

Nasal Epithesis Retained by Basal (Disk) Implants

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Aim: To report the case of a patient who underwent facial reconstruction with nasal epithesis anchored on basal (disk) implants after ablation of midface squamous cell carcinoma.

Methods: Ablative surgery of the midface region and insertion of 3 basal implants into the glabellar area of the frontal bone, the upper part of the right side of the alveolar crest, and the lateral side of the maxillary bone, which forms the left lateral wall of the nose, respectively, was performed. Implants were placed at the time of the primary surgical attempt.

Results: After an unloaded osseointegration phase of 3 months, all implants appeared well integrated according to radiologic criteria and clinical stability. At the end of the osseointegration process, the final epithesis was delivered. Epithesis was anchored to the bars that were fabricated to provide retention and better stability, whereas the implant on the left side was used individually only to improve stability. At the control examinations after 1, 3, 6, 12, and 18 months, respectively, there were no signs of recurrence of the tumor or any complications related to the implants.

Conclusions: Disk implants that were applied to our patient present an excellent alternative, particularly in cases with minimal available bone, resulting in reduced complications in elderly oncologic patients.

Key Words: Extraoral implants, basal (disk) implants, nasal epithesis

(*J Craniofac Surg* 2010;21: 33–36)

Trauma, surgical defects secondary to malignant tumors, and genetic causes can result to facial disfigurement and dysfunction. Poor quality or insufficient quantity of hard and soft tissue often limits treatment options. Radiation therapy in the treatment of malignant tumors commonly compromises bone quality and produces significant morbidity, and its consequences are unique tissue management problems.¹ Prosthetic restorations are important in the rehabilitation of such defects. Appropriate retention, stability, and support of the prosthesis must be provided to achieve successful outcome. In 1977, Branemark et al² introduced the concept of

endosseous implants as anchorage for facial prosthetic devices.^{3,4} These extraoral implants are shorter than the ones used intraorally, which, therefore, allow their placement in pericranial bone.

Major indications for the craniofacial application of endosseous implants are the stable anchorage of a bone-anchored hearing aid device and anchorage of facial prostheses in cases of missing external ear, eye, or nasal structures caused by ablative tumor surgical attempts, congenital disorders, or trauma.^{4–7} Sometimes, when craniofacial implants are placed secondary to the removal of extraoral structures for cancer, they have to be inserted into an irradiated bone. The rehabilitation of patients with bone-anchored prosthesis has several advantages over conventional methods, where use of skin adhesives is necessary for retention. Adhesives can result to skin irritation, allergic reaction, discoloration of the prosthetic material, and accidental detachment and may bring the need for retention by building thick unaesthetic margins of the prosthesis.^{8,9}

Skin-penetrating titanium implants were designed for the attachment of prostheses in regions where it is difficult to obtain stability of the prostheses with adhesive or tape methods of attachment. Short-length craniofacial implant fixtures tolerate placement in areas with insufficient bone. Facial prostheses can be retained with the aid of a bar-and-clip mechanism or magnetic (cobalt-samarium) attachments, thus making it possible to use large devices resting on movable tissues.

Another option for extraoral implantology is the use of orthopedic (disk) implants via basal osseointegration in compact bone that is resistant to resorption. Advantages of inserting these implants include cortical anchorage, ability to add more bone screws for stabilization, and modest demand for vertical (axial) bone. In the midface area, anchorage of screw-type implants is difficult because axial bone supply is limited and only thin plates of cortical bone are present. The only locations for screw implant placement are the glabella and the upper (basal) alveolar crest of the maxilla. If vertical or even horizontal bone dimensions are limited in the alveolar crest because of atrophy or after resection, axial implants often cannot be used. Under these circumstances, as occurred in our case, a basal implant may be used because such implants require width rather than height of bone. In addition, basal implants are completely polished, which means that they are highly infection resistant.

The aim of this article was to present a clinical report of a patient who underwent facial reconstruction with nasal epithesis anchored on disk implants after ablation of midface squamous cell carcinoma.

