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Implant-Retained Nasal Prosthesis for a Patient Following Partial Rhinectomy: A Clinical Report

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Abstract

Prosthetic rehabilitation of facial defects has always perplexed maxillofacial prosthodontists. Facial defects lead to functional and cosmetic deficiencies. Early rehabilitation improves patients' quality of life. Osseointegrated rehabilitation of the maxillofacial prosthetic patient presents the potential for overcoming many of the disadvantages associated with conventional retentive methods. This paper presents the clinical report of a patient who had undergone partial rhinectomy due to basal cell carcinoma. Following post-surgical healing, the patient was rehabilitated with a temporary acrylic resin nasal prosthesis retained by eyeglass frame. Later a silicone nasal prosthesis supported by an implant-retained framework was fabricated as a definitive replacement.

The face is the most noticeable part of the body. Many patients who suffer facial tissue defects as a result of malignant tumor resection or trauma may have an impaired social life stemming from esthetic problems. Hence early prosthetic rehabilitation contributes greatly to improving such patients' quality of life.[1-3]

Among facial defects, nasal defects produce severe cosmetic impairment, since the nose is a prominent feature of the human face.[3] Rehabilitation of such defects subsequent to surgery is done in a sequential manner, which includes a surgical, provisional, and definitive prosthesis.[4] The retentive media are an important factor for the satisfactory rehabilitation of these defects. In the past, most nasal prostheses were retained with strings or straps anchored behind the head,[5] intraoral or intranasal extensions,[5-7] and gold strings or leaves.[8-10] Spectacle frames have been popular for anchoring nasal prostheses and even today, are preferred when patients show a desire for an economical treatment solution.[11,12] Today, prosthetic replacements are secured with readily available adhesives that are easily applied and provide satisfactory retention for limited periods of time;[13] however, the effectiveness of adhesives is often compromised by the presence of mobile tissues in the defect, nasal secretions, and warm moist air associated with respiration.[14] The concept of osseointegration[15] has enabled a more predictable mode of retaining nasal prostheses.[16] Implant-retained nasal prostheses are more comfortable and also enhance a patient's self-esteem and confidence. Hence, they have the potential to overcome many of the disadvantages associated with conventional retentive methods.

The placement of dental implants in patients who have undergone cancer surgery depends on whether post-surgical chemotherapy or radiation therapy has been given. Granstrom et al[17] have shown that osseointegration in irradiated patients depends on factors such as radiation dose, fractionation of the dose, and time from radiotherapy to implant surgery. Other factors such as fixture length and prosthetic retention affect the result.[18] Even though implant survival might be affected by radiotherapy, the benefits the patient can gain from receiving implants are so high that it is now a recommended procedure. The adjunctive use of hyperbaric oxygen therapy can enhance the survival rate of implants. This article describes the procedure for rehabilitating a patient with an implant-retained nasal prosthesis.

Clinical report

A 58-year-old male patient diagnosed with basal cell carcinoma of the nasal vestibule had undergone partial rhinectomy. The patient was referred to the Department of Maxillofacial Prosthodontics at our institution. The patient's chief complaint was "I have stopped looking at the mirror after the nose surgery because of my unpleasant appearance." Clinical examination

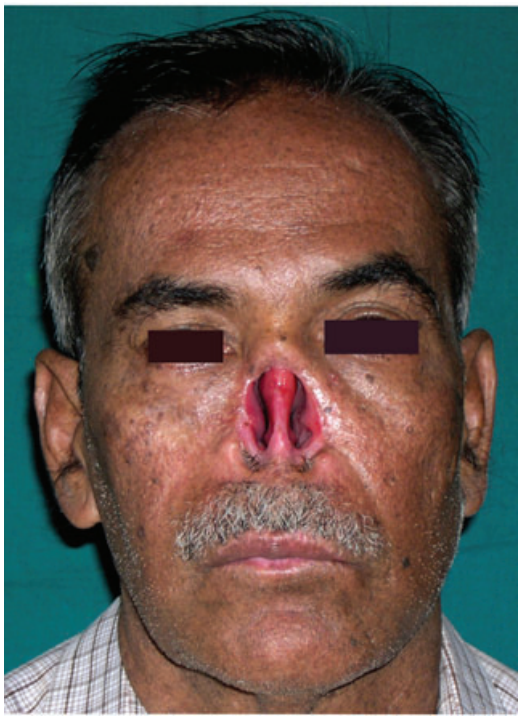

Figure 1 Acquired nasal defect after partial rhinectomy.

revealed absence of the entire cartilage of the nose, ala, and part of the nasal septum due to the surgery (Fig 1). The patient did not have a history of significant medical illness aside from the carcinoma. No follow-up radiation therapy or chemotherapy was given.

