

## Progress report on the implant-assisted removable partial denture units (IRPD) using a new method for attaching magnetic assemblies

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### Abstract

Since a small air gap in magnetic attachment can cause a significant reduction in attraction, the installation of magnetic assemblies (MAs) must be done with great care. The authors have developed a new method using a cast frame with metal housings and a permanent cured resin base plate.

Merit: (1) Easy installation of magnets, (2) Accurate positioning of the MA, abutment and keeper. (3) Highly accurate occlusal grading and trial fitting with detailed checks possible. (4) The retentive force of the magnet can be checked prior to placement of the final prosthetic device. (5) No exposure of the immediate-curing resin, smooth and easy to clean. (6) The metal surrounds the keeper, making it easy to clean. (7) Less prone to fracture.

Demerit: (1) Not applicable for mucosa-bearing dentures that require so-called settling. (2) Requires two separate resin curing procedures

This technique is considered to be the best solution to the conventional problem of MA fixation in IRPD using multiple implants and the rigid type IOD.

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### Introduction

Magnetic attachments require careful installation of magnetic assemblies (MAs), because a small air gap can cause a significant reduction in attractive force. The authors reported a new method for IOD and IRPD using a cast frame with the metal housings and a permanent cured resin base plate at the 25th and 29th Annual Meetings of the Japanese Society of Magnetic Dentistry. In this report, we describe the failure events that occurred for 9 years in IRPD cases using this method.

### Summary of a new method for attaching MAs



Fig.1

Fig.2

Fig.3

Fig.4

After intraorally fastening the completed abutment, which will serve as the keeper's receptacle (Fig.1). The keeper is fixed with Superbond™(Fig.2). After that, the internal crown of the cornus is placed (Fig.3) and a precise impression is taken to incorporate the internal crown (Fig.4). The keeper is currently attached to the abutment with cellophane tape to prevent it from falling off.

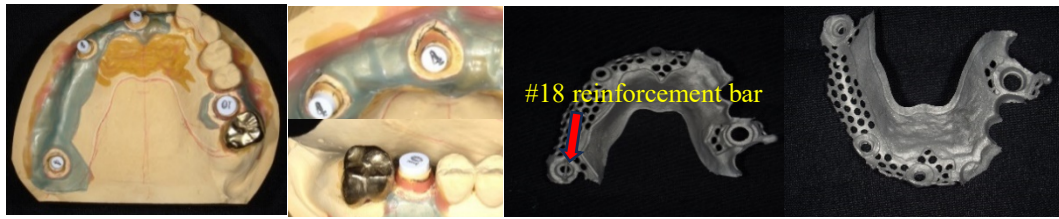


Fig.5

Fig.6

Fig.7

Fig.8

An external crown is fabricated as shown in the study model incorporating the inner crown of the conus, and the replica of MA is attached to the keeper (Fig.5). The undercut of the abutments with the replica are blocked out (Fig.6) and a refractory model is fabricated. After looking at the current 10-year case, we feel that metal touch around the abutment is very useful from view point of preventing the induction of peri-implantitis. The finished cast frame with metal housing (Fig.7.8). Since the thickness of the resin cannot be taken for #18, a reinforcement bar is given to the upper part of the housing (Fig.7). In addition, the bonding surface to the resin is blasted with Rocatec™ sand to reinforce the strength of the cast frame.



Fig.9

Fig.10

Fig.11

Fig.12

The housing should have a cutout as shown in the photo (Fig.9). The cast frame is returned to the study model with the MA replica removed, and after waxing the external crown of the conus and cast frame (Fig.10), the permanent foundation base is fabricated with poured-in-place polymerized resin. The photo (Fig.11) shows the completed permanent base restored to the duplicate model of which undercuts of the alveolar bone mucosa are removed. The permanent base is placed in the oral cavity with a trial fit of the internal crown, the MAs are attached (Fig.12), and they are fixed in the metal housing by immediate-curing resin (Fig.13).



