Skill up the magnetic attachment hands-on seminar —Three-year report—

Mayu Yamazaki, Syugi Ji, Yuta Takahashi, Kichizo Kikuta, Shogo Shibata, Mitsuki Masumoto, Hidemasa Shimpo, Daisuke Kurihara, Yasunori Suzuki, Chikahiro Ohkubo
Department of Oral Rehabilitation and Prosthodontics, Tsurumi University School of Dental Medicine

Abstract

【Objective】
For magnetic attachments, it is important to accurately position and fix the magnetic assemble and the keeper. This report provides an overview of a hands-on seminar, titled “How to use the magnetic attachments: laboratory and clinical procedures,” was held at the 131st through 133rd Annual Meetings of the Japanese Prosthetic Society.
【Methods】
The hands-on seminars were consisted of a lecture on the features of magnetic attachments and how to proceed with treatment, and hands-on practice using a jaw model and overdenture replica to fix a magnetic structure to a denture.
【Results and Discussion】
The hands-on seminars received 40 applicants each year and were held six times in total, divided into two sessions of 20 participants each.Problems that occurred during installation each time included detachment of the magnetic assemble from the denture and lack of attractive force. The problems with detachment were thought to be due to the non-use of metal primer or the removal of the denture before the self -curing resin had completely polymerized. Insufficient attractive force may be due to misalignment of the magnetic assemble, such as resin intrusion onto the keeper surface or existing air gap.

Introduction

Unlike conventional mechanical force-application mechanisms, magnetic attachments use attractive force and have many advantages, such as their small size, their simple shape, and their use of a less harmful lateral force. For clinical success with magnetic attachments, accurate positioning of the magnetic assembly on the keeper and its connection are very important, as inadequate attachment causes a gap between the keeper and the contact surface as well as a significant reduction in retentive force. In order to acquire the needed skills, a hands-on seminar, titled “How to use the magnetic attachments: laboratory and clinical procedures,” was held at the 131st through 133rd Annual Meetings of the Japanese Prosthetic Society. In this paper, we report on these seminars.

Objective

In each seminar, a 40-minute lecture on the characteristics of magnetic attachments and how to proceed with treatment, their application, design, treatment procedures, and possible problems was given. After the lecture, 50 minutes was allowed for practice using a simulation model and overdenture replica and for training in the clinical procedure of fixing the magnetic assembly to the denture base using autopolymerized resin.

Lecture
1. Explanation of points to note when placing magnetic attachments
(1) Causes of significant decrease in retention
Failures in the attachment procedures include misalignment of the magnetic assembly, namely, air gaps due to the intrusion of the resin onto the keeper surface or polymerization shrinkage.
As for the misalignment of the magnetic assembly and the keeper, it has been reported that the

attractive force decreased by about 1/3 when an air gap of 0.1 mm was vertically created and by about 2/3 when the magnetic assembly was horizontally displaced by 0.5 mm (Figs. 1, 2).[1)]

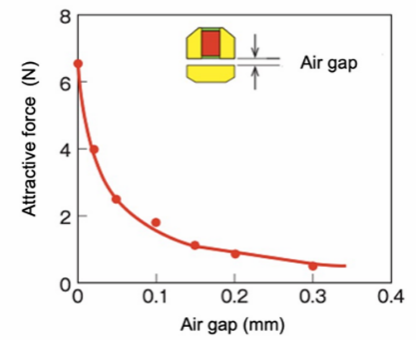

Fig. 1 Effect of vertical gaps between the magnetic assembly and the keeper on attraction force[1)]

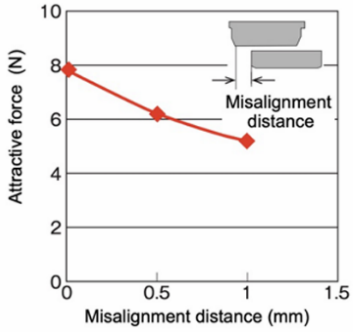

Fig. 2 Effect of horizontal displacement of the magnetic assembly on the keeper on the attractive force[1)]

(2)Polymerization shrinkage of autopolymerized resins
(i) As the amount of autopolymerized resin used when fixing the magnetic assembly was increased, the shrinkage of the autopolymerized resins also increased, and the air gap grew.
(ii) The brush-on technique showed lower polymerization shrinkage and better dimensional accuracy as compared to the mixing technique (Fig. 3).[2)]
(iii) The brush-on technique can control the amount of resin on the inner surface of the denture base by the placement of a spillway. The results include the prevention of ill-fitting dentures and dentures that are difficult to remove due to resin that has penetrated into the undercut around the keeper coping (Fig. 4).
(iv) Holding the denture until the resin is polymerized and the timing of denture removal are also important.