As a bank employee who interacts with customers, the patient was deeply concerned about his esthetics and was seeking prosthetic rehabilitation soon after surgery. Since an immediate definitive prosthesis was not feasible, the patient was temporarily rehabilitated with an acrylic resin nasal prosthesis attached to an eyeglass frame. During the subsequent follow-up appointment, it was noted that retention and marginal fit of the temporary prosthesis was lost due to post-surgical marginal tissue changes. At this stage, the option of the implant-retained silicone prosthesis was given. The advantages of silicone over acrylic resin were explained. The patient chose to proceed with the suggested treatment plan. An orthopantomograph and computerized tomography scan were made as a part of the investigation to evaluate the bone height for implant placement.

Treatment provided

The temporary nasal prosthesis and a clear acrylic resin (Rapid Repair, Dental Products of India Ltd, Mumbai, India) surgical template with properly angulated pilot holes were used as a guide for the implant placement. Under local anesthesia, a full thickness mucoperiosteal flap was elevated, exposing the anterior border of the nose and the nares. Two implants of 3.75-mm diameter and 10-mm length (Pitt-Easy Bio-Oss, V-

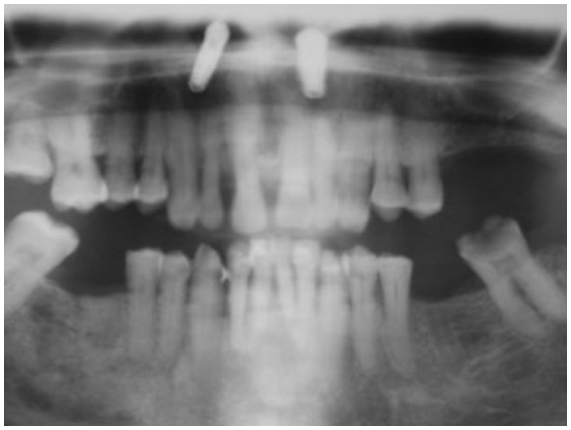

Figure 2 Orthopantograph following implant surgery.

TPS coated, Oraltronics, Bremen, Germany) were placed into the anterior maxilla through the nasal fossa on either side of the nasal septum (Figs 2 and 3). The primary stability of the implants was excellent. The mucoperiosteal flaps were then repositioned and closed with 4-0 VICRYL* sutures (Ethicon Inc., Johnson & Johnson Ltd., Aurangabad, India). At stage two surgery 6 months later, a small mucoperiosteal flap was raised, de-bulking of the soft tissue was performed, and the healing abutments were placed. Three weeks later, the soft tissue edema had subsided, and a peri-implant mucosal seal was observed.

The nasal defect was packed with moist gauze to prevent the flow of the impression material and implant components

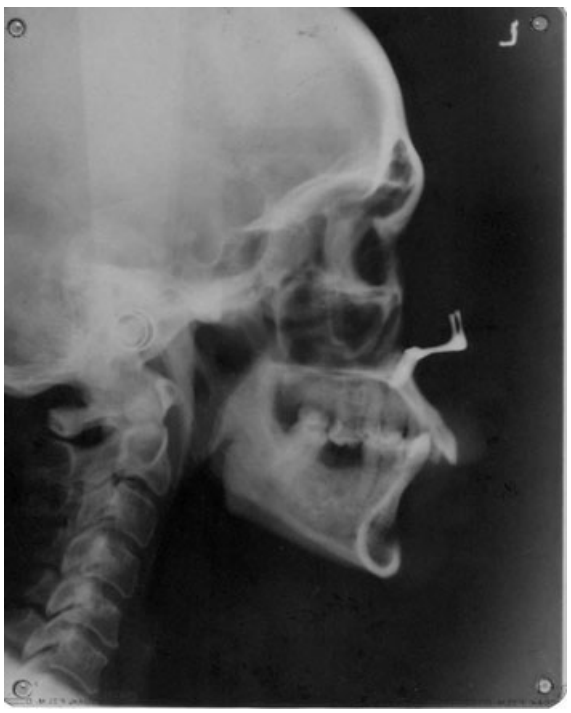

Figure 3 Lateral cephalograph.

