A nasal prosthesis magnetically connected with a maxillary complete denture: A clinical report

Naomi Tanoue, DDS, PhD,[a] Shuichi Mori, DT,[b] and Hideo Matsumura, DDS, PhD[c]

[a]Prosthodontics, General Dentsitry Department, [b]Dental Laboratory Center, Nagasaki University Hospital of Dentistry, and [c]Division of Fixed Prosthodontics and Oral Rehabilitation, Nagasaki University Graduate School of Biomedical Sciences, Nagasaki, Japan

A sectional denture/prosthesis was fabricated for an edentulous patient with a nasal defect for the purpose of recovery of orofacial functions. The denture and the prosthesis were connected by a cobalt-samarium magnetic retainer (Hicorex Super) and an acrylic joint rod through an access hole under the nose. Although the hard plastic prosthesis component and the inflexible joint slightly affected the patient's orofacial movement, color stability, fitting, and retention were satisfactory. The patient recovered the anatomic form of the nose wing, as well as mastication, respiration, and speech through use of the sectional denture/prosthesis. **(Int Chin J Dent 2002; 2: 86-91.)**

Key words: magnet, nasal prosthesis, sectional denture.

INTRODUCTION

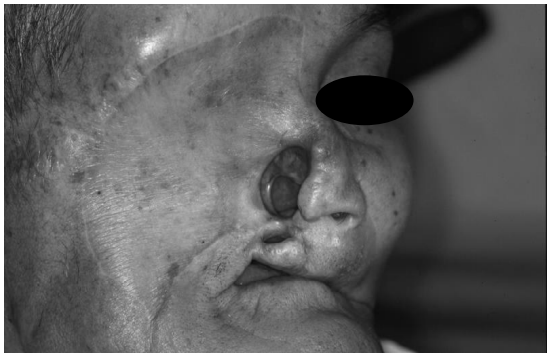
A facial defect caused by either traumatic injury or extirpation of neoplasm induces esthetic and functional problems for the patient. Prosthetic treatment of a nasal defect is typically performed in conjunction with a prosthodontic procedure when the defect includes the maxilla or passes through the palate. A number of techniques and materials for recovering nasal defects[1-13] as well as methods and devices for removal/insertion or orientation of prostheses[14,15] have been reported. Fabrication of a facial prosthesis connected with a maxillary denture contributes both to recovery of anatomic form and to improvement in the oral functions of the patients who underwent orofacial surgery. Due to complicated marginal and internal forms of the defects, special attention should be taken with respect to the impression procedure, mode of retention, sealing at the prosthesis border, home care, etc.[16-20]

A number of magnetic retainer systems have been developed for retaining removable dentures and maxillofacial prosthesis. Application to sectional prostheses of magnetic retainers is quite useful for achieving an appropriate path for insertion/removal of complicated dentures.[21-23] Materials and techniques used for orofacial prostheses, however, vary considerably according to the cause of the defect, the healing condition, and the post-operative anatomic structure of individual cases. This clinical report describes a

case of a nasal prosthesis connected with a maxillary complete denture in which a magnetic retainer is bonded to a joint rod.

CLINICAL REPORT

A 74-year-old male patient was referred to the Prosthodontics Department of the University Hospital for recovery of his lateral nasal defect and dentition (Fig. 1). Examination revealed that the patient was edentulous in both the maxilla and the mandible. In addition, his right maxilla, eyeball, and nose wing had been resected due to squamous cell carcinoma originating from maxilla. Post operative radiation therapy using a linear accelerator (60 Gy) had been completed by the time of the prosthodontic consultation. According to the report from the Plastic and Reconstructive Surgery Division, the facial defect was reconstructed several times after resection of carcinoma with auto-grafted rib and flaps. Considering the connection of a nasal prosthesis and a maxillary denture, the surgeon prepared an access hole 6 mm in diameter under the original right nasal cavity, lined with the cutaneous tissue of the patient.



