Clinical Application of Dental Magnetic Attachment for Partial Denture

— Construction of an Upper Removable Partial Denture without Clasp —

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Introduction

The use of dental magnetic attachments to ensure the retention of overdenture or maxillofacial prosthesis has become a common dental procedure^{1,2)}. Generally, dental magnetic attachments consist of two parts, the magnetic assembly and the keeper. The magnetic assembly consists of a rare earth magnet and a magnetic alloy placed within the removable prosthesis. The keeper is made of a magnetic alloy and is attached within a root cap of an endodontically treated tooth. These two components provide a magnetically attractive force to improve retention of a prosthesis³⁾.

Recently, a magnetically attractive force was improved strongly and this attachment has been also used as a direct retainer of removable partial denture⁴⁻⁹⁾. Although clasp, precise attachment, and Konus crown are used as direct retainers of removable partial dentures, clasp is inferior in esthetics, and precise attachment and Konus crown are difficult to make.

This clinical report describes the application of dental magnetic attachments as direct retainers for esthetics to an upper removable partial denture without clasps.

Examination

The patient visited our clinic on April 8, 1993. She was a 50-year-old woman and her chief complaints were esthetic problem and masticatory disturbance. All of her upper remaining teeth had been prepared, without explanation by a general practitioner, for constructing an upper full mouth fixed bridge prosthesis. And then she wore an upper full mouth provisional restoration, so-called a temporary bridge. After these treatments, the general practitioner told her about the fee of her final prosthesis. She was shocked to learn its unbelievably high cost. She decided not to receive any more treatment at that time because of her anger at the dentist. Although she went without her dental treatment for about a year, she couldn't help visiting another dentist for repair of her broken provisional

restoration.

In intraoral findings of upper jaw, the right lateral incisor and the right canine and the left first premolar to the second molar were lost. The right central incisor and left third molar discharged pus from periodontal pockets around them. Although she hoped to wear a full mouth fixed bridge prosthesis, we felt otherwise because of these conditions of the remaining teeth. We explained that the remaining teeth would get worse by wearing a full mouth fixed bridge and it was best to use a combination of fixed bridges and a removable partial denture. She agreed with us in every respect under the condition of the esthetic consideration of anterior teeth region.

Design of prosthesis

At first, we designed a few types of prosthesis before constructing a final prosthesis. These were as follows :

Design A : All residual teeth are restored by full cast crowns except the right central incisor and the left third molar which are restored by root caps. The areas of missing teeth and alveolar bone resorption from the right canine to the central incisor and from the left first premolar to the third molar are restored by a removable partial denture with an Aker's clasp on the left central incisor, the left canine, and the right first premolar, a double Aker's clasp on the right first molar and the second molar (Fig. 1).

Design B : The area from the right third molar to the left canine is restored by a fixed bridge. The left third molar is restored by a root cap. The area of the left first premolar to the third molar is restored by a removable partial denture with an Aker's clasp on the left canine and a double Aker's clasp between the right first molar and the second molar. The double Aker's clasp is connected to the denture plate by a palatal strap (Fig. 2).

Fig. 1 Scheme of the design A

Fig. 2 Scheme of the design B

The good points of the design A are strong retention by many clasps and good stabilization by a large area of the denture plate. But design A has an esthetic problem by using clasps on the anterior teeth and it is thought that a palatal plate increased displeasing feeling of the patient because she has never worn a removable partial denture before.

Although design B has improved the esthetic problem by reducing the number of clasps of the anterior region and the displeasing feeling by decreasing the denture plate area as compared with design A, prognosis for the right central incisor is uncertain and it is too difficult to make crown forms of the anterior defect area identical with the crown forms of the opposite side.

We therefore designed another one which improved the bad points of the design A and the design B (Fig. 3). Although this design is similar to design A basically, dental magnetic attachments are used on the right central incisor and the left third molar as a radicular attachment and used on the right first premolar and the left canine as an extracoronal attachment. By using these attachments, we are able to make a removable partial denture without clasp. We chose this as the final design in consideration of the protection of remaining teeth and mucous membrane, cost, and prognosis.

Fig. 3 Scheme of the final design

Treatment and technical procedure

At first, the reconstruction of her broken temporary bridge was done. The purpose of this procedure was to recover mastication and esthetics. She was satisfied with this results and showed her trust in us. Next, the endodontic treatment of the right central incisor and the left third molar and a thorough plaque control were done at the Department of Periodontology, Kyushu Dental College Hospital.

Fig. 4 shows the final crowns. These crowns consist of full cast crowns of the right third molar to the right first molar, an one piece full cast crowns of the right second premolar and the right first premolar with an extracoronal magnetic attachment, and an one-piece hard resin veneer crowns of the left central incisor to the left canine with the same type of extracoronal magnetic attachment. The direct retainers consist of two extracoronal attachments mentioned above and two root caps within magnetic keepers (Hicorex Keeper MK, Hitachi) (Fig. 5). After trying these prosthesis into her mouth, the impression was taken and the temporary removable partial denture was made (Fig. 6). All fixed prosthesis and the temporary denture were set on August 19, 1993.

Fig. 4 Final fixed prosthesis except root caps

Fig. 7 Final removable partial denture (occlusal view)

Fig. 5 Direct retainers consist of two extra-coronal attachments and two radicular attachments

Fig. 8 Four dental magnetic assemblies which were used in this case

Fig. 6 Temporary removable partial denture

Fig. 9 Final removable partial denture with four magnetic assemblies

Fig. 10 Frontal view without the removable partial denture

Fig. 12 Frontal view when the patient was smiling. Note her esthetic aspect.