CLINICAL REPORT

A 90-year-old woman was referred with a gross tumor of the nose and bilateral central midface (Fig. 1). High blood pressure and controlled tachycardia were recorded in the medical history. The patient stated that the first observation of the slow-growing tumor happened 2 years before the admission for surgery. A histopathologic diagnosis of squamous cell carcinoma was obtained after an incisional biopsy. For the assessment of the size of tumor and its borders of expansion in relation to surrounding tissues, a computed tomographic scan was obtained. However, the amount of necessary

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Received April 2, 2009, and in revised form May 7, 2009.

Accepted for publication May 23, 2009.

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Part of this research was financed with grant no. 1454042 of the Ministry of Science of Serbia.

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ISSN: 1049-2275

DOI: 10.1097/SCS.0b013e3181c3626c



FIGURE 1. Frontal view of the patient preoperatively.

bone removal was definitively estimated intraoperatively. When nasal pyramid was amputated and tumor entirely removed a soft tissue and bony defect in transversal, and in sagittal direction has been exposed. To fulfill the anatomic requirements for the middle region of the face, a nasal epithesis had to be planned with retention of implants. The first choice was conventional short extraoral implants. However, after intraoperative observation, it became obvious that there is no sufficient bone to support conventional implants of 3.5 or 4 mm in diameter. Regarding limited bone substance/thickness to less than 3 mm in width in the upper part of the right side of the alveolar crest and the lateral left side of the maxillary bone, basal (disk) implants were indicated as the optimal solution. In the same surgical stage, basal implants (Diskos; Dr. Ihde Dental AG, Switzerland) were used for anchorage of the nasal epithesis. The main advantage of the basal (disk) implants is the relatively small diameter of the vertical part (2.3 mm) and the bicortical implantation



FIGURE 2. Intraoperative view after tumor ablation and placement of the basal (disk) implants.



FIGURE 3. Retentive bars placed on basal (disk) implants after osseointegration.

technique. Although the base diameter is 5 mm, implants were successfully adapted and stabilized in the bone for as thin as 3 mm. Despite the sufficient bone in the glabellar area of the frontal bone, double base plate implant was inserted with excellent primary stability. In the upper part of the right side of the alveolar crest, a single base plate was placed in small rests of bone and was additionally secured by a bone screw. Another double base plate implant was finally placed into the lateral side of the maxillary bone, which forms the left lateral wall of the nose (Fig. 2). Soft tissues were restored by the island flap positioned in the glabellar area. Two cheek flaps were used for paranasal area and the upper lip, respectively.

After an unloaded osseointegration phase of 3 months, 2 of the implants appeared well integrated according to radiologic criteria and clinical stability (Fig. 3). The implant on the left side was slightly mobile, indicating fibrous integration to some extent. At the



FIGURE 4. Postoperative radiograph of osseointegrated basal (disk) implants 3 months after placement.



FIGURE 5. Frontolateral view of the patient after placement of the nasal epithesis.

end of the osseointegration process, the final epithesis was delivered. Epithesis was anchored to the bars that were fabricated to provide retention and better stability, whereas the implant on the left side was used individually only to improve stability (Fig. 4).

A bar-and-clip retention mechanism was planned with one bar segment arranged vertically and another horizontally. This design provided adequate resistance to lateral displacement and excellent retention. The rigid bars were cast from chromium-cobalt alloy through prefabricated plastic models (Bredent, Senden, Germany). Acrylic resin substructures housing the plastic retentive clips were designed and fabricated. The wax sculpting of the prosthesis was prepared and evaluated on the patient, ensuring that the pattern faithfully restored contour and symmetry. The nasal epithesis was made from a silicone material with intrinsic and extrinsic coloration procedures (Epithetik Set; Bredent). The silicon nasal epithesis was retained by plastic clips (4–6 N) on the acrylic resin substructure housing the rigid bars screwed on double-plate implants. The prosthesis was finally delivered (Fig. 5), and hygiene instructions were provided in the usual manner.

The patient was satisfied both with the appearance and the unproblematic manipulation of the epithesis. Control examinations were performed after 1, 3, 6, 12, and 18 months, respectively. Neither recurrence of the tumor nor complication related to the stability or insertion of the implants was present 22 months after the surgical attempt and 18 months after completion of the prosthetic restoration, respectively.

