

Multiple Retentive Means for Prosthetic Restoration of a Large Facial Defect – a Case Report

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A 70-year-old man who suffered from extensive extra and intraoral defects was rehabilitated with a prosthesis using multiple retaining means. The treatment was performed in two parts: externally involving the construction of an episthesis supported only by the remaining intact boundaries of the defect and retained by mini-dental implants and spectacle frame with a modified ear hook; and intraorally by an acrylic resin obturator to restore the function of the hemi-sectioned hard and soft palate. The episthesis was securely retained with minimal movement and/or dislodgment of the prosthesis during function. Multiple retentive techniques may be used to fix heavy external prostheses as an alternative to conventional implants or biological adhesives.

Key words: *anaplastology, midface replacement, mini-dental implant, ear hook*

A facial prosthesis or episthesis can offer an excellent solution for large facial defects due to radical removal or secondary surgical procedures in the nasofacial area^{1,2}. Extensive orofacial defects in many patients are difficult to close, or the transferred flap/or graft breaks down leaving raw sensitive tissues exposed to the external environment. Nasomaxillary and nasolabial defects cause functional and aesthetic problems that may require load-bearing capability by the fixture sites, especially if oral prostheses are part of the reconstruction. The anchorage of simple or complex nasal and nasofacial prostheses are best obtained by using available bone that can support flangeless dental implants³. However, in certain conditions where the bone thickness is insufficient for craniofacial implants, mini-dental

implants (MDIs) may offer an additional option to fix the prosthesis, even though they are not yet widely used and tested. Facial defects including nasal mucous tissues show high sensitivity to minor irritations. Irritation of this tissue can occur when in intimate contact with the prosthetic material. The purpose of this case report is to demonstrate treatment of an orofacial defect using MDIs to retain a large facial prosthesis assisted by the spectacle frame and auricular hook.

Case report

The subject was a 70-year-old man referred by the Oral and Maxillofacial Surgery Department for prosthetic replacement of his large post-surgical defect resulting from recurrent tumour excision that included the zygomatic process, cheek, half of the nose, the eyeball, and the lateral and lower wall of the orbit. The patient was operated on in 2003 to remove squamous cell carcinoma (SCC) of the left maxilla including the left part of the soft palate. Subsequently, a Co-Cr obturator was fabricated to replace the defect. In June 2006, a recurrent SCC involving the left cheek, half of the nose, the left

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Fig 1 Breakdown of the skin graft.



Fig 2 Patient after mini-dental implants insertion.

eyeball and its orbit boundaries, except the supraorbital margin, were removed completely including the left part of the upper lip to the angle of the mouth (Figs 1 and 2). After the second surgical intervention, the exposed area was covered by a vascularised skin graft transferred from the patient's arm. The grafted skin necrosed after 2 weeks leaving the area completely exposed except a thin area containing radial artery and vein.

The prosthetic option was to remove the necrotic skin and remaining skin flap (around the nourishing radial artery) and place three or more (if feasible) conventional orofacial implants in the supra-orbital margin, residual zygomatic bone and the remaining anterior maxillary region. However, the surgeon proposed the placement of multiple quasi-parallel MDIs (2.0 mm x 10 mm, Mini Drive-Lock with o'ring attachment, Intra-Lock International, Boca Raton, FL, USA) inside the upper border of the left orbit directly below the remaining eyebrow due to limited bone thickness in this region and its closeness to vital structures (Fig 3). An additional two MDIs were placed: one inside the nasal bone and the other in the remaining part of zygomatic bone anterior to the tragus. The zygomatic MDI was removed 4 weeks later by the surgeon due to consistent severe pain and infection that could not be resolved by antibiotics.

The palpation of the defect area revealed sensitivity, discomfort and pain to minor pressure especially in the exposed nasal mucous and zygomatic region. Therefore, a decision to fabricate a spaced prosthesis that covered the defect area without contact to the exposed sensitive tissues and the painful pretragal region was undertaken. The MDIs were used to direct and to retain the prosthesis in place. In addition, spectacle frames were used with an auricular hook due to the expected weight of the prosthesis².