Fig. 11 Frontal view with the removable partial denture

The final removable partial denture was made with PMMA after the final impression (Fig. 7). Four dental magnetic assemblies (Hicorex MD, Hitachi) were applied for the retention of this denture (Fig. 8). One was a small type whose diameter was 3.5 mm and had a 230 g of attractive force. Other three were of a regular type whose diameter was 4.4 mm and had 350 g of attractive force. Before setting, these four magnetic assemblies were sandblasted and coated with a metal primer (Meta Fast, Sun Medical) except the contact surfaces with

keepers. After these procedures, magnetic assemblies were put on the each keeper, and the contact area of the denture with the magnetic assembly was eliminated with a carbide bur. These magnetic assemblies were bonded to the denture with an auto-polymerized acrylic resin (Fig. 9). All prosthetic treatment was finished on September 30, 1993 (Fig. 10, 11).

Management of these prosthesis after setting were instructed, especially plaque control of the extracoronal attachment region.

Discussion & Conclusion

In this report, a dental magnetic attachment was used as an extracoronal attachment. Although this attachment was basically developed as a radicular attachment, the application like this was very useful for improving the patient's esthetics. Actually, she was very satisfied with her prosthesis and she recovered her beautiful smile (Fig. 12). Generally, retentive force of removable partial denture requires more than 1.2 kg. Total retentive force

of this partial denture was 1.28 kg and it was enough to make the denture stable. After thirty months with a recall every six months, there has been no problem to date. On the other hand, if the general practitioner had explained about the treatment detail for so-called informed consent when she visited his office, removable partial denture would not have been necessary for her.

References

- 1) Miyake, S., Shinohara, I., Wu, W. and Toyoda, S.: A clinical case of radicular attachment with use of Sm-Co alloy magnet. *J. Jpn. Prosthodont. Soc.* 28 : 1129-1133, 1984 (in Japanese).
- 2) Masumi, S., Miyake, S., Kido, H. and Toyoda, S.: Use of a sectional prosthesis following partial maxillary resection. A clinical report. *J. Prosthet. Dent.* 64 : 401-403, 1990.
- 3) Masumi, S., Nagatomi, K., Miyake, S. and Toyoda, S.: Removable magnetic dental attachment which permits magnetic resonance imaging. *J. Prosthet. Dent.* 68 : 698-701, 1992.
- 4) Masumi, S. and Toyoda, S.: Clinical application and instruction of dental magnetic attachment. *J. Dent. Med.* 38 : 41-47, 1993 (in Japanese).
- 5) Masumi, S.: Application of dental magnetic attachment for esthetic dentistry — Characteristics, problems, and solutions —. *J. Esthet. Dent.* 6 : 258-262, 1994 (in Japanese).
- 6) Masumi, S., Ozamoto, M., Kido, H., Arita, M. and Morikawa, M.: Methods of removal for a commercial dental magnetic keeper. *J. J. Mag. Dent.* 3 : 30-35, 1994 (in Japanese).
- 7) Arita, M., Masumi, S., Ozamoto, M. and Morikawa, M.: Clinical evaluation of the HICOREX MD dental magnetic attachment. *J. J. Mag. Dent.* 3 : 36-43, 1994 (in Japanese).
- 8) Kido, H., Masumi, S., Arita, M., Takeya, K., Chigusa, R. and Morikawa, M.: A statistical study of the clinical applications of the MAGFIT 600 dental magnetic attachment. *J. J. Mag. Dent.* 3 : 44-52, 1994 (in Japanese).
- 9) Ai, M., Mizutani, H., Ishihata, N. and Nakamura, K.: Removable partial denture with dental magnetic attachment. *Quintessence*, Tokyo, 1994, 49-127 (in Japanese).

磁性アタッチメントのパーシャルデンチャーへの臨床応用

— ノンクラスプパーシャルデンチャーの製作 —

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最近の磁性アタッチメントは、従来のものより吸引力が上昇したため、パーシャルデンチャーの直接維持装置としてクラスプや他のアタッチメントと同様の使用が可能となってきた。磁性アタッチメントはクラスプと比較して、審美的に非常に優れており、また従来の精密性アタッチメントやコーヌスクローネのような煩雑な技工操作を必要としないため、術者のみならず患者も満足する有用な維持装置と思われる。今回、審美不良と咀嚼障害を主訴として当科に来院した患者の上顎部分床義歯製作に際して、磁性アタッチメントを利用した歯冠外および根面アタッチメントを用いて、クラスプを全く使用しない、いわゆるノンクラスプパーシャルデンチャーを製作したところ、非常に良好な結果が得られたので、その製作法ならびに治療経過について報告する。患者は50歳女性で、某歯科医院において上顎フルマウスのテンボラ

リーブリッジを装着され、最終補綴にはいる時点で治療費を聞いて困惑し、その後の治療を約1年間放置していた。患者自身はフルマウスのブリッジを希望していたが、残存歯および歯周組織の状態を考慮すると不可能であると考えられた。デザインに関しては、できる限り患者の要求を取り入れ、かつ術者側も満足できる補綴物を製作することを目指して設計を決定した。クラスプが全くないことから審美的に非常に優れており、また磁石を4つ使用することにより、十分な維持力が得られた。さらに義歯床面積の縮小が可能となり、患者に満足してもらうことができた。現在まで半年毎のリコールを行って約2年半が経過しているが、アタッチメントの維持力の低下や根面板周囲の歯周組織の炎症などの問題もなく機能している。