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Osseointegrated craniofacial implants have improved retention and patients’ perceptions of implant-retained nasal prostheses; however, the determination of the available bone sites for implant placement post-rhinectomy is difficult. This case report describes the use of cone beam computed tomography scanning and computer-assisted virtual planning in conjunction with digital photographs for rehabilitation of a facial defect with an implant-retained silicon nasal prosthesis. Two implants were planned in the anatomical area with adequate bone volume to achieve favorable cosmetic outcomes and accessibility for hygiene maintenance. The implant-retained nasal prosthesis resulted in a meaningful improvement in the esthetics without the need for plastic surgery. In such cases, the post-rhinectomy reconstruction surgery should be limited to preparation of the surgical defect area for an implant-retained prosthesis. Silicone prostheses are reliable alternatives to surgery and should be considered in selected cases. Int J Oral Maxillofac Implants 2017;32:XXX–XXX. doi: 10.11607/jomi.4302

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Surgical management of basal cell carcinoma in the facial region could lead to a partial- or full-thickness facial defect. A partial-thickness defect can be managed satisfactorily with plastic surgery, while surgical reconstruction in a full-thickness defect, such as in cases of total rhinectomy, can be more challenging.\(^1\) The necessity to restore the complex three-dimensional anatomy of the nose with satisfactory cover lining and appropriate support requires multistage procedures and availability of healthy surrounding soft tissue. The risk of flap failure and tumor recurrence and the side effect of radiotherapy make reconstruction even more challenging.\(^1\)

On the other hand, the prosthetic management of such defects would be less demanding.\(^2\)

Methods to establish the retention of maxillofacial prostheses include the use of adhesives, undercuts, eyeglasses, and implants.\(^3\) Adhesive usage requires the patient to regularly apply it to periphery of the prosthesis, and some patients could develop allergic reactions. Patients who do not wear eyeglasses may not prefer that option. On the other hand, extraoral implants have been shown to be successful at anchoring hearing aids and auricular prostheses since 1977, and their application has been extended to retain other maxillofacial prostheses.\(^4\)-\(^6\)

To get the best result for the prosthesis, proper treatment planning is necessary, especially in the fabrication of maxillofacial prostheses. Routine application of cone beam computed tomography (CBCT) for dental implant planning has been suggested\(^7\) since the accuracy is adequate with the data acquired.\(^8\) Its popularity is based on known advantages, such as low radiation dose, short scanning times, and low acquisition cost compared with conventional multislice computed tomography.\(^9\)

The aim of this case report is to report on the use of virtual treatment planning for an implant-retained nasal prosthesis.

CLINICAL CASE

A woman 71 years of age who had undergone a total rhinectomy was referred to the Department of Prosthetic Dentistry for rehabilitation with an implant-retained...
nasal prosthesis. The patient was previously diagnosed with basal cell carcinoma affecting the nose. Examination revealed that the defect margins were regular and completely healed. A split skin graft had been placed at the base of the defect. Further investigation was required to assess availability of bone around the defect region for implant placement (Fig 1).

PROCEDURE

The preliminary impression of the nasal defect and surrounding area was made in irreversible hydrocolloid impression material (Kromopan, Lascod). From the preliminary cast obtained, a diagnostic template covering the defect area was constructed using vacuum form thermoplastic resin material (Erkodur, Erkodent). Gutta percha was inserted at a few strategic locations along the margin in the template as a marker. Three-dimensional scanning was performed using CBCT, and the data set generated was used to determine the bone volume for determination of the implant position. Two virtual implants of 3.6-mm diameter and 8-mm length (Superline, Implantium) were inserted, and their positions were verified to be parallel to each other (Fig 2).

The rendered facial image obtained from the CBCT scanning was utilized to ensure that the proposed implant position would not interfere with the nasal openings of the prosthesis and would be within the anatomical contour of the nasal prosthesis. For this, a preoperative photograph (prior to the total rhinectomy) and another photograph taken in the current state were scanned. The digital images were edited and superimposed using photo managing software (Corel PaintShop Pro X4 version 14.0.0.322). The rendered facial image obtained from the CBCT scanning (utilizing Simplant software) was further superimposed on these superimposed photographs (Figs 3 and 4), and from this, the implants were verified to emerge within the contour of the alar and margin of the prosthesis, with no interference with the margins of the nasal prosthesis.

Using the template as a guide to the implant position, surgery was performed under infraorbital local anesthesia, and two implants (Bone Level, Superline, Implantium) were placed using the intraoral approach. Healing screws were connected, and the implants were left to osseointegrate for 3 months before stage two of implant surgery and the prosthetic stage.

At the prosthetic stage, prior to secondary impression taking, the nasal apertures at the defect area were packed with Vaseline-coated gauze to prevent flow of impression material into the nasal cavity. Impression copings were screwed to the implants, and the final impression was made using polyvinyl siloxane impression materials (GC Exaflex light, GC America) after the defect area was boxed using boxing wax. Plaster of Paris was packed on the top of the impression material to add support. Implant analogs were attached, and the impression was poured in type IV stone (Elite stone, Zhermak).

Using the master cast, the nasal pattern was sculptured using Bredent modelling wax (Epithetic Bredent) (Fig 5) and tried on. The metal framework consisted of double bars splinting the implants horizontally, and a cantilever portion that extended vertically upward along the nasal septum was cast. This bar orientation...
was selected to resist the rotation tendency of the prosthesis around the horizontal axis. The framework was tried for fit (Fig 6), and in the laboratory, it was re-screwed and the nasal wax pattern was replaced on the cast for investing. The acrylic frame was processed to house two clip attachments for retention.

The silicone part of the nasal prosthesis was processed using heat curing silicone material (Multisil Epithetic, Bredent) with the intrinsic color added chairside prior to processing. Extrinsic color was added to finalize the color of the prosthesis to match the patient’s skin color at the delivery visit (Fig 7).

**DISCUSSION**

Because of insufficient bone observed lateral to the nasal defect and the high failure rate associated with
implants in the glabella,\textsuperscript{10} it was decided to position the implants in the base of the maxillary bone. Virtual surgical planning software enhances the surgical outcome and prediction of future facial prosthesis interferences. In this case, prior to implant surgical placement, the virtual surgical planning Materialise software was used to confirm that the proposed implant positions would not interfere with the future nasal prosthesis margins. That provided the ability to visualize the future prosthetic boundaries and form. As a result, the implants were planned in the anatomical area with the best cosmetic outcome.

The bar clip attachment has higher retention than magnets; however, it needs sufficient space inside the prosthesis to accommodate the acrylic resin clip carrier and bar. With adequate implant planning, it was possible to utilize this type of attachment without compromising the outcome. The bar can also be useful for cases involving nonparallel implants.

CONCLUSIONS

The implant-retained facial prosthesis is a reliable alternative for prosthetic reconstructing of large full-thickness rhinectomy defects. However, preoperative virtual planning for the surgical placement of the implants considering the facial prosthesis’ future shape, boundaries, and anatomy is critical to avoid prosthetic problems and to get the best cosmetic result.

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REFERENCES