Rehabilitation of a Craniofacial Defect using Extra-cranial Prosthesis
Nicholas Mathew¹, Suja Joseph², Angel Mary Joseph¹, Ashwin Thomas Koshy¹, Roshy George³

Contributors:
1PG Student, Department of Prosthodontics, Pushpagiri College of Dental Sciences, Medicity Campus, Thiruvalla, Kerala, India; 2Professor & HOD, Department of Prosthodontics, Pushpagiri College of Dental Sciences, Medicity Campus, Thiruvalla, Kerala, India; 3Senior Lecturer Department of Prosthodontics, KMCT Dental College, Mukkam, Kozhikode, Kerala, India.

Correspondence:
Dr. Mathew N. Department of Prosthodontics, Pushpagiri College of Dental Sciences, Medicity Campus, Thiruvalla - 689 107, Kerala, India. Phone: +91-9447411630. Email: nicholas1985kk@gmail.com

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Abstract:
Maxillofacial prosthodontics is one of the most challenging branches in dentistry. Whether congenital or acquired, the treatment of defects may improve his/her quality of life. This paper is a case report of a patient who had undergone cranioplasty on right forehead region following a surgical excision of meningioma. The patient reported to the department of prostho-dontics after the healing of cranioplasty wound, and hence, was not willing for further surgical intervention to correct the defect. Thus, it was decided to manage the defect through extra-cranial prosthetic rehabilitation. Among the numerous maxillofacial prosthetic materials, room temperature vulcanizing silicone material was selected for fabrication of the final prosthesis. Pigmentation and shade matching were done for improved aesthetics. The prosthesis tremendously improved her quality of life in terms of appearance and confidence. The face is the forefront of aesthetics and the restoration of the lost tissue is of benefit to the patient because of the social acceptance in the family as well as public.

Key Words: Acrylic resin framework, alginate impression material, cranioplasty, extra-cranial prosthesis, maxillofacial prosthesis, meningioma, prosthetic rehabilitation, room temperature vulcanizing silicone

Introduction
The mental anguish due to the unaesthetic appearance of cranial defects has a greater impact on patient's self-confidence along with physical trauma. Causes for craniofacial defect might include trauma, surgical resections for tumors, congenital anomalies, gunshot injuries, and burns.¹ Cranioplasty is a procedure for repairing such defects of the skull.² Its prolific outcome entails the procedure to follow an interdisciplinary approach including both surgical correction and prosthetic rehabilitation.³ An absence of interdisciplinary approach on right time may invite a compromise in treatment.

This is a case report which describes prosthetic rehabilitation of a cranial defect where extra-cranial prosthesis had to be given due to lack of timely interdisciplinary approach during cranioplasty.

Case Report
A 60-year-old female patient reported in the Department of Prosthodontics, with complaints of large defect on right forehead region following a surgical excision of meningioma with bony involvement and subsequent cranioplasty (Figure 1). The defect was 12 cm wide mesiodistally, 11 cm long superiorly-inferiorly, and 4.5 cm deep. The patient was dejected because of the defect, and the loss of confidence was reflected in her behavior. This situation arose due to improper planning and lack of interdisciplinary approach at the time of cranioplasty. Since the patient was not willing to undergo further surgical intervention to correct the defect using intra-cranial prosthesis, an extra-cranial maxillofacial prosthesis was planned.

After applying petroleum jelly on the remaining soft tissue and facial hair, an impression was made with irreversible hydrocolloid impression material. The defect region was covered with a thin plastic to avoid contact of the impression material with hair. Before setting of the alginate, cotton fibers were incorporated onto the surface, which provided mechanical retention for the rigid dental plaster (Type II gypsum product) that will support the alginate impression material in the form of a tray (Figure 2).

A cast was made using dental stone (Type III gypsum product). A wax pattern was made using modelling wax. The mesial, distal, inferior, and superior borders were marked on the cast with a lead pencil for further re-orientation of the wax pattern. During the next appointment, wax-up of the prosthesis was tried and assessed on the patient’s face. Corrections were made on the wax pattern to match with the contours of the face (Figure 3).

