

The scope of maxillofacial prosthodontics

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ABSTRACT

Oral cancer may affect up to 275 000 new patients per year worldwide. Many of these will be disfigured by the destruction of tissue within the face and head area. Maxillofacial prosthodontics can play a vital role in restoring such patients to a semblance of normality in appearance and function. This article will describe the role of maxillofacial prosthodontics in the treatment of these oral cancer patients.

INTRODUCTION

Defects of the head and neck region may result from congenital, traumatic, infective or neoplastic reasons. Of these, oral cancer is probably the most common cause of facial and jaw defects that require rehabilitation. Oral cancer has a global incidence of up to 275 000 cases per year of which most will occur in developing countries.¹

The head is arguably one of the most important anatomical regions of the human body, accommodating the brain, eyes, ears, nose, mouth and muscles of facial expression. Facial aesthetics is intricately related to ego, self-esteem and body image, thus defects of this region can have a very negative impact on a person's quality of life.² Treatment should ideally be carried out as soon as possible to minimize psychological damage. Surgical reconstruction is not always possible due to the size or location of the defect, the loss of vital anatomical structures, previous surgery or radiation therapy, non-healing, friable or cancerous surrounding tissues, or general debilitation of the patient.² In these situations, prosthetic rehabilitation is the only alternative available to the patient.³

Maxillofacial prosthodontics seeks to restore form and function to patients with head and neck defects using removable prosthetic appliances. This article will briefly describe the possible treatment options available, according to the area affected (i.e. dento-alveolar, mandibular, maxillary, auricular, nasal, facial, ocular, orbital).

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Dento-alveolar defects may affect speech, mastication, surrounding tooth stability and facial appearance. These are relatively easy to treat with conventional dentistry, often using a combination of fixed, removable and implant-supported prostheses.

Partial loss of the mandible is more difficult to treat, as it involves the tongue, associated facial and masticatory muscles and the TMJ. This results in the remaining mandible being controlled by structures on the unaffected side, leading to a deviated path of opening and closing and an altered rest position. This will result in unstable prostheses.⁴ Loss of mandibular bone also compounds the problems of an already small denture bearing surface area.

Osseointegrated implants have greatly improved the success of prosthodontic rehabilitation by counteracting the destabilising influence of the remaining tongue and muscles of mastication (Figure 1A & B).⁵ The successful utilisation of dental implants depends on many factors including the availability and position of sufficient good quality bone, arch shape, inter-arch space, occlusion, degree of mouth opening, un-irradiated tissues, plaque control, patient motivation and affordability.³ It is also imperative that the surgeon and the prosthodontist plan each case carefully prior to implant placement. The treatment plan should include the use of accurate diagnostic dentures and surgical stents. Intra-orally, a minimum of two bilaterally placed implants is needed to provide acceptable retention for a removable prosthesis, while at least four to six well-spaced implants are required for a fixed prosthesis. The angulation and path of



Figure 1. A: Ameloblastoma of right maxilla. B: Resected maxilla and immediate implant placement. C: Immediate obturation with implant support.

insertion of the prosthesis are critical factors to consider as these will affect all the subsequent stages of rehabilitation (Figure 1C).

Maxillary defects can be congenital (mostly cleft palates), traumatic, or neoplastic, and are the most common maxillo-facial deformities encountered. They have a wide impact on many aspects of a patient's well-being, life-style and social interactions.

Patients with maxillary defects frequently suffer from the following complications:

- frustrations of unclear speech;
- social and functional problems during eating and swallowing as food and fluids enter the sinuses and are regurgitated out of the nasal cavity;
- difficulty in cleaning the defect which may lead to a foul smell and recurrent infections
- facial collapse causing diplopia.

These complications often lead to depression and poor self-esteem.

Fortunately, most maxillary defects can be rehabilitated aesthetically and functionally using removable prostheses. In small defects with adjacent teeth or adequate supporting alveolar ridges, a one-piece maxillary denture/obturator prosthesis is often all that is needed. Retention and comfort are enhanced by making it light-weight, hollowing out the obturator section, and extending it only a few millimetres into the defect.⁴ Full extension is not advocated as the tissues surrounding the defect often lack bone and can be tender and friable, providing no additional support or retention for the prosthesis, but adding to the possible complications of tissue irritation. It is crucial to ensure a good seal around the opening of the defect by taking a functional impression or using a tissue conditioner to record fine details and tissue movement.

Larger maxillary defects need to be obturated to address the complications mentioned above. This usually involves a two-part prosthesis consisting of a hollow, flexible glove/bulb obturator attached to a solid denture base. The glove section is made from a rubber material, which can be compressed to allow for easy insertion and removal (these patients often have trismus which makes it difficult to insert large appliances). The denture clips into the bulb for added retention and to ensure a complete seal. The entire prosthesis is easy to insert and remove for oral hygiene purposes and to allow the clinician to inspect the defect periodically for any signs of tumour recurrence or other complications.

