

Revolutionizing Facial Reconstruction: The Promise of Extraoral Implant-supported Maxillofacial Prosthesis

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Abstract

A facial defect presents a tough and hard treatment for the maxillofacial surgeon and the prosthodontist, and it causes problems that are functional, psychological, and cosmetic. A patient's satisfaction and acceptance with their facial prosthesis greatly depend on their ability to retain it. Applications for extraoral implants have gained acceptance as a cutting-edge technique for retention. This article defines the many forms of maxillofacial prostheses and proposes a classification system for them. Together with describing their creation and progress, it also tries to outline the materials and methods that are currently accessible, forecast future needs, and then, explore areas for improvement as a restorative modality. Maxillofacial prostheses enhance patients' quality of life in addition to correcting a variety of orofacial abnormalities. While the current state of the art in the field of maxillofacial prostheses is encouraging, future developments in the material quality and procedures for these prostheses may be anticipated to yield better patient outcomes.

Keywords: Extraoral maxillofacial prosthesis, Maxillofacial prosthodontics, Maxillofacial implants.

INTRODUCTION

Maxillofacial prosthetics is considered in the literature as "the art and science of anatomic, functional, and cosmetic reconstruction, using non-living substitutes, of those regions in the maxillae, mandible, and face that are missing or defective.^[1]" Reconstruction of facial defects is a complex modality either surgically or prosthetically driven depending on the site, size, etiology, severity, age, and the expectation of the patient. Whenever surgical reconstruction is not possible or failure of the alloplastic or autogenous graft occurs, maxillofacial or craniofacial prosthesis becomes an alternative method.^[2]

Maxillofacial prostheses play an important part in rehabilitation following ablative surgery, congenital deformity, or trauma. The psychological benefits and lifestyle improvement offered by maxillofacial prosthesis have been well documented. Maxillofacial prosthetic rehabilitation is a team effort involving restorative dentists, maxillofacial prosthodontist, dieticians, speech and language therapists, physiotherapists, general medical practitioners, specialist nurses, and social workers.

A lot of work has gone into creating innovative methods and materials to help people with congenital and acquired abnormalities. But sometimes, even with these novel methods and materials, it has proven hard to create a prosthesis that is secure, adherent, and restores function. This has mostly

been brought about by the severity of the fault found, the after effects of the therapy obtained, or the limitations of the materials employed.

Although silicones and other contemporary plastic compounds have allowed for the create a superb prosthetic, there is still one issue to be resolved: how to keep the prosthesis in place? Adhesively attaching the prosthesis is one option. However, the adhesive has its own adverse effects on both the prosthesis and the tissues. Another method is to affix it to a pair of glasses, but there are also serious disadvantages to this technique, one of which is that the fault cannot be seen if the patient takes off the glasses. Rehabilitation using Osseo integrated implants has presented the first genuine hope for resolving many of the drawbacks of traditional retentive news sources. Obviously, this idea expanded to the craniofacial region, and treating these patients with it has infused the field of maxillofacial prosthetics with new life and passion.^[2]

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Received: Sep. 12, 2023; **Accepted:** Oct. 23, 2023; **Published:** Nov. 15, 2023

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How to cite this article: Jain A, Jain R, Srivastava R, Makker R, Razdan RA, Patel V. Revolutionizing Facial Reconstruction: The promise of Extraoral Implant-supported Maxillofacial Prosthesis. J Res Adv Dent 2024;15(4):1-4.

Access this article online

Website:
www.jrad.co.in

DOI:
<https://doi.org/10.53064/jrad.2022.15.4.492>

MATERIALS AND METHODS

Ocular prosthesis

In addition to impairing vision, partial or complete eye loss can also negatively affect a patient's social life and sense of self. Given the significance of the eyes in interpersonal relationships, one of the main goals of ocular prostheses is to facilitate reintegration into society. In addition, the purpose of the ocular prostheses is to prevent eyelid atresia owing to lack of function, preserve the tear duct to prevent eyelash adhesion and conjunctival dryness and shield the cavity mucosa from dust and debris. Ocular bulb loss can arise from either unintentional or pathological factors.^[3]

Ocular prostheses are associated with three types of orbit and eyelid surgeries: exenteration, which involves removing the entire contents of the orbital cavity and surrounding tissues, enucleation, which involves removing the entire eye bulb leaving only the capsule and oculomotor muscles, and evisceration, which involves removing the eye bulb partially while maintaining the sclera. A well-fitting prosthesis needs little upkeep every day, the patient takes it off to clean it with water and neutral soap. The efforts required to develop the techniques used in the creation of eye prostheses are intended to help patients in need with the many intricate aspects of losing their vision and having their organs removed.^[3,4]