A facial impression was made after protecting the exposed sensitive tissues of the defect by a regular thickness of transparent cellulose paper (without contact with the underlying tissues) and one layer of soft red wax fortified by one layer of gauze. These materials were adapted onto the defect area piece-by-piece and fixed to the intact external skin using adhesive tape. The intact eyelid and eyebrow were isolated using petroleum jelly. A round box made of modelling wax (Collegewax, Metrodent, Huddersfield, UK), with variable height to accommodate a sufficient regular thickness of impression material was adapted to the face to provide support for the irreversible hydrocolloid material (Aroma fine DF III, GC, Tokyo, Japan). Two airway inlets were provided, one using a disposable plastic saliva ejector inserted and locked into the intact nostril and the other through the intact side of the mouth. A thin mix of irreversible hydrocolloid was used to record the impression. A second layer of quick-setting plaster of Paris was poured after inclusion of stainless metal clips inside the impression material prior to setting. The impression was removed, and poured with dental stone (type III dental stone, Moldano, Heraeus Kulzer, Hanau, Germany).

One layer of modelling wax was adapted to the duplicated cast, covering the whole defect area and ending 3 to 4 mm across the defect borders in the nasal, lip, midfrontal and pretragal regions. The adapted wax base was placed in a flask and processed into transparent heat-activated acrylic resin (Meliodent, Heraeus Kulzer, Hanau, Germany) (Fig 4). It was checked on the patients' defect for adaptation and interference. Excess acrylic material was removed, and the surface polished and finished. The wax trial prosthesis was built-up and sculptured step-by-step using modelling wax. Frontally, the skin was covered by a thin layer of wax extending



Fig 3 The mini-dental implants in their place.



Fig 4 Final cast and the finished acrylic base.



Fig 5 The waxed prosthesis without eye.



Fig 6 The finished eye.

nearly to the midfront. The wax on the orbital rim was adapted over the three MDIs (after opening a hole in the acrylic base to accommodate for the three MDIs) so that all three holes were formed in wax. The remaining naso-orbital MDI was ignored due to its inconvenient alignment. The orbital cavity and its contents were reformed with a wax shell representing the eyeball and were sculpted into two articulated sections (Fig 5). This was so that the upper eyelid could be removed to permit modification in order to match the shape and size of the intact eye and its orbital surrounding.

The average vertical and horizontal dimensions of the intact open eye were recorded, its external shape duplicated using transparent paper (iris and pupil diameter), and then reversed to match the left side eye. The normal procedures were applied to permit the conventional steps used for eye fabrication from acrylic resin (shell

fabrication, iris colouring, pupil formation, glazing and finishing) (Fig 6). After completion of the ocular prosthesis, it was replaced inside the pre-formed cavity with its upper eyelid to check symmetry, location and orientation in relation to the nose, opposite eye and eyelids (Fig 7). The metal housing of each MDI was replaced on its corresponding implant tip starting with the medial MDI. The previously created holes inside the wax base were excavated from inside using a lecron carver to accommodate the metal cups' diameter. Molten modelling wax was added inside the hole, and then the try-in prosthesis was inserted in its position on the defect and fixed without movement until the wax hardened. The procedure was repeated to fix the three metal housings with their o-rings, respectively. Finally, the waxed prosthesis was retried to check its extension, symmetry and harmony with the contralateral parts of the face.



Fig 7 Trying the waxed prosthesis with eye.



Fig 8 The waxed prosthesis on the cast.



Fig 9 The finished prosthesis in its place.



Fig 10 The finished prosthesis with auricle hook.



Fig 11 The try-in obturator inside the patient's mouth.



Fig 12 Lateral view of the prosthesis in place.

Three wax stoppers were sculpted on the nasal areas and above the zygomatic areas to aid prosthesis retention using spectacle frames. This extra retention was necessary to reduce the pulling forces on the MDIs, without using a biological adhesive, due to the increasing weight of the prosthesis after processing into silicon (138.8 gm), even though it was only 102 g during the construction of the trial wax prosthesis (Fig 8). The waxed episthesis was replaced on the model to check the adaptability of the wax border to peripheries of the defect, to refine the surface texture and to fill any voids in the wax. Old MDIs were used as analogues embedded inside the facial moulage during fixation and processing of their housings to the acrylic base of the prosthesis using auto-polymerised acrylic resin.