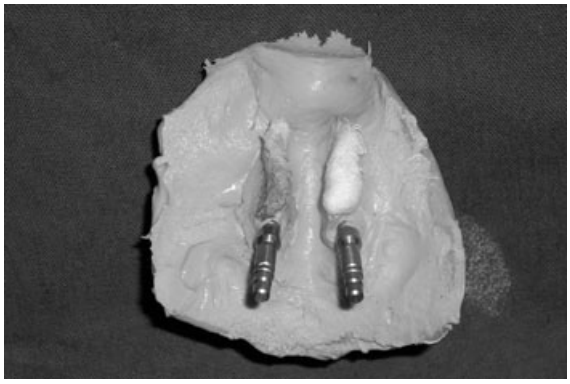

Figure 4 Polysiloxane impression with lab analogs.

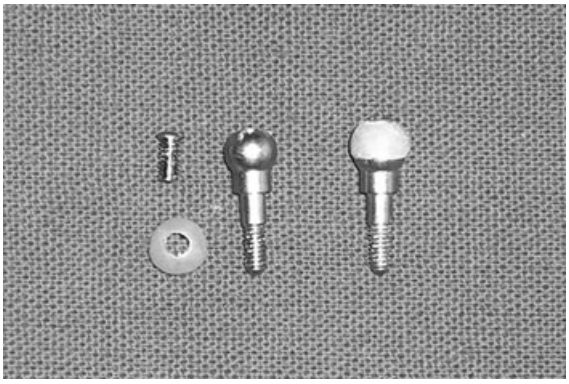

Figure 6 Resin copings fabricated on ball abutments.

falling into the nasal cavity. Care was taken not to distort the nasal tissues while packing the gauze. Healing abutments were removed, and impression posts were connected to the implants. An impression was made using medium-body vinylpolysiloxane impression material (Aquasil, Dentsply, Caulk, Milford, DE) in a custom tray (DPI RR, Mumbai, India). The impression posts were unthreaded and connected to the laboratory analogs (Fig 4). The master cast was then made with dental stone (Type IV, Kalrock, Kalabhai Dental Pvt Ltd, Mumbai, India) (Fig 5).

Pattern resin copings (DPI RR) were fabricated on both the ball abutments. Screw channels were made to place the screw that will retain the copings onto the ball abutments (Fig 6). Rigid castable bars (Oraltronics) were attached to the resin copings using inlay wax (Dentarum, Bremen, Germany). The framework included two vertically oriented elements overlying the defect on both sides of the nasal septum and one horizontal bar connecting the implants and resin copings. The waxed-up framework was invested (Titec, Orotig, Verona, Italy), and burnout was performed according to the manufacturers' instructions. The casting was done in a semi-automatic two-chambered titanium-casting machine (Titec 201F, Orotig) under argon gas pressure. The cast titanium framework was retrieved, finished, and polished with a titanium finishing and polishing kit (Titec). The titanium bar was positioned on the master cast and threaded to the ball abutments.

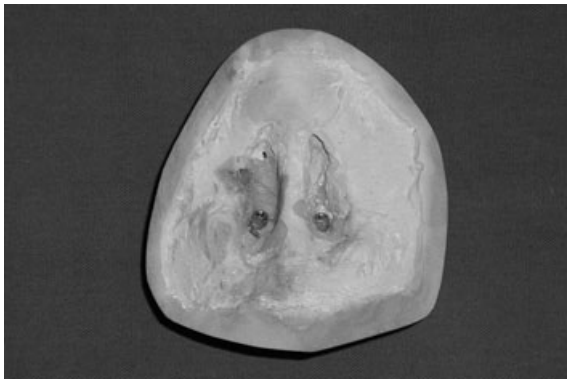

Figure 5 Master cast.

The nasal prosthesis was sculpted in wax (Modeling wax, Dental Products of India Ltd) on the master cast. Care was taken to avoid any interference to the bar. The morphology and the anatomic contours of the nose were developed according to the patient's own description of his presurgical appearance and also the references given by the patient's immediate circle of relatives. The wax pattern of the prosthesis was hollowed to make space for the acrylic resin substructure, which housed the retentive elements. The bar and the acrylic resin substructure were designed to fit within the confines of the final nasal prosthesis.

