Prosthetic Rehabilitation of Nasal Defect: A Case Report

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Abstract

Facial defects not only impact on the function and quality of life but also affect the psychological well-being and social behavior of patients. A nasal prosthesis can re-establish the esthetics and anatomical contour in patients with mid-facial defects, often more effectively than surgical reconstruction. For successful results, many factors such as retention, texture, color match and blending of tissue with the prosthesis must be taken into account. The aim of this clinical report was to describe a modified technique for rehabilitation of a nasal defect with suitable adaptation. This provisional prosthesis was made to restore the esthetic appearance of the patient with a mechanically retained design using a spectacle glass frame without inserting craniofacial implants.

Key words: Nasal; Rehabilitation; Retention.

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Introduction

Facial defects can result from trauma, surgical resections, congenital anomalies, acquired infections and burns (1,2). These defects not only impact on the function and quality of life but also affect the psychological well-being and social behavior of patients (3). Surgical reconstruction, prosthetic rehabilitation or a combination of both are the commonly used methods to restore facial disfigurements (4).

The reconstructive options depend on the size and site of defect, etiology of defect, general health status of patient, medical condition of patient and patient's desire and demands (1,3). Materials commonly used for fabrication of facial prostheses include acrylic resins, acrylic copolymers, vinyl polymers, polyurethane elastomers and silicone elastomers (5,6). However, silicones remain the more widely used materials for facial restorations because of their optimal surface texture and hardness, biocompatibility, flexibility, color stability, light weight and tissue-like appearance (3,4).

Silicone block copolymers are the newly developed materials to overcome some of the shortcomings of silicone elastomers, such as a low tear strength, low elongation and the potential to enhance bacterial and fungal growth (6). Long-term success of facial prostheses mainly depends on their retention. Retention of facial prostheses depends on providing optimal marginal integrity and conserving the position of prosthesis during movement of the head and function of muscles (1). Retention of facial prosthesis can be achieved by use of biocompatible adhesives or mechanically by engaging anatomical undercuts, attaching the prosthesis to the patient's eyeglasses and use of straps, head bands, magnets or osteointegrated implant-retained titanium screws (7,8). This clinical report aimed to describe a modified technique for

rehabilitation of a nasal defect.

Case Report

A 22-year old male presented to the Deptartment of Prosthodontics, Shahid Beheshti University of Medical Sciences Tehran Iran for prosthetic rehabilitation of his nasal defect (Figure 1). The patient had a history of Pseudomonas aeruginosa infection in the mid-facial region, extending to his lateral nasal cartilages, alar cartilages and septal cartilage (Figure 1). On intraoral and extraoral examination, there was no sign of any ulceration. After consultation with the patient and surgeon, a provisional nasal prosthesis was designed and a surgical procedure was scheduled for final reconstruction of the nose.

Figure 1- Patient's frontal view (A); Lateral left view (B); Lateral right view (C)

PROCEDURE DETAILS

Boxing wax (Kerr, Romulus, MI, USA) was fitted to the patient's face to support the impression material (Figure 2A). After blocking out the undercuts by filling the nasal cavities with lubricated gauze, an impression was taken from the defect and the adjacent tissues using irreversible hydrocolloid impression material (Zhermack, Rovigo, Italy) with the patient in semi-upright position in order to minimize tissue bed distortion. Paper clips were used to provide retention for dental stone on the alginate impression. Fast-set plaster was then used to support the impression (9) (Figure 2B). The impression was removed and poured with type III dental stone (Moldano; Bayer, Leverkusen, Germany) (Figure 2C).

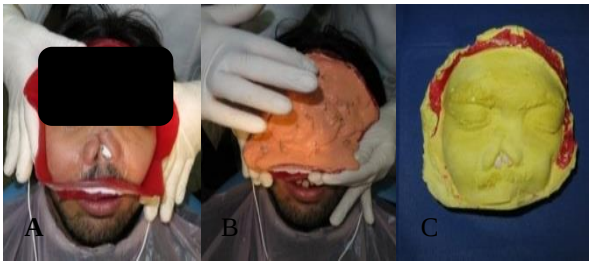

Figure 2- Boxing of face for taking impression (A); Impression taken by irreversible hydrocolloid material (B); Cast made of type lll dental stone (C)

The pattern of prosthesis was sculpted on the facial cast with baseplate wax (Cavex, Cavex Holland, Haarlem, Netherlands) (10). After completion of the wax pattern, it was evaluated to improve the whole morphology, contour, surface texture and position on the patient's face (Figure 3).

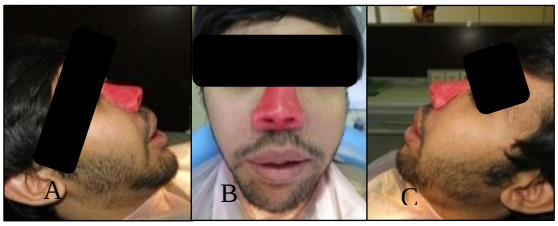

Figure 3- Wax model of the nose in frontal (A); Lateral left view (B); Lateral right view (C)

In order to improve the marginal adaptation of the wax pattern, it was relined with Kerr elastomeric impression material (Romulus, MI, USA) on the face and poured with type III dental stone (Figure 4). Marginal adaptation of nasal pattern was corrected again with wax on the new cast, and then eyeglasses frame was worn with the relined wax trial, considering the need for retention of final prosthesis. After verifying the wax prosthesis by its trial insertion with

eyeglasses on, it was sent to the laboratory for fabrication with silicone. In the lab, the relined wax model was placed in a flask. The flask was immersed in boiling water for five minutes in order to eliminate the wax (4). After complete removal of the wax, the intrinsically colored (Factor II Inc., Lakeside, AR, USA) Cosmesil M511 silicone material (Cosmedica Ltd., Cardiff, UK) was then bulk-filled, and the material was processed according to the manufacturer's instructions (1). Appearance of the prosthesis was improved by extrinsic coloring and use of eyeglasses (Figure 5). The patient reported to be comfortable with the prosthesis. The patient gave consent to the publication of his treatment report including full face pictures (Figure 6).