A silicone material base colour was selected following the manufacturer's instructions (Episil, Dreve Dentamid, Unna, Germany), and then processed. The final prosthesis (Fig 9) was checked for extension, margin continuity, colour-matching, adaptation to the defect and retention. An eyebrow and eyelashes made of nylon threads were then glued to the silicon using lacquer as described by the manufacturer. An additional retention mode using a transparent auricle hook was fabricated of clear heat-polymerised acrylic resin, encircling the posterior root of the ear and fixed to the lower part of the prosthesis (Fig 10). External pigments were applied to the prosthesis to enhance skin colour matching. A new acrylic resin obturator was constructed to replace the old one. The intraoral defect area was recorded using stock trays and irreversible hydrocolloid for the two arches. On the resulting casts, individual trays were constructed using auto-polymerised acrylic resin. After correcting the border extension of the spaced individual tray using a green thermoplastic composition (SDS Kerr, Tokyo, Japan), the final impression for the remaining maxillary jaw was made using medium viscosity siloxane (Exaflex[®], regular, GC America, Alsip, IL, USA). The impression was beaded, boxed and poured using hard stone (Moldano, Heraeus Kulzer). The obturator was designed so as to fully cover the defect. An acrylic plate was extended to cover the defect in the direction of the soft palate. Two SSW clasps (0.9 mm) were used to retain the obturator and were placed on the remaining anterior teeth (central, lateral and canine). Functional tests like swallowing water were used to check the sealing of the defect. In addition, any interference with the external episthesis during functional movement was removed during try-in checking using indelible pencil (Fig 11). The plate was processed into heat-polymerised acrylic resin (Meliodent, Heraeus Kulzer) in the normal way. The obturator was finished, polished and inserted

into the patient's mouth to check any interferences, sensitive areas or pressure spots.

The retentive quality of the primary means, i.e. MDIs used in the present case, was tested manually to check its efficiency before checking the extra retentive means (eyeglass frame and auricle hook). The MDIs provided lifting and path guidance for the prosthesis. However, the retention was not very effective, especially in vigorous repeated dislodging movement due to the hanging location and increased weight of the device (movement could be strong during walking and face turning to right and left, and patient still depended on himself to reach the clinic by driving alone). Therefore, extra retentive means to help the MDIs and to elongate their presence became necessary.

Discussion

Designing complicated prostheses for patients with special needs is a significant challenge. The prosthesis in the present case was designed to allow maintenance two/three times a day and cleaning of the defect area. The extra retention provided was very effective. This provided a feeling of confidence and ameliorated the adaptation of the prosthesis margins to the defect periphery as well.

Unilateral facial defects with lower and lateral extensions forming part of moving structures are expected to be very unstable unless many retentive elements are used. If more stretching properties are needed, thin silicone may enhance these properties. However, several limitations regarding the use of a thin silicone margin are expected (reduction of tear resistance, and need for frequent repair and reinforcement). The use of conventional craniofacial implants can dramatically enhance the prognosis if distributed evenly, but they could not be integrated in the present case. The use of MDIs to support large facial prostheses in this case is a relatively new practice and has not been reported in the literature. Their longevity, even for overdentures, is not described in the literature⁴⁻⁶. Generally, the use of extra-oral implants provides the most useful means for retaining and stabilising a facial prosthesis⁷⁻⁹. In the present case, MDIs were employed to retain the prosthesis due to the limited recipient bone available to integrate conventional facial implants. However, the three MDIs used in this case were insufficient to provide effective, long-term retention. Moreover, their use was essential to hold and direct the prosthesis inside the defect during use. Additional means to help retain the large heavy episthesis were necessary. Therefore, spectacle frame glasses, hat (can be considered later with

simple modification to the prosthesis) and ear acrylic hook were used to ensure maximum retention in case the MDIs are lost at a later date (Fig 12).

Fixation of the housings can be done either immediately after the base fabrication or later during the try-in stage using a pick-up technique. The patient's main complaint was that the prosthesis appeared heavy when first issued, but the feeling disappeared some days later. The saliva and food pooling was unavoidable, but occurred mostly during eating. Generally, the first objective of this prosthesis was to cover and repair the mutilated tissue defects. Therefore, the patient and his family were completely satisfied with the appearance and obturator function of this prosthesis. In a defect that needs continuous daily maintenance, a removable extraoral prosthesis supported by using multiple means is best.

Fabrication of an intraoral prosthesis can be performed before the construction of a facial episthesis or later, after finishing it (as in this case). The decision depends on the anaplastologist's experience and the patient's preference.

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