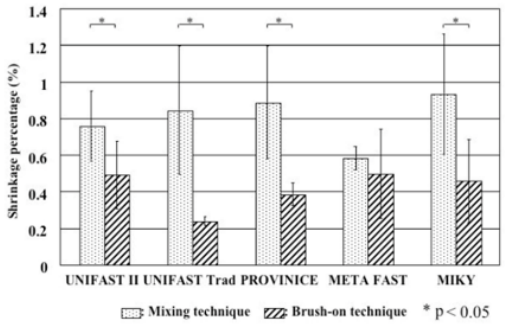

Fig. 3 Polymerization shrinkage of autopolymerized resin using brush-on and mixing techniques[2)]

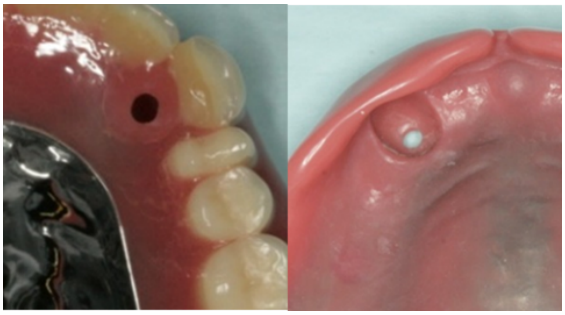

Fig. 4 Spillway provided to the denture base

(3) Placement of the magnetic assembly.The magnetic assembly should be placed after the denture is settled, considering the minimum shrinkage of the autopolymerized resin.

2. Movie explaining the clinical procedure of magnetic attachments (Fig. 5)

Fig. 5 Clinical procedures for applying the magnetic attachment

Practice

Placement of magnetic attachments (magnetic assembly) (Figs. 6-9)

Fig. 6 Jaw model of a partially edentulous mandible with left and right remaining canines, overdenture replica, and magnetic attachments (Physio Magnet, Kedika Corporation) used in the seminar.

Fig. 7 A space for magnetic attachments was created on the denture. The denture was placed on the jaw model, and a spillway was provided.

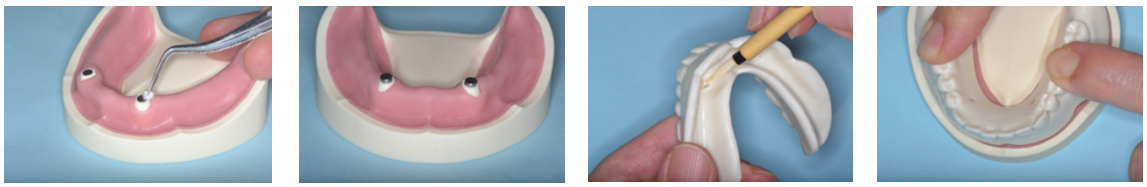

Fig. 8 After applying Vaseline to the keeper coping and the residual ridge, the magnetic assembly was placed on the keeper. Using the brush-on technique, the magnetic assembly was fixed with autopolymerized resin using light pressure.

Fig. 9 After the resin was polymerized, the denture was removed and polished

Results

The hands-on seminars received 40 applicants each year and were held six times in total, divided into two sessions of 20 participants each.

The breakdown for the three years from the 131st through the 133rd Annual Meeting was 99 participants with university affiliations and 21 with non-university affiliations, with 33 participants with university affiliations and 7 with non-university affiliations at each session (Figs. 10, 11).

Difficulties such as the detachment of the magnetic assembly and lack of attractive force were observed during the fixing procedures. Questionnaire results from participants were provided by the Japanese Society of Prosthetic Dentistry only for the 131st Congress, but results for the 132nd and 133rd Congresses were not available. Participants' years of experience at the 131st meeting are shown in Fig. 12. In addition, evaluations of the seminar by the participants showed that many of them answered that they were satisfied with the seminar. The results of the post-seminar questionnaire are shown in Fig. 13.