Figure 4- Nasal wax pattern relined with elastomeric impression material

Figure 5- Finished silicone prosthesis attached to spectacles

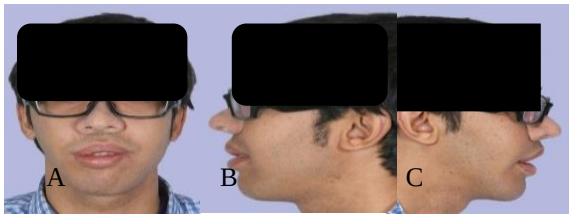

Figure 6- Final nasal prosthesis in frontal view (A); lateral left view (B); lateral right view (C)

Discussion

This clinical report describes a simple and affordable method for fabrication of a provisional nasal prosthesis for interim use. Eyeglasses and anatomical undercuts were used to provide retention for the silicone prosthesis. According to Ciocca *et al*, (11) acceptance of facial prosthesis by the patient highly depends on its optimal retention, which can be provided by craniofacial implants. However, for a temporary prosthesis, the retention can be provided by use of undercuts and glasses providing support. Patients who have had experiences with different methods of restraint often experience a substantial improvement in quality of life with implant-supported prosthesis. However, the use of implants is limited because it requires adequate bone thickness for its installation, and its use is restricted in patients with a history of radiation of the implant region, in addition to its high cost and the need for a surgical phase (11). Nadeau (12) first described the combined use of an intraoral prosthesis connected by magnets. Connecting intra and extraoral implants often results in movement of intra and extraoral prostheses during mastication. The movement is particularly problematic in patients with compromised retention, support and stability of intraoral prosthesis. Adhesives are the most commonly used materials for retention but the weight of larger prostheses may prohibit or limit their use (5). Moreover, use of adhesives with certain materials such as elastomers results in poor bond strength with unpredictable periods of retention for everyday use. Additionally, adhesives tend

to degrade the prosthetic material, especially at the borders, where the material is thinner and eventually necessitate the fabrication of a new prosthesis (13). When suitable conditions are provided, mechanical retention obtained by anatomical undercuts is the most advantageous. Presence of moisture, mobile soft tissues or lack of stable tissue support all affect the retention, and these are considered as the disadvantages of anatomical retention (14).

Various maxillofacial impression techniques have been described so far, which are based on the availability of materials and dexterity of the operator; thus, fabrication of an extraoral facial prosthesis requires a combination of art and science (15).

The conventional method of taking a maxillofacial impression involves the use of irreversible hydrocolloid material reinforced with type lll gypsum (16). Alternatively, high-viscosity polyvinyl silicone impression materials can be used with the help of a suitable carrier (17). In the present case, the conventional method was used. At first, the impression was made with irreversible hydrocolloid impression material and reinforced with type lll dental stone. Then, for better integrity of the margins, the nasal wax pattern was relined with elastomeric impression material. Only one level impression has been taken in previous studies(4,5,7). But in this case, the wax pattern was relined after initial impression for better adaptation. This mismatch can be due to the volumetric changes in the plaster and wax. Moreover, perfect adaptation of wax to the facial soft tissue is difficult and imprecise; thus, relining and pouring the new impression can be an efficient method to improve wax pattern adaptation. For the present case, a silicone material with intrinsic coloring was used and in order to achieve a natural appearance, further extrinsic coloring was applied. The intrinsic coloration increases the color stability and translucency of the prosthesis (13). Approaches and techniques that attempt to achieve an accurate skin color match include trial-and-error mixing shade guides, pigment dispersion systems and color measurements using a colorimeter or spectrophotometer (18). In this case report, trial-and-error method of mixing was done. Heat-polymerizing methyl methacrylate is the material preferred by many clinicians because it can be relined with a temporary denture reliner to compensate for tissue changes secondary to scar contracture and wound organization. Also, it can be satisfactorily colored to match individual skin tones. However, its use is limited by its rigidity and heavy-weight.

A silicone elastomer may also be used to fabricate a temporary prosthesis (19). Cosmesil M511 silicone material was used for fabrication of the provisional nasal prosthesis because it can be processed to varying degrees of hardness and has a high tear strength (8). However, silicone materials fall short of an ideal maxillofacial prosthetic material as adhesives do not work well with silicones, and silicones are difficult to polish, have low tear strength, and promote microbial growth. Although attempts have been made to greatly improve the properties of various maxillofacial rehabilitation materials, there is still no ideal material perfectly resembling the human

skin (20).

Laser scanning, computer aided design/computer aided manufacturing, and rapid prototyping technologies simplify the procedures, because the entire process of maxillofacial prosthesis construction can be automated.

The computer aided design/computer aided manufacturing system decreases the number of manual steps needed to build a temporary nasal prosthesis. The main advantages of this technique are that all corrections can be made directly on the computer screen (9).

Conclusion

In this report, eyeglasses were used for retention of the silicon prosthesis. The advantages of this prosthesis were that its fabrication technique was noninvasive, easy and affordable and it provided acceptable esthetics and comfort for the patient. In addition, the two-step impression technique provided optimal marginal integrity.

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Conflict of Interest: "None Declared**"**

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