The wax pattern was invested into Type IV gypsum until the margin of the convex surface. Once set, the separating medium was applied. Then, the other surface was invested using Type III gypsum. Thus, the lower compartment of the mold was poured with, Type III gypsum and the upper compartment with Type IV gypsum. This helped in easy identification of the lower and upper compartments (Figure 4). After setting of gypsum, the mold was separated into upper and lower compartments.
Since it was planned to give an acrylic substructure to support the silicone material, adequate space for acrylic has to be created. The wax pattern was placed into the lower half and was carved to create enough space for the acrylic resin between the wax pattern and the upper compartment of the mold (Figure 5).

An acrylic framework was made over the wax pattern and colors were added to the monomer liquid so that the framework matches the skin tone of the patient. This was trimmed to the exact borders. Small holes were made all over the acrylic tray for mechanical interlocking of the silicone material to the framework (Figure 6).

V-shaped grooves were made on the borders of the lower half and the acrylic stops were extended into these grooves to maintain the tray in its original position during the closure of the upper compartment. Straight line grooves were also placed on the upper compartment for proper alignment of the upper compartment to the lower compartment (Figure 7).

The wax was removed from the mold and the acrylic tray was stabilized on the lower compartment using the acrylic stops at the borders. An irreversible hydrocolloid impression material was loaded over the acrylic tray, and the upper compartment was closed to check the availability of space for the silicone material to flow onto the acrylic frame (Figure 8). As space was found to be adequate, it was decided to proceed with the incorporation of silicone material into the prosthesis.

Room temperature vulcanizing, medical grade silicone material was intrinsically stained to match with the patient’s skin tone. It was adapted over the acrylic framework and the upper lid was closed in such a way that the grooves were oriented properly. Then, the upper and lower halves were tied together so that no distortion occurs until the material sets. It was cured for 24 h.
The prosthesis was finished and attached to a headband for retention. Artificial hair was fixed on to the silicone material using adhesives to improve the appearance (Figure 9). The fit of the prosthesis was checked on the patient’s head and the final corrections were done. The prosthesis was well fitting into the craniofacial defect and it improved the patient’s confidence as well as self-esteem (Figure 10).

**Discussion**

The rehabilitation of cranial defect with extra-cranial prosthesis is not much documented in the literature as the most common method followed is intra-cranial prosthetic rehabilitation. Combined surgical and prosthetic intervention would provide good results for the rehabilitation of cranial defects. Situations with a lack of prompt consultation between the surgeon and prosthodontist during cranioplasty would necessitate rehabilitation of the entire defect with extra-cranial prosthesis. As the old saying “A stitch in time saves nine.”

The physical and mechanical properties of the material used for the fabrication of maxillofacial prosthesis influence success, of prosthodontic treatment. The materials commonly used for fabrication of facial prosthesis are acrylic resins, acrylic copolymers, vinyl polymers, polyurethane elastomers, and silicone elastomers. However, none of them fulfill all the requirements for a satisfactory prosthesis.

The flexibility, good surface texture and life-like appearance of silicone make it the most widely used material for fabrication of maxillofacial prosthetic material. Recently, Computer Aided Design and Computer Aided Manufacturing system for fabrication of oral and maxillofacial prosthesis is being used. However, its complexity, cost and non-availability at many centers is a limitation.

This article describes the extra-cranial prosthetic rehabilitation of a defect in the forehead region of women following a surgical excision of tumor and ensuing cranioplasty. Although the literature states several methods to retain the prosthesis such as biocompatible adhesives, mechanical methods engaging into...
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anatomical undercuts, use of straps and headbands, magnets or osseointegrated implant retained titanium screws, a headband was used as a retentive aid in this case. Using a headband is an easier and non-invasive method with minimal financial burden.

The final prosthesis was well accepted by the patient and had a positive effect on her quality of life in terms of confidence and overall appearance.

Results
The prosthesis tremendously improved her quality of life in terms of appearance and confidence.

Conclusion
The face is the forefront of aesthetics. The surgical intervention for tumors or any other anomalies have a serious impact on the individual’s aesthetics and can cause psychological trauma. When interdisciplinary approach is not followed during cranioplasty, the situation might necessitate the prosthetic rehabilitation of entire defect. Here, an attempt was made to rehabilitate the patient with cranial defect using the extra-cranial prosthesis. The restoration of the lost tissue is of benefit to the patient because of the social acceptance in the family as well as public.

References