Fig.13

Fig.14

Fig.15

Fig.16

The permanent base is held in place for 10 minutes (Fig.14). And it is removed from the oral cavity. Looking at the area around the MA from the mucosa surface, there are areas where there is insufficient resin, so add resin with an ultra-fine brush, wipe off the excess, and re-test. After that, the occlusion is taken using the permanent base. The model is returned to the duplicate model that will be attached to the articulator, and the artificial teeth are placed. If there are residual teeth in the esthetic area, as in this case, it is necessary to return to the duplicate model of which undercuts of the alveolar bone mucosa is removed for placing of the artificial teeth. On the other hand, if the remaining teeth are not affected by the removal of the artificial teeth, as in the

case of the IOD and the case shown in the photo (Fig.16), it can be used laboratory silicone when the model is attached to the articulator. The denture was then trial-fitted, and the remaining wax portion was replaced with poured polymerized resin to complete the denture

## Case Summary

### 1. Patient Information (case1)

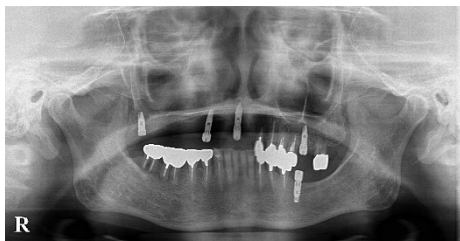


Fig.17 When placing implant



Fig.18 At 7 years



Fig.18 At the time of first visit

Fig.19 When wearing denture

Fig.20 At 7 years

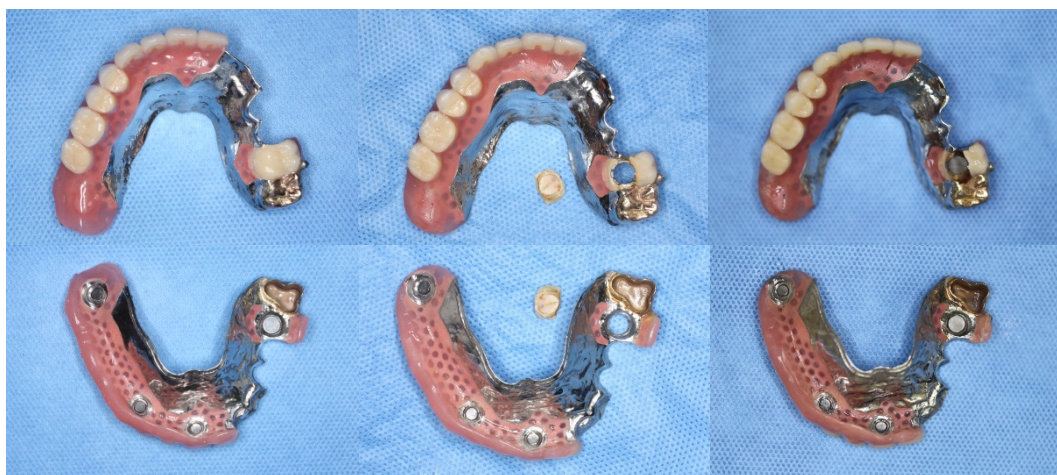


Fig.21 When wearing denture

Fig.22 At 4 years

Fig.23 At 7 years

This is the condition of this denture after 7 years. The resin and the artificial tooth that cover MA #26 have detached (Fig.22), and the denture has to be fixed with Superbond™. In addition, the boundary line between the primary and secondary resin in the median palatal area is becoming prominent, and the reinforcement bar



of housing #18 is exposed (Fig.23). The condition of the remaining maxillary teeth has improved since the initial examination (Fig.17,20).

## 2. Patient Information (case2)

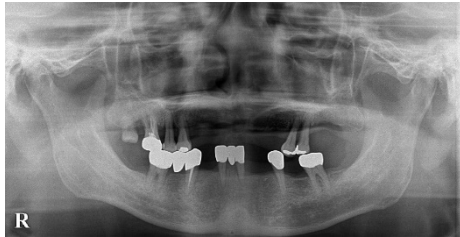


Fig.24 At the time of first visit



Fig.25 At 7 years



Fig.26 When wearing denture



Fig.27 At 7 years



Fig.28 When wearing denture

Fig.29 At 4 years

Fig.30 At 7 years

The 2-armed hooks of #24 and #25 have been fractured (Fig.30), but they are being used as they are. Although tooth pulp of #15 and #24/25 have been extracted, the condition of the maxillary periodontal tissues is better than at the initial visit (fig25,27).