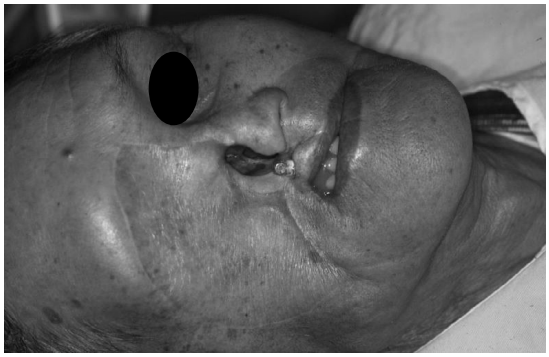
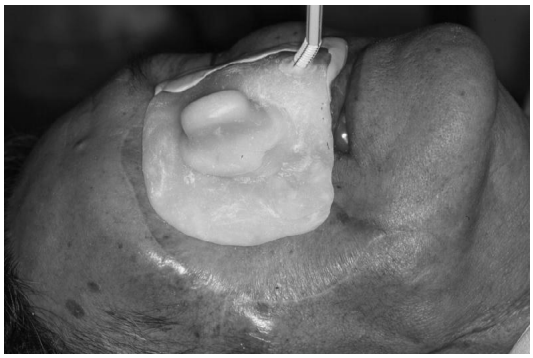


Fig. 1. Appearance of the patient with nasal defect before prosthetic treatment.

Fig. 2. Lateral view of the patient before impression for nasal prosthesis. The maxillary complete denture with an acrylic rod and a keeper component of a magnetic retainer is seated.



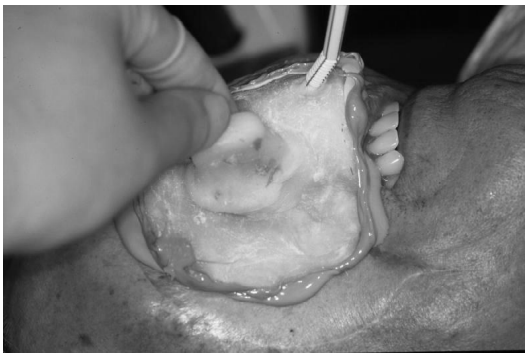
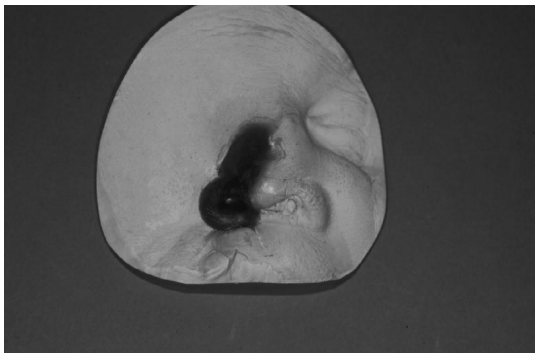


Fig. 3. A custom tray used for facial impression. An air-way made of a piece of straw was placed at the orifice of the left nasal cavity.

Fig. 4. Combined impression was made with two types of silicone elastomeric materials.



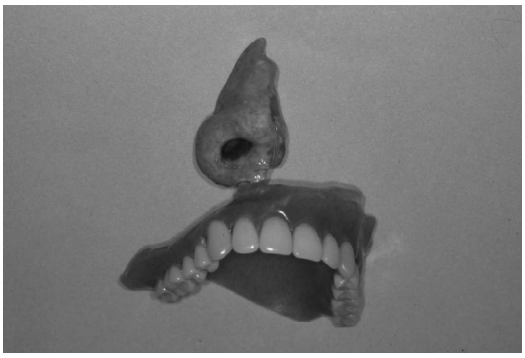
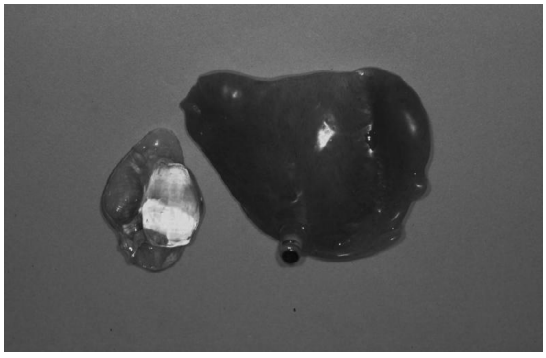


Fig. 5. A wax pattern for the nasal prosthesis on the working die.