Procedure

Three or four intraoral dental implants were positioned in the supraorbital rim and/or the lateral region of the orbit, depending on the amount of bone present at the defect site. Dental implants placed intraorally were positioned in the orbital rim at 7–10 mm. To begin the surgical procedure, a semicircular incision was made on the superior edge of the orbital rim. es were revealed where dental implants were located. We employed dental drills running between 1,500 and 3,000 rpm to create tap wrenches and holes on extremely tough osseous tissue.^[4]

Auricular prosthesis

Trauma, congenital deformities, and tumor removal can all lead to auricular problems. Skin adhesives are the main means of achieving prosthesis retention in these deformities, which lack hard or soft tissue undercuts. The application of skin adhesives has a number of noteworthy drawbacks. Repeated application and removal of the glue can cause damage to the facial prosthesis's margins, and patients may occasionally experience a toxic skin reaction. It is possible that adhesives' retentive power is limited in damp or dynamic tissues. The application of skin adhesives is further complicated by the presence of hair. There may be several advantages of using craniofacial titanium implants to repair auricular abnormalities. When inserted into the auricular bone, skin-penetrating osseointegrated implants have shown an exceptional degree of predictability, and the quality of retention offered considerably surpasses that of adhesives.^[5]

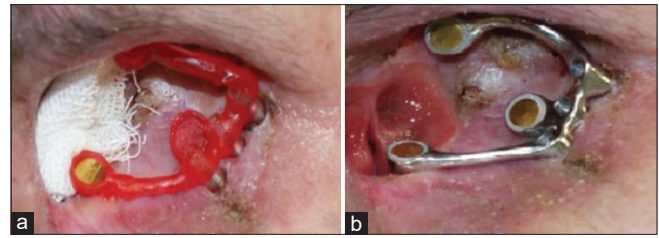


Figure 1: Acrylic resin pattern of bar containing indentations for magnets (a), Try-in of metal bar on the implants with magnet keepers in place (b)^[3]

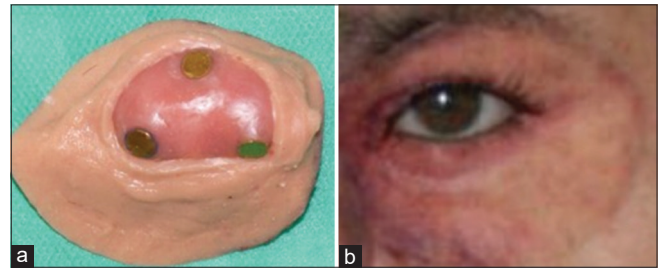


Figure 2: Tissue side of the prosthesis with three magnets (a), Delivery of the prosthesis (b)^[3]

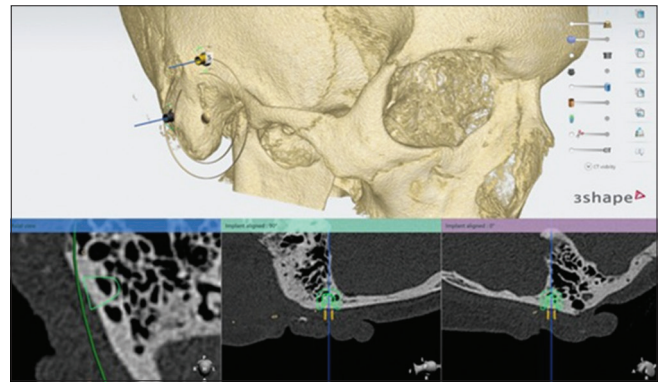


Figure 3: Pre-operative planning of the implants using a CT-scan^[6]



Figure 4: Marking of the positions of the implant using the template pre-operatively^[6]

Procedure

Two to three craniofacial implants (3–5 mm; 3.75 mm) were positioned in the mastoid or temporal bone sites in the auricular

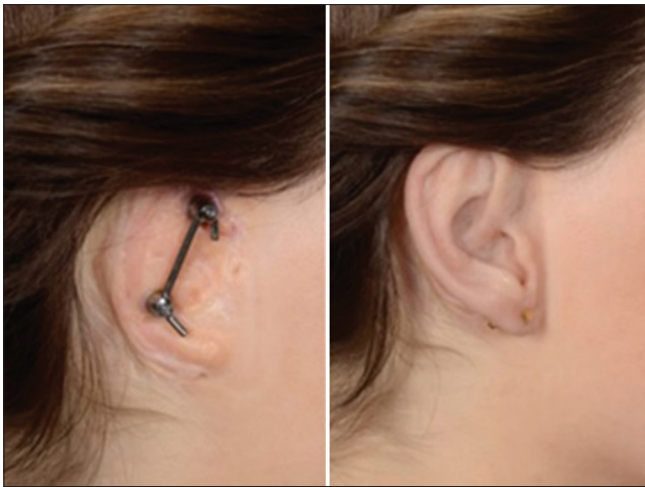


Figure 5: Implants (left) and prosthesis (right)^[6]