The ball abutments, along with the titanium framework, were threaded onto the implants (Fig 7), and trial placement of the wax pattern of the prosthesis was done. At the time of trial, the fit of the bar, size, contours, and marginal adaptation of the wax pattern of the prosthesis were evaluated and found satisfactory. The titanium framework was repositioned on the master cast, and the borders of the wax pattern were sealed. A dental stone (Type III, Kalastone, Kalabhai Dental Pvt Ltd) mold was produced in a conventional manner. Mold releasing agent (Technovent Ltd, Leeds, UK) was sprayed after the wax elimination to facilitate removal of the silicone prosthesis. Primer (A-330-Gold, Factor II, Lakeside, AZ) was applied on the acrylic resin substructure after cleaning with acetone, for mechanical retention of the silicone elastomer. Silicone (A-221-05, Factor II) was packed in layers into the mold, developed with intrinsic color (KT-599, Factor II) to match the patient's skin tone, and allowed to cure at room temperature. The acrylic resin housing had bonded well to the silicone. Nostrils were cut open in the acrylic resin for air exchange (Fig 8). The silicone nasal prosthesis was retrieved and finished. Initial trial was done on the patient to check the color match of the prosthesis. Extrinsic colors (P201–P227 Cosmesil dry pigments, Technovent Ltd) were used to match the small-pigmented dots present on the skin. The prosthesis was delivered to the patient. The patient was satisfied with the esthetic outcome of the silicone prosthesis (Fig 9). Home-care instructions were given. Hygiene of the abutment and titanium framework included mechanical debridement with a cotton ear bud dipped in warm water. Follow-up evaluation was done once every 3 months for

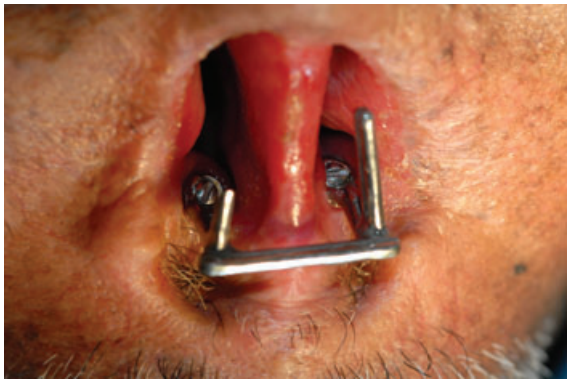

Figure 7 Try-in of cast titanium framework.

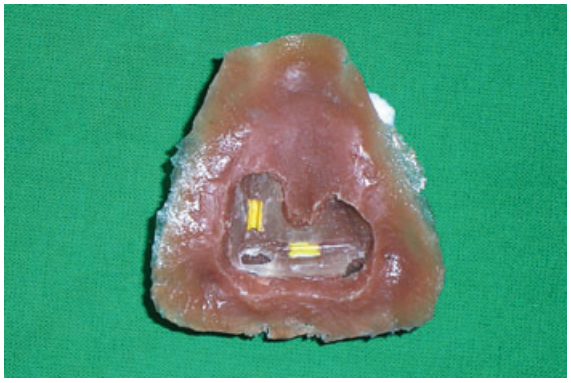

Figure 8 Tissue side of the prosthesis showing acrylic resin substructure with clips.

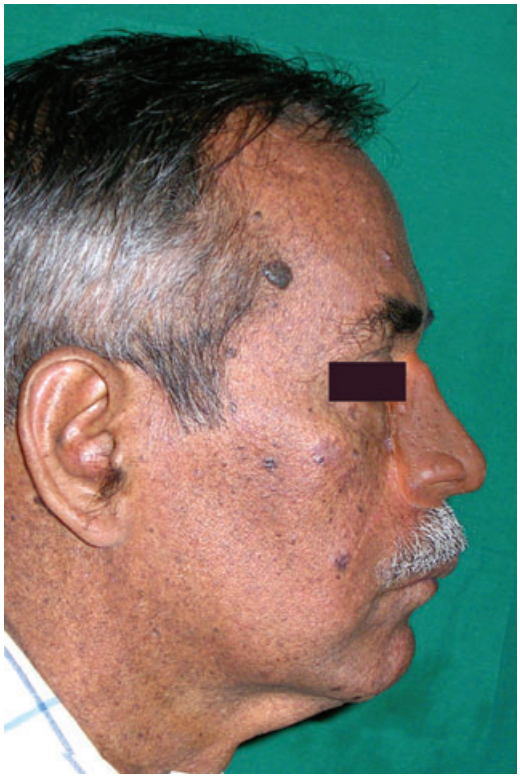

Figure 9 Lateral profile of the patient subsequent to prosthesis placement.