Fig. 6. A nasal prosthesis connected to the maxillary denture with a magnetic retainer (Hicorex).



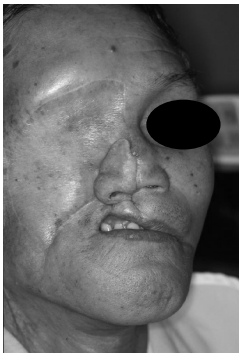


Fig. 7. Separated prosthesis/denture. The magnetic retainer is embedded into the nasal prosthesis, whereas the keeper component is bonded to the acrylic rod built in the denture.

Fig. 8. Seated complete denture and nasal prosthesis.

Prior to fabrication of the nasal prosthesis, the patient underwent seating of maxillary and mandibular complete dentures. Both dentures were made of a heat-cured acrylic denture base resin (Acrell, Nissin Dental Products Inc., Kyoto, Japan) and composite artificial teeth (Endura, Shofu Inc., Kyoto, Japan). A hole was sunk into the maxillary denture base, which was located to near the right central incisor and corresponded to the access hole of the patient, using a rotary cutting instrument. A transparent acrylic rod 6 mm in diameter by 15 mm in length was built up using a self-curing acrylic resin (Repairsin, GC Corp., Tokyo, Japan). After confirmation of the proper position of the rod passing through the access hole, a keeper component of a magnetic attachment system (Hicorex Super, Hitachi Metals Ltd., Tokyo Japan) was bonded to the end of the rod. The bonding procedure is as follows; 1) the surface to be bonded of the keeper was air-abraded with 50 μm grain sized alumina (Hi-Aluminas, Shofu Inc.) followed by air-spraying, 2) a phosphate metal conditioner (Cesead II Opaque Primer, Kuraray Co., Ltd., Osaka, Japan) was applied to the alumina-blasted surface, and 3) the keeper was bonded to the rod with a self-curing adhesive resin (Super-Bond C&B, Sun Medical Co., Ltd., Moriyama, Japan). Fig. 2 shows the lateral view of the patient before impression for nasal prosthesis. The keeper component was located at the bottom of the nasal defect

at this stage.

A custom tray for facial impression (Fig. 3) was made with an acrylic resin (Ostron II, GC Corp.), and the border of the tray was partially molded with a putty type silicone material (Exafine putty, GC Corp.). After blocking out the undercut of the nasal defect with pieces of gauze and cotton, the impression of the face including the defect and the keeper component surface was made with two types of silicone elastomeric materials (Exafine regular and injection, GC Corp.). An air-way during the impression was secured through the left nasal cavity by using a piece of straw embedded in the custom tray (Fig. 4). Die stone (New Plastone, GC Corp.) was poured into the boxed impression, and the undercut of the defect was reformed with the same stone material. An outline form of the nasal prosthesis was made with paraffin wax (Fig. 5), invested into a flask, and the pattern was replaced with a heat-cured transparent acrylic denture base material (Acron, GC Corp.). Coloring of the nasal prosthesis was performed using a light-curing color fluid system (Creactive, Heraeus Kulzer GmbH & Co., Wehrheim, Germany). The surface of the prosthesis was roughened with methylene chloride, and the blended color liquid was applied with a brush. Painting and light exposure with a laboratory light-curing unit (Dentacolor XS, Heraeus Kulzer GmbH & Co.) were repeated until skin color of the patient was reproduced. Color slides and printed photographs were used as the reference color indicator in the laboratory process.