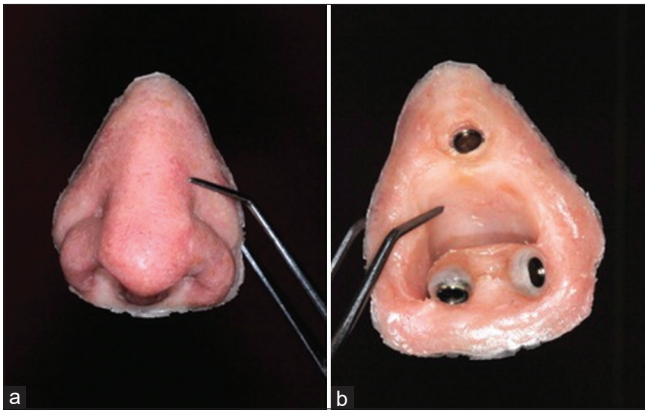


Figure 6: Implant-supported nasal prosthesis^[8]

region. These implant locations were identified on the skin above the mastoid process, about 20 mm from the external ear canal, using methylene blue. The posterior side of the ear was incised semicircularly, approximately 4 cm from the craniofacial defects and extraoral implants auditory meatus, if one was present. A full-thickness skin flap was raised, and then, the osteotomies were drilled using a guiding drill. The drill was swapped out for a 3-to 4-mm spiral drill with a countersink after the guide hole was bored and the depth was determined. For proper cooling of the implant sites, craniofacial implants were positioned under strong irrigation with gradual rotation (8–15 rpm). At this point, scar tissues and auricular remnants were also removed during the surgical process.^[5,6]

Nasal prosthesis

The technical placement of implants in the nasal region may be difficult because of the thin and poor quality of the surrounding bone. The intricate structure of the nasal cavity and surrounding tissues influences the effectiveness of this area's implant surgeon. Particularly among individuals who have undergone radiation therapy, this circumstance might be significantly more difficult. Average dimensions of bones up to the pyriform edge (2.9 mm), perineal region, glabella (12.8 mm), as well as the

nasal cavity's anterior fossa (10.2 mm) revealed the ideal bone capacity to be restricted to the nasal fossa in front. Implants are typically positioned in a triangle.^[7]

The frontal face of the maxilla and the nasal floor are the best places to put implants. The glabella is occasionally investigated for implant implantation, yet research has indicated that implant success rates are low in this area. For the implants to reach enough bone, the nasal cavity should be softly filled. Prosthesis thickness should be sufficient, similar to what was shown in the orbital reconstruction.^[8]

DISCUSSION

Defects in the midface arise from trauma or disfiguring cancer surgery. In comparison to these acquired flaws, congenital problems are less common. Midfacial defect restoration can be achieved surgically, through prosthetic means, or by combining the two. The size, location, and etiology of the lesion are the primary determinants of the choice. Autogenous tissue grafting is typically challenging to rebuild these abnormalities, and when it is successful, the outcome is typically disappointing aesthetic. For the replacement of locations such as the orbit, nose, and ear, facial prosthesis supported by implants are therefore perfect.

Extraoral skin-penetrating facial implants have been very successful in anchoring orbital, auricular, and nasal prosthesis, even though they are more prone to inflammatory reactions than dental implants. As a result, there is less need for adhesives since facial prosthesis retention and stability have significantly increased. Skin adhesives were frequently linked to adverse skin reactions and irritations, patient anxiety, and the degradation of prosthetic margins, which led to incorrect prosthesis alignment and repeated prosthesis application and removal.

The literature indicates that the long-term success rate of extraoral implants is comparable to that of dental implants used to restore individuals who are edentulous. The drawback of being shorter is offset by lower loading forces. The survival rates for implants placed and loaded in the mastoid region are above 95%, for orbital implants they are between 35% and 91%, and for nasal implants, they are between 71% and 81%. These rates vary according to the anatomic locations.

The results of implant application are influenced by three primary factors: Irradiation therapy, hygiene, and the quantity and quality of the bone. The absence of compact bone, which offers primary support at the moment of implant insertion, is closely linked to the lack of implant osseointegration. A grading system based on bone volume has been proposed by Jensen *et al.* for implants that are positioned correctly. They categorized the lateral and inferior orbital rim as a beta site with 4–5 mm of available bone for implantation and the superior orbital rim as a delta site with 3 mm of available bone for implantation. With at least 6 mm of accessible bone, the mastoid region was categorized as an alpha area.^[9,10]

These results, along with radiographic evaluations, indicate that 5.5-mm implants were used in the auricular area and 5-mm conical implants were used in the orbital and nasal regions.

To manage the development of sebum crusting, the health of the soft tissue surrounding the implant, and the integrity of the implant and retention system, the patient should be suitably motivated, informed, and monitored by a recall system every 6 months.^[7,11,12]

CONCLUSION

We believe that using prosthesis supported by implants to treat facial abnormalities was a successful outcome. The prosthesis has been successfully supported by the implants, which have demonstrated physical stability and satisfactory cosmetic and psychological outcomes.

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