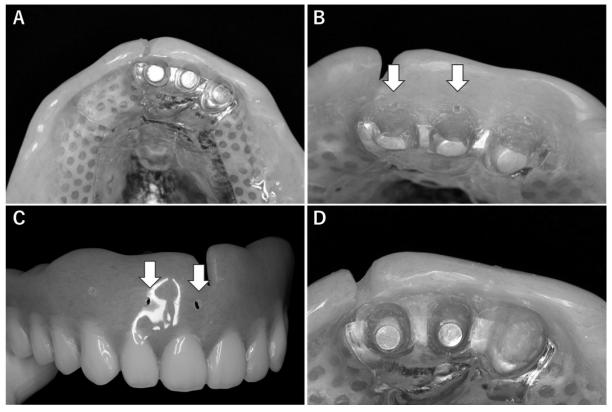


Fig.7 Images of the housing structure in the maxillary definitive denture. A: overall image; B and C: the magnified image of the inner and outer surfaces before magnet placement (arrows reveal spillways); and D: the magnified image of the inner surface after magnet placement.

## **Outcome of treatment**

Using the short version of the oral health impact profile (OHIP-14)<sup>3)</sup>, the oral health-related quality of life (OHRQoL) was assessed both before and after the prosthodontic treatment. The assessment before the treatment revealed an OHIP-14 score of 33 including especially high scores in "physical pain", "social disability", and "handicap". On the other hand, the score after the treatment was 12 including especially low scores in "handicap", indicating that the prosthodontic treatment with the magnetic attachments was successful based on the subjective assessment of the patient. To date, periodontal and prosthodontic maintenance has been conducted every two months.

#### **Discussion**

In this case, the periodontal assessment at the first visit revealed a deep pocket depth and hypermobility in each remaining tooth in the maxillary. Meanwhile, magnetic attachments were applied for #11 and #12 instead of tooth extraction because those teeth had strategic values to be maintained from the prosthodontic viewpoint. Thanks to the magnetic attachments, preferred outcomes have been obtained to date. However, the long-term prognosis of overdenture treatment would depend on several factors, such as the age of patients, habits, occlusal force, and the condition of periodontal tissues of the remaining teeth. To achieve long-term success, in addition to the patient's oral hygiene, clinical follow-up focusing on the occlusal position stability and the artificial teeth wear is necessary to prevent excessive occlusal stress on the anterior region <sup>4)</sup>.

# Conclusion

In this case, a partially edentulous dental arch with severe periodontitis and hypermobility of remaining teeth was rehabilitated using maxillary overdenture and mandibular clasp-retained RPD. By application of magnetic attachments incorporated in an overdenture, the disarranged occlusal plane was corrected and denture stability was achieved. Based on the OHIP-14 assessment, the OHRQoL of the patient was improved with the prosthodontic treatment.

# Acknowledgment

All the authors of this study would like to thank the patient who willingly consented to publish our treatment for him including his clinical history.

## Conflict of interest statement

None.

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