### 3. Patient Information (case3)

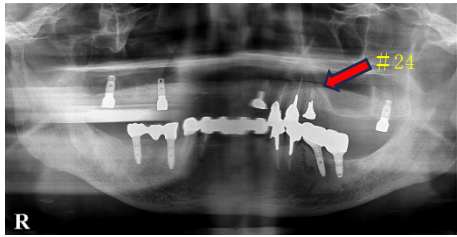


Fig.31



Fig.32

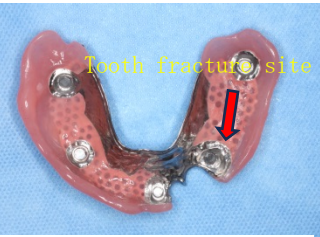


Fig.33



Fig.34

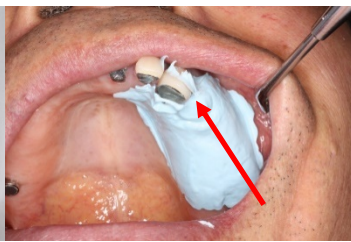


Fig.35



Fig.36



Fig.37 When wearing denture



Fig.38 When placing implant



Fig.39 keeper of implant abutment

anwl

Tooth #24, which was used as a keeper, was fractured due to an accident and was replaced with an implant. In order to create the abutment according to the position of the metal housing and MA of the denture, an impression was taken of the denture inner surface and mucosa surface (Fig.34), the impression material was returned to the mucosa surface, initial drilling was done from the MA position indicated by the indicator line (Fig.35). And the implant position was determined after it was confirmed that there was sufficient depth for the height of abutment, After the second surgery, a temporary abutment was fabricated using immediate curing resin, an impression of the abutment was taken with a digital scanner, and a CAD/CAM was used to smooth the submucosal shape indicated by the indicator line and fabricate a zirconia abutment (Fig.36). Intraoral photographs at the time of denture placement, implant placement, and replacement of the implant-supported zirconia abutment with a keeper (Fig.37,38,39).

## Discussion

This time, we discuss the failure event in Case 1 as a problem specific to IRPD with magnetic attachments. The internal structure of the implant and abutment is shown on the right. The abutment can only be shortened up to the screw head position, and then the thickness of the keeper and MA are added and sealed with denture resin and an artificial tooth. The surgical solution to secure that resin thickness is to select an implant with the shortest height of abutment and to consider a deeper placement.



On the other hand, the prosthetic solution is to use the reinforcement bar used for #18 (Fig.7). However, the site where the reinforcement bar is used should be blocked out of the undercut up to the height of the MA. The use of a smaller radius magnet may also be effective.

## Conclusion

Five to nine years passed after the dentures were delivered, various problems were observed. We would like to investigate the causes of these problems and solve them in the future. However, all patients are still wearing the dentures, and it is more certain that the dentures are useful in view point of preserving periodontal tissues by reducing the load of occlusal forces on the remaining teeth.

## References

- (1) Y. Maeda, Y Takayama, T.Hosoi et al : Effects of the housing for the magnetic assembly on the attractive force of the magnetic attachment (in Japanese)., J J Mag Dent, 20(1), 44-48,2011
- (2) T. Miyata, Y.Nakamura, Y Tanaka et al : Influence of the heating on the attractive force of the magnetic attachments (in Japanese)., J J Mag Dent, 18(1), 25-31, 2009
- (3) M.Yokoe, F Ito, Y Tanaka et al : Basic laboratory procedures for successful magnetic dentures (in Japanese)., J J Mag Dent, 23(1), 17-23, 2014
- (4) Y.Maeda , A.Damien Walmsley : Clinical practice of implants using magnets, Quintessence,1(1), 2005.
- (5) H. Yamamoto, M. Hideshima : A case report of the new procedure of fixing magnetic assemblies to an implant supported partial denture unit (in Japanese), J J Mag Dent, 29(1), 43, 2020.
- (6) H. Yamamoto, M. Hideshima : A case report of the new procedure of fixing magnetic assemblies to an implant overdenture unit (in Japanese), J J Mag Dent, 29(1), 96-97, 2016.