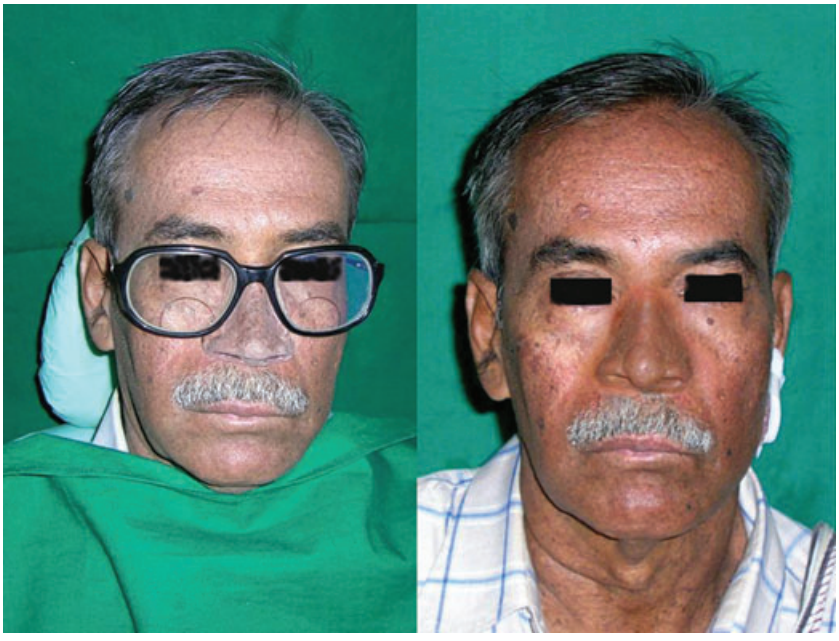

Figure 10 Comparison of acrylic resin prosthesis and silicone prosthesis.

a year, during which the patient had no complaints and conveyed his satisfaction with the prosthesis (Fig 10).

Discussion

Maxillofacial rehabilitation poses many challenges. Achieving functional esthetics is very complex, especially when it comes to those parts of the human body that cannot be masked by clothes. Replacement of nasal parts excised due to surgery is one such situation, and the choice is between autogenous and prosthetic reconstruction, both of which are dependent on several factors.[19] Surgical reconstructions of the nose may involve numerous procedures spanning several surgical appointments. The complex anatomical configuration may also cause difficulty in surgical rehabilitation.[20] On the other hand, prosthetic rehabilitation of nasal defects is more viable when the defects are large in size.[21] Advancements in dental technology have made prosthetic rehabilitation more reliable, especially if the prosthesis is retained by osseointegrated implants.

Ever since the onset of osseointegrated implants, a number of patients having a variety of facial defects have been rehabilitated with craniofacial implants, providing remarkable success;[22,23] however, one important factor for the success of implants in nasal defects is the implant site. It has been suggested that dental fixtures may be placed in the alpha sites to retain naso-facial prostheses.[24] Alpha sites are 6 mm or greater in axial bone volume. The most common areas of the facial skeleton having this volume of bone are the anterior maxilla through the nasal fossa (floor of the nose) and the zygoma. The success rate for implants placed in the anterior nasal floor has been reported to be higher compared to those placed in the glabella region.[16,17] It is suggested that the bone is dense at the glabella, but the blood supply to this region is poor with little marrow space. This may be the reason for high failure rates at this site. The alpha site appears to be an excellent implant site, as ample bone is available with excellent vasculature.[24] In a 14-year follow-up report on the survival rates of implants at UCLA, Roumanas et al[25] showed 87% survival rate at the floor of the nose in non-irriadiated patients. In irradiated patients who received hyperbaric oxygen therapy, the implant survival rate was 83% in the floor of the nose group, as compared to 0% in the irradiated glabella.

To provide suitable retention and stability for the nasal prosthesis, two implants were placed in the anterior nasal fossa. This also facilitated access for maintaining hygiene. The implants were connected with a titanium framework, which was threaded to the ball abutments. Facial prostheses can be anchored to implant abutments in one of two ways: a bar with clip attachment or a bar-splint assembly with paired magnets.[26] For a nasal prosthesis, bars with clips were preferred for retention because of their excellent retentive qualities and longevity of service compared to magnets, which have shown signs of corrosion.[16]

The cast titanium framework fulfilled the objectives of strength, support, non-tissue impingement, and non-interference with the desired contour of the prosthesis.[26] The use of ball abutments also eliminated the undesirable undercuts associated with standard or angulated abutments. The clips were embedded into the acrylic resin substructure of the prosthesis for retention. These were placed on the vertical and horizontal element of the bar, which prevented the movement of the prosthesis in all possible directions.

It is noteworthy that there was acceptance of the implant-retained nasal prosthesis by the patient vis-à-vis the temporary spectacle-retained acrylic resin prosthesis. The patient said that the prosthesis provided a feeling of security, comfort, and convenience.

Summary

Osseointegrated implants have given biologically and psychologically acceptable results when compared to conventional methods for retaining nasal prostheses. The prosthesis fabricated for the partial rhinectomy patient was cosmetically and functionally acceptable. There was reduction in overall weight of the prosthesis owing to the use of silicone and a titanium bar, allowing the patient to resume his professional and social interactions comfortably and confidently.

Acknowledgments

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