The prosthesis was tried in, at the next visit of the patient, and a small hole was sunk into the inner part of the prosthesis for the placement of a magnetic retainer. The cobalt-samarium magnetic component (Hicorex Super, Hitachi Metals Ltd.) was then bonded to the nasal prosthesis with the same procedure as the keeper metal. Fig. 6 shows the extraorally connected prosthesis/denture, whereas Fig. 7 represents the separated parts. The completed prosthesis was seated, and the direction of insertion/removal was explained (Fig. 8). Due to the hard plastic structure of the prosthesis and the inflexible joint, movement of the face was limited. The daily life of the patient, however, was not particularly affected. The patient recovered the anatomic form of the nose wing, as well as mastication, respiration, and speech. Color stability, fitting, and retention were also judged as satisfactory. Adjustment and relining of the prosthesis/denture were performed several times in accordance with the change in anatomical post-operatively. In addition, the patient wore dark spectacles to hide the flattened surface around the resected right orbita. Regular check-ups were continued both by the plastic and reconstructive surgery division and by the prosthodontics division, and the prosthesis/denture functioned for more than six months.

DISCUSSION

This clinical report presented a sectional prosthesis/denture connected with a magnetic retainer for recovering the anatomic form of the nose and the maxillary dentition. Prior to visiting the prosthodontics division, the surgeon in the plastic and reconstructive division prepared an access hole lined with cutaneous tissue between the lip and nasal defect for connecting the prosthesis and the denture with a rod. The 6-mm rod diameter was determined considering the size of the defect, diameter of the magnetic retainer (4 mm), and the strength of the connector.

A combined impression with silicone elastomers was made in fabrication of the current nasal prosthesis. For further improvement in sealing at the prosthesis border, especially the movable area, the use of a functional impression technique should be considered.[24] By use of the magnetic connector, both the nasal prosthesis and the denture of this report appeared to be stabilized at the centric occlusion. Respiration, speech, and mastication have also been considerably improved through the use of the sectional prosthesis/denture. The patient, however, sometimes felt discomfort due to slight vertical movement of the nasal prosthesis during mastication, probably due to rigid connection between the two sections. The use of a more flexible or movable connector[9] should be taken into consideration if stability of the nasal part is considerably affected by daily oral functioning.

The current nasal prosthesis was fabricated with a heat-cured acrylic resin, and stabilized using a magnet system. When a facial prosthesis cannot be connected with a removable denture, another retention system should be employed. If sufficient undercut for retaining the prosthesis were available, a prosthesis made of elastomeric material combined or not combined with other materials would be beneficial, although elastomers are inferior in color stability to plastic materials. The use of medical adhesive, surgical tape,[7,12] or Velcro[17] is an alternative for retaining a facial prosthesis with insufficient undercut. An adhesively retained nasal prosthesis made of a light-cured resin overlaid with a silicone elastomer has been reported.[8] It should be noted, however, that medical adhesives are generally more compatible to acrylic polymers than to silicone elastomers.[8] Although the hard plastic segments of a facial prosthesis restrict movement of orofacial tissues and organs, repair/relining as well as coloring can be quickly performed. The use of acrylic resins is therefore profitable for patients with small facial defects, and reform of the prosthesis is to be scheduled in future.

CONCLUSION

A nasal prosthesis connected to a maxillary complete denture was fabricated for a patient with a post-operative orofacial defect. Both the prosthesis and the denture were made of heat-cured acrylic denture base resin, and they were sectionally connected with a cobalt-samarium magnetic retainer (Hicorex Super) embedded into an acrylic rod. Although materials and techniques should be carefully considered on the basis of the situation of each patient, application of a magnetically connected sectional prosthesis was useful in the current case for establishing path of insertion/removal as well as stabilization of both parts.

REFERENCES

1. Brown KB. Fabrication of a nose prosthesis. J Prosthet Dent 1971; 26: 543-54.
2. McClelland RC. Facial prosthesis following radical maxillofacial surgery. J Prosthet Dent 1977; 38: 327-30.
3. Hutcheson PE, Udagama A. Surgical nasal prosthesis. J Prosthet Dent 1980; 43: 78-81.
4. Knudson RC, Saunders TR. Modified clinical and laboratory procedures for fabrication of nasal prostheses. J Prosthet Dent 1984; 51: 660-2.
5. Shifman A. Selective-pressure impression technique for nasal prostheses. J Prosthet Dent 1987; 58: 349-51.
6. Udagama A. Urethane-lined silicone facial prostheses. J Prosthet Dent 1987; 58: 351-4.
7. Reisberg DJ, Habakuk SW. Nasal conformer to restore facial contour. J Prosthet Dent 1990; 64: 699-701.