DISCUSSION

Several factors should be considered when designing a retention system for an epithesis to avoid implant failure or complications. (1) It is desirable to connect all of the implants with a rigid bar. Consequently, the stress delivered to the implants will be distributed equitably among the implants. (2) The retention bars must fit in a passive manner. (3) The retention system must fit within the confines of the prosthesis without affecting contour or symmetry. (4) The retention must be sufficient to eliminate accidental dislodgement of the prosthesis.^{5,10} Selection of the most appropriate implants for achieving these objectives is critical in ensuring treatment success.

In the review of electronic database, 9 studies estimating craniofacial implant survival rates without respect to bone irradiation were identified. In a case series,¹¹ 32 patients who received craniofacial implants were followed up for a mean of 15.3 months. No implant failures were reported with auricular implants, orbital implants had a 13% failure rate, and 57% of nasal implants failed during the follow-up period. In 4 clinical and retrospective studies,^{12–15} patients who received auricular implants were followed up for 1 to 12 years. The pooled failure rate for craniofacial implants in the auricular area was 6.1%. In a retrospective case review,¹⁶ 170 patients who received auricular implants for implantation of bone-anchored hearing aids have been analyzed. They reported the results as failures per patient, which was 3.4%. In a clinical study,¹⁷ 76 children aged 1 to 16 years underwent restoration of auricular defects due to congenital malformation, tumor resection, or trauma. After placement of craniofacial implants in the auricular area, they were followed up for a mean of 14.8 years. The failure rate of these auricular implants was reported to be 6%. In a prospective study,¹⁸ 20 patients who received implants in the auricular area reported a 7% failure rate after a mean follow-up of 2.5 years. In a clinical 7-year follow-up,¹⁹ 11 patients received craniofacial implants in the nasal area for restoration of nasal defects. One patient received radiation treatment before implant placement. The implant failure rate was 22% in nonirradiated patients and 67% in the patients who received radiation treatment. When comparing implants in patients with and without radiation, we identified 5 studies that reported a 2- to 6-fold significant increased risk of craniofacial implant failure associated with irradiation.^{10,20–23} Two case series^{10,23} described patients who have received craniofacial implants during 18 to 30 months of follow-up. On the basis of pooled data, the increased risk of craniofacial implant failure was 5.9 (relative risk, 95% confidence interval, 2.7–12.9). In orbital and auricular implants, there were greater percentages of failures in irradiated patients. Nasal implants had no failures in irradiated patients ($n = 0/5$) compared with 19% failures in nonirradiated patients ($n = 6/31$). In a clinical case series,²⁴ 14 patients who received nasal implants and all 7 patients who received radiation treatment also underwent hyperbaric oxygen therapy have been described. Six percent ($n = 1/17$) of nasal implants failed in irradiated patients, whereas 0% ($n = 0/13$) of nasal implants failed in those who were not radiated.

After identifying features of the basal implants that may lead to limiting complications, namely a different modus of osseointegration and the fact that owing to the good, design-based macroretention, infections are very rare. Basal implants are completely machined, with thin vertical struts between the base plate and the parts of the prosthetic connection area. Basal implants use cortical bone for implant anchorage. The void spaces created by the osteotomy fill with blood, which is later reorganized to become woven bone and, finally, osteonal bone. Thus, basal implants exhibit a dual integration process that is similar to orthopedic healing patterns after long bone fractures.^{25,26}

Immediate loading of disk implants is widely used in intraoral implantology. However, immediate loading of the implants extraorally is not recommended owing to the soft tissues' shrinkage. If this is not respected, a gap will form between the epithesis and the surrounding skin, creating early and repeated demands for relining the nasal epithesis.

CONCLUSIONS

After 22 months of follow-up period, inserted basal (disk) implants for the retention of a nasal epithesis proved to be stable and supportive. The basal implants present an optimal alternative whenever implants-retained craniofacial epithesis are indicated and bone substance is limited.

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