A ablative surgery or trauma to the nose can result in extensive mutilation or destruction. Surgical reconstruction can accommodate young and fit individuals, but can be complex and challenging for elderly patients or those with complex defects.1

Extraoral implants have been used for many years2 to provide anchorage for silicone nasal prostheses, as an alternative to surgical reconstruction.3 Conventional dental implants are generally used in nasal reconstruction. However, access to the prosthetic platform for prosthetic reconstruction can be difficult because of the positioning of the implant head within the piriform aperture.

This case report describes the design and use of a specially engineered bifunctional implant with improved surgical and prosthetic handling characteristics that may be placed via an intraoral approach. The implant is able to provide anchorage at both of its ends, making it possible to simultaneously stabilize nasal and dental prostheses.

CASE REPORT

This report describes the design and use of a bifunctional implant to treat an edentulous patient who had undergone a complete rhinectomy. The objective was to design an implant capable of retaining a nasal prosthesis inserted into the nasal cavity from an intraoral approach. The intention was to utilize standard surgical instruments and prosthetic components. The implant was designed in computer-aided design/computer-assisted manufacturing (CAD/CAM) technology to produce bespoke implantable components at low cost. In this report, the implant greatly facilitated the surgical and prosthetic management for the simultaneous provision of nasal and oral prostheses.

Extraoral implants have been used for many years to anchor silicone nasal prostheses. This report describes the design and use of a specially engineered bifunctional implant, which is placed via an intraoral approach, to simultaneously anchor nasal and oral prostheses for an edentulous patient who has undergone a complete rhinectomy. The bifunctional implant was designed and milled from commercially pure titanium using computer-aided design/computer-assisted manufacturing (CAD/CAM) technology. The nasal part of the implant was designed to fit through the prepared site and protrude into the piriform aperture. A hex attachment was orientated perpendicular to the axis of the implant on this extension. The intraoral head of the implant was provided with a standard Brånemark hex configuration. Implants were placed using the guide and associated instrumentation. This case demonstrates the potential for CAD/CAM technology to produce bespoke implantable components at low cost. In this report, the implant greatly facilitated the surgical and prosthetic management for the simultaneous provision of nasal and oral prostheses.
To compensate for the natural inclination of the premaxilla, specially engineered, 5-mm long, 17-degree angled NP abutments were manufactured for the connection of a gold substructure, which would retain a silicone prosthesis produced using entirely standard prosthetic and laboratory components and materials.

Surgical planning software (Nobel Guide, Nobel Biocare) was used. Because the implant was not available in the implant library, a similarly sized, long cylindrical implant was planned in a position that would extend through the nasal floor, so that the intraoral head of the implant would be conveniently positioned for prosthesis retention, and the tips of the implants would penetrate the nasal floor in close proximity to the nasal aperture. Measurements of the available bone determined that the threaded portion of each anterior implant should be 12 mm long, ensuring that the threaded portion of the implant would be entirely within the bone.

A surgical guide was ordered from within the software. The special implants were ordered. Surgery took place using a standard guided protocol for the two bifunctional implants (Fig 2) and two further tapered implants (Replace Select, Nobel Biocare).

Connection of multiunit abutments left the prosthetic platforms ideally located for prosthetic access, both extra- and intraorally (Figs 3a and 3b). A conventional impression technique was used for both the oral and nasal prostheses which were fitted after a 12-week healing period (Fig 4) that allowed for tissue healing and osseointegration before loading the implants with a fixed resin prosthesis. Had the stability of the implants been better at time of insertion, an immediate loading protocol may have been considered.

Implant-retained reconstruction remains the most straightforward approach to nasal reconstruction, particularly in elderly patients or in those in whom access to the nasal cavity for inspection of the region is important.

Access for surgery and prosthetics to implants placed from a nasal approach is relatively less straightforward compared with an intraoral approach. Alternatives include the placement of zygoma implants, where access for surgery and the course of the implant can be challenging, or placing conventional dental implants horizontally.

Many patients requiring nasal reconstruction are also edentulous (eg, five of nine patients had edentulous maxillae in the study by Karakoca et al) and would benefit from oral reconstruction. Partially dentate patients might also benefit from simultaneous oral rehabilitation if anterior teeth are missing.

The bifunctional implant has also found application in cases requiring extensive surgery in both the nasal and maxillary regions, where there may be only one suitable site for an implant, enabling simultaneous oral and nasal or orbital reconstruction, where it might not otherwise be possible to restore both cavities (Fig 5).

CAD/CAM technology offers the opportunity to produce small numbers of bespoke components at a low cost. The bifunctional implant facilitated surgical and prosthetic management in this unique case.

The provision of a fixed implant-retained denture avoided the need for a removable prosthesis, which in this case may have led to a disturbance in the seating of the nasal prosthesis if a labial flange had been provided. It may have also been difficult to wear following surgery. Regardless, the patient experienced the great benefit of a fixed oral rehabilitation.

Complete rhinectomy is not a particularly common procedure, but it is highly mutilating. Surgical reconstruction is difficult and not always possible in the older or infirm patient or when tissues have been extensively irradiated.

The situation of the implant may possibly be compared with that of a conventional dental implant that has engaged the nasal or sinus floor, achieving bicorti-
cal stabilization. In this particular elderly patient, it was felt that anchorage would be sufficient to provide support for the oral prosthesis; however, a shorter implant, with bone loss at both ends, may offer less predictable anchorage.

Static mechanical loading of the nasal portion of the implant is minimal; the potential for harmful forces to be transmitted through the retaining superstructure as the nasal prosthesis is removed might be worthy of further study.

The tissue response of the nasal mucosa to titanium implants or abutments does not appear to have been adequately studied or reported. Clinical trials are needed to explore this new approach to simultaneous oral and nasal rehabilitation with the bifunctional implant. It is hoped and anticipated that this modified dental implant will offer a more straightforward surgery and improved prosthetic management for patients requiring nasal prostheses.

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REFERENCES


Fig 3a  Conventional multiunit abutments are ideally presented for connection of the nasal prosthesis.

Fig 3b  Intraoral abutment ready for fixation of the maxillary prosthesis.

Fig 4 (Left)  The nasal and oral prostheses in place.

Fig 5 (Right)  With only a few sites available for implant placement, the bifunctional implant (arrow) is able to provide simultaneous anchorage for a facial and intraoral prosthesis.