8. Marion LR, Rothenberger SL, Minsley GE. A method of fabrication of a facial prosthesis that improves retention and durability: a clinical report. J Prosthet Dent 1997; 77: 457-60.
9. Dumbrigue HB, Fyler A. Minimizing prosthesis movement in a midfacial defect: a clinical report: J Prosthet Dent 1997; 78: 341-5.
10. Flood TR, Russell K. Reconstruction of nasal defects with implant-retained nasal prostheses. Brit J Oral Maxillofac Surg 1998; 36: 341-5.
11. Cheng AC, Morrison D, Wee AG, Maxymiw WG, Archibald D. Maxillofacial prosthodontic management of a facial defect complicated by a necrotic frontal bone flap: a clinical report. J Prosthet Dent 1999; 82: 3-7.
12. Toljanic JA, Lee J, Bedard JF. Temporary nasal prosthesis rehabilitation: a clinical report. J Prosthet Dent 1999; 82: 384-6.
13. Cheng AC, Wee AG, Tat-Keung L. Maxillofacial prosthetic rehabilitation of a midfacial defect complicated by microstomia: a clinical report. J Prosthet Dent 2001; 85: 432-7.
14. Lemon JC, Chambers MS, Wesley PJ, Martin JW. Technique for magnetic placement and orientation of a facial prosthesis. J Prosthet Dent 1996; 75: 50-2.
15. Mekayarajjananonth T, Huband ML, Guerra LR. Clear acrylic resin device for orientation and placement of a small facial prosthesis. J Prosthet Dent 2000; 83: 656-9.
16. Hutton B, Hutton J. Living with a facial prosthesis. a guide to patient care. Am J Nursing 1984; 84: 50-2.
17. Grant GT, Taft RM, Wheeler ST. Practical application of polyurethane and Velcro in maxillofacial prosthetics. J Prosthet Dent 2001; 85: 281-3.
18. Kiat-Amnuay S, Gettleman L, Khan Z, Goldsmith LJ. Effect of adhesive retention of maxillofacial prostheses. Part 2: Time and reapplication effects. J Prosthet Dent 2001; 85: 438-41.
19. Markt JC, Lemon JC. Extraoral maxillofacial prosthetic rehabilitation at the M.D. Anderson Cancer Center: a survey of patient attitudes and opinions. J Prosthet Dent 2001; 85: 608-13.
20. Pigno MA, Funk JJ. Augmentation of obturator retention by extension into the nasal aperture: a clinical report. J Prosthet Dent 2001; 85: 349-51.
21. Nadeau J. Maxillofacial prosthesis with magnetic stabilizers. J Prosthet Dent 1956; 6: 114-9.
22. Masumi S, Miyake S, Kido H, Toyoda S. Use of a sectional prosthesis following partial maxillary resection. clinical report. J Prosthet Dent 1990; 64: 401-3.
23. Matsumura H, Kawasaki K. Magnetically connected removable sectional denture for a maxillary defect with severe undercut: a clinical report. J Prosthet Dent 2000; 84: 22-6.
24. Pow EH, McMillan AS. Functional impression technique in the management of an unusual facial defect: a clinical report. J Prosthet Dent 2000; 84: 458-61.

Reprint request to:

Dr. Naomi Tanoue

Prosthodontics, General Dentistry Department, Nagasaki University Hospital of Dentistry

1-7-1, Sakamoto, 852-8588, Japan

Fax: +81-95-849-7689

E-mail: t-naomi@net.nagasaki-u.ac.jp

Received on March 15, 2002. Revised on March 25, 2002. Accepted on May 5, 2002.