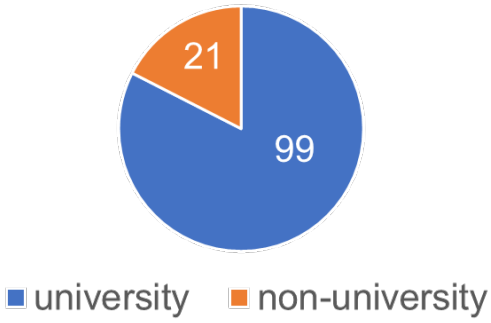

Fig.10 Workplaces of participants (3 years)

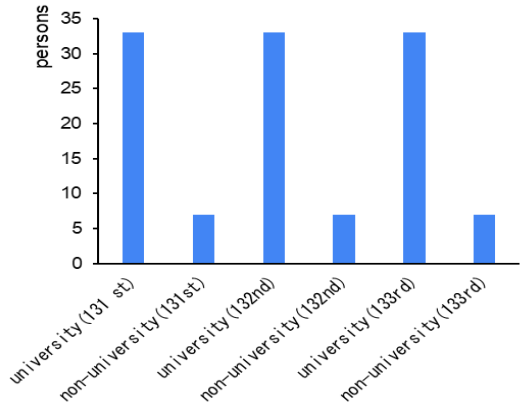

Fig.11 Workplaces of participants (each year)

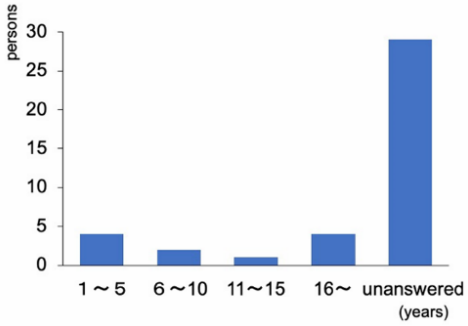

Fig.12 Participants'years of experience

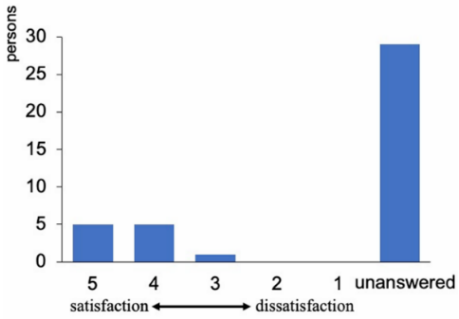

Fig.13 Evaluations of the seminar

Discussion

The past three seminars have been held with a fee, but each seminar has been well attended.

The detachment of magnetic structures from dentures was considered to be caused by the non-use of a metallic adhesive primer or the removal of dentures before room temperature curing of the resin. Therefore, metal adhesive primer was actively used in the 132nd seminar.

Insufficient pull force of the magnetic attachment was considered to be due to misalignment of the magnetic structure, such as an air gap caused by resin intrusion into the suction surface or polymerization shrinkage. As for the lack of retentive force, we changed the size of the keeper and magnetic assembly from 3.5 mm to 5.0 mm in diameter at the 133rd Annual Meeting; however, the

same lack of retentive force was observed as in the previous two meetings, so it is considered necessary to review the attachment clinical procedures in the future.

Conclusions

In order to promote appropriate clinical techniques for magnetic attachment treatment, which is now covered by insurance, we held a hands-on seminar, titled “How to use the magnetic attachments: laboratory and clinical procedures,” at the 131st through 133rd Annual Meetings of the Japanese Prosthetic Society. Although most participants were satisfied, some problems were identified, such as the detachment of magnet assemblies and insufficient retention. In the future, we would like to investigate the causes of these problems and improve the lectures and practical training.

References

1) Ai M, Shiau YY. New magnetic applications in clinical dentistry. Quintessence Publishing Company, Tokyo, 2004, 28–50.
2) Hanatani S, Shibuya N, Muraishi E, et al. Dimensional accuracy of autopolymerized resin applied using the brush-on technique. Int Chin J Dent. 2009; 9 (1): 9–13.

Acknowledgments

We would like to thank the Morita Corporation, the Kedika Corporation, and the Kikutani Corporation for their support of this seminar, as well as the teacing staff in our department for their cooperation in organizing the seminar.