Auricular and nasal defects are difficult to treat surgically and usually necessitate fabrication of a prosthesis. This involves taking a moulage impression of the affected site as well as of the contra-lateral facial structure. The latter is copied (in mirror image) to fabricate a closely matched wax replica. This is carved *de nova* using casts, old photographs and a general knowledge of anatomy and facial dimensions as a guide.^{6,7} Alternatively a "donor-ear / nose" may be used (Figure 2). An impression is taken of the corresponding structure on a volunteer who has similar anatomical features to the patient and a wax replica is fabricated. This is then modified and adjusted clinically to ensure that it matches and fits closely. The next stage of colour match-

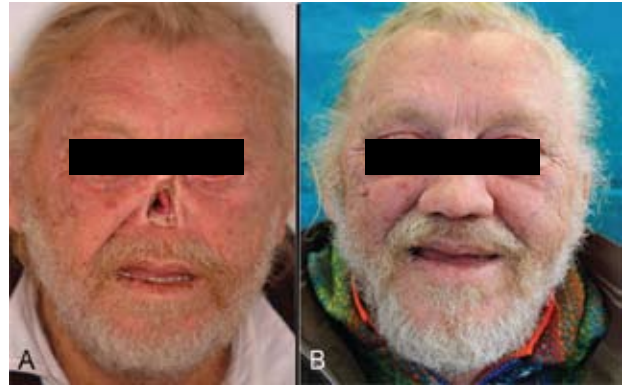


Figure 2. A: Nasal resection with midface defect. B: Final nasal prosthesis.

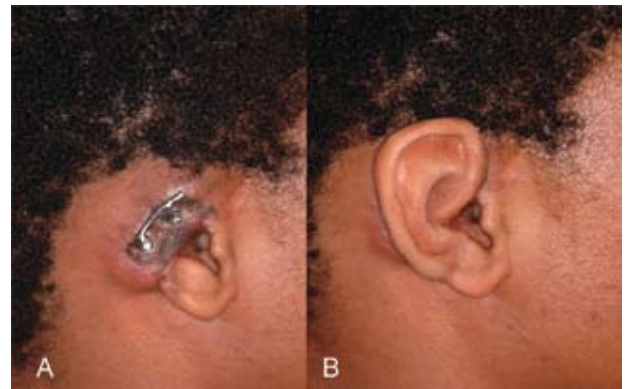


Figure 3. A: Extra-oral implants in mastoid area. B: Implant-retained auricular prosthesis.



Figure 4. A: Large ocular, orbital and maxillary defect. B: Combination of maxillary obturator and facial prosthesis (including ocular).

ing is one of the most challenging aspects of maxillofacial prosthetics. Here the clinician and technician work hand-in-hand to mix suitable pigments to match the patient's natural skin tones. An artistic eye and sense of colour are required to select the most appropriate shades. Added difficulties are that many of the silicones change colour once processed, and a patient's skin tones may vary depending on their state of health, sun exposure, or tissue healing. Aesthetics may be improved by inserting artificial veins, freckles and skin textures into the silicone, by keeping the margins in natural skin folds, or by adding hair in areas like sideburns, moustaches, eyebrows and eyelashes.

Retention is a problem with all extra-oral prostheses (Figure 3A). Even though they don't have to withstand dislodging masticatory forces, strong, long-lasting retention to skin is seldom achieved with adhesives as these don't bond well to oily or moist skin, cannot be used in sensitive areas or where tissues have not epithelialized, and they lose their retention if there is movement between the skin and the prosthesis.

Osseointegrated implants greatly improve retention and spare the tender, sensitive skin the aggravation of having adhesives applied and removed daily (Figure 3B). Implants also make it easier for patients to place their prostheses in the correct position, as many find it difficult to position their auricular and nasal prostheses accurately, especially when looking in a mirror. Correct position and added retention is also crucial if the prosthesis has to support spectacles. This also provides a psychological benefit to patients who no longer fear that their prosthesis may become loose and fall off in company – an embarrassing reality when adhesives are used.⁶

Despite these advantages, extra-oral implants have many complications and should be used with caution, especially in previously irradiated bone as this may lead to serious consequences such as infection and bone necrosis. Careful planning prior to placement is crucial to ensure that implants are placed in areas of adequate bone, as well as in a position where the implants can be housed within a suitable bulk of prosthesis material.⁷ Soft tissue infection around the implants is a further complication leading to inflammation, saucerisation of bone and possible implant loss.

Ocular and orbital defects are challenging but rewarding to treat. Custom made acrylic resin ocular prostheses are made by individually painting clear iris buttons to match the patient's remaining eye. (Stock eyes are available, but are seldom good matches and often look artificial). The prosthesis is then positioned into wax conformers, scleral shades and characterisation features are noted and the entire assembly is converted into acrylic.^{6,8} A successful ocular prosthesis depends on the patient having a deep, healthy socket with competent functioning eyelids. Final adjustments and polishing is done at chair side to perfect the eye position, contour, lid support and to optimise movement (Figures 4A & B).

Orbital exenteration entails complete removal of the orbital contents, eyelids, surrounding skin, soft tissues and bone.² A moulage impression is taken of the entire upper face, including the non-involved side, and used to fabricate a plaster cast. The prosthesis will consist of an ocular portion (made as described above), which is then positioned into a waxed-up orbital section. Anatomical features and positioning are verified and adjusted on the patient before converting the wax into silicone.^{6,8}

Other solitary facial defects are restored using similar techniques and adapting them to suit the particular area and defect. Miscellaneous appliances are varied and numerous, but most commonly include: pre-surgical stents for patients scheduled to have tumours resected, radiation protection shields, scar traction or compression stents, trismus-breaking appliances, and neo-natal cleft palate feeding plates.

Successful prosthodontic rehabilitation of patients with head and neck defects depends on a multidisciplinary approach where members from all the associated disciplines work in close consultation and co-operation with each other and with the patient during all the stages of treatment. This remains an area of dentistry which is often neglected, not only in under and postgraduate training, but also in private practice. As a profession we owe

these patients our full involvement and commitment. We therefore need to become involved with our medical and dental colleagues who treat oral cancer and other patients requiring such rehabilitation, so as to improve the quality of life, not only of the patients themselves, but of the immediate family members as well.

Declaration: No conflict of interest declared.

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