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Case Report

Prosthetic rehabilitation of midface defect using two hollow component magnet retained silicone prosthesis: Case report

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ABSTRACT

Body abnormalities that compromise form, function or aesthetics can make an individual incapable of leading a relatively normal life. Facial disfigurement may occur as a result of a congenital anomaly, trauma or tumor surgery. The defects can be rehabilitated surgically or with the help of prosthesis. Many situations due to size or the location of defect or because of patient's medical condition, surgical reconstruction is not possible. In these cases rehabilitation is done using maxillofacial prosthesis. This case report describes a complete prosthetic rehabilitation of mid face defect secondary to surgery. The intraoral maxillary defect was rehabilitated using velopharyngeal prosthesis and extraoral cheek defect was corrected using custom made two component hollow silicone prosthesis. The rehabilitation restored mastication, speech, swallowing, aesthetics as well as social and psychological status of the patient.

1. Introduction

Surgical resection often is a standard practice in carcinoma management, the area of resection may include maxilla, mandible, teeth, hard palate, soft palate, nasal and orbital contents which results in a large facial defect.[1] In most of the cases midfacial defects have an intra-oral communication. Marunick et al[2] have classified mid-facial defects into two categories: midline defect that includes nose and may also include the upper lip; lateral defects, which include orbital and cheek parts. Also, a combinations of these categories may also be found. These defects can be managed by surgical reconstruction or prosthetic rehabilitation using facial prosthesis. But reconstruction of large facial defects still remains a challenge, irrespective of recent advances in surgical reconstruction methods. The risk of recurrence and the use of radiation therapy generally complicates the procedure and add further challenges to the reconstruction.[3] Therefore, prosthetic rehabilitation is the treatment of choice in such cases. If further excision is required, replacement of the prosthesis is a relatively feasible procedure.[4] In addition, facial prostheses also provides an appropriate alternative solution for the large mid-facial defects to rehabilitate the form, function and aesthetics.[5,6]

Though many materials are available, but with the advent of silicone has brought us a material that almost meets the requirements of ideal prosthetic material as mentioned by Bulbulian.[7] This case report describes prosthetic rehabilitation of a large midfacial defect with a magnet retained combined two piece acrylic resin-silicone facial prosthesis and rehabilitation of intraoral defect with velopharyngeal prostheses.

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2. Case Report

A 68-year-old, male patient was referred from department of reconstructive surgery for orofacial rehabilitation. On evaluation patient had a medical history of squamous cell carcinoma for which he underwent partial maxillectomy right side followed by radiation therapy four years back. Carcinoma recurred around one year back for which partial mandibulectomy right side including ramus, condyle and part of body was carried out. Also radical neck dissection and reconstruction using Pectoralis Major Myocutaneous(PMMC) flap was done. Multiple attempts for reconstruction were made for reconstruction but none turned successful. On examination patient had an asymmetric face with complete soft tissue defect of right cheek (Figure 1). The dentition was compromised with multiple missing teeth in maxillary and mandibular arch on the right side (Figure 2). The defect of the hard palate (18mm x 10mm) in size extended posteriorly and was lined by split thickness skin graft which was evident with hair follicles present in the grafted region. On evaluation of soft palate the defect extended till midline of the soft palate. Resection resulted in restricted mouth opening, orofacial communication causing escape of food and fluids, so a nasogastric feeding tube was inserted.

Fig. 1: Pre op extraoral showing midfacial defect

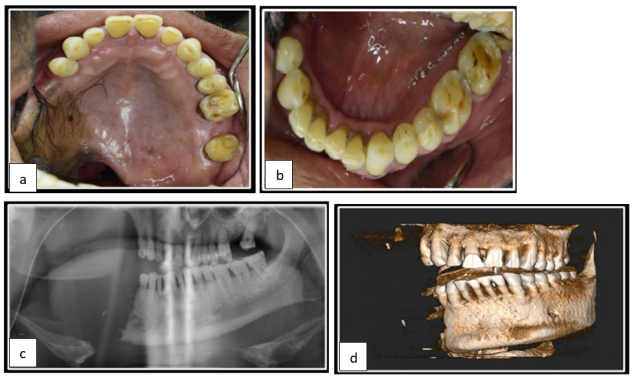

Fig. 2: Pre-op intraoral features **a)**: Maxilla, **b)**: Mandible, **c)**: Orthopantomograph **d)**: CBCT

After precise evaluation of the case, the diagnosis included midfacial defect – cheek right side, subtotal maxillectomy right side (Armany's Class II), hemi-mandibulectomy right side(Cantor & Curtis class II) with velopharyngeal insufficiency secondary to surgical resection was made. The proposed treatment plan was to construct magnet retained two piece combination prosthesis having hollow acrylic resin framework and a silicone facial prosthesis. The purpose of fabrication of this two piece prosthesis was to help distribute the weight of prosthesis and also enhance retention with magnets.

In the phase 1, an interim velopharyngeal prosthesis was fabricated. Primary impressions of maxillary and mandibular arch were made with irreversible hydrocolloid (Algitex, DPI, India) and casts were poured by using Type III dental stone (Kalabhai, India). A custom tray was fabricated using Polymethylmetacrylate (DPI, India) and functional impression of the maxillary defect was made using compound impression and light body consistency (Affinis, Coltene, whaledent) impression material (Figure 3 a). All conventional clinical and lab procedures were followed. Finished interim velopharyngeal prosthesis was inserted in situ(Figure 3 b) and evaluated for retention, support, stability, esthetics and phonetics. Also, final evaluation to check for complete closure of defect a nasopharyngoscopy was carried out(Figure 3 c). It confirmed close approximation of distal surface of prosthesis and anterior pharyngeal wall.

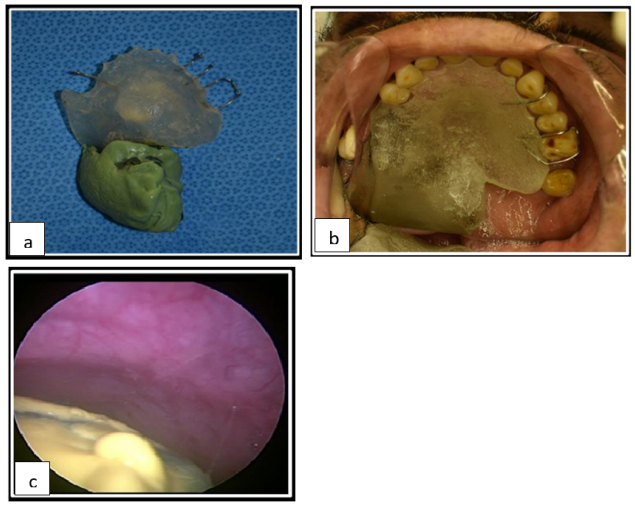

Fig. 3: a): Final impression of maxillary defect, **b)**: Velopharyngeal prosthesis in situ, **c)**: Nasopharyngoscopy performed to check close approximation of distal surface of prosthesis and pharyngeal wall

Impression of the maxillofacial defect was made using elastomeric impression material with putty consistency (Affinis, Coltene, whaledent) (Figure 4 a). A putty index of the orofacial communication was made. The putty index was placed in a duplication flask where duplication procedure was carried out using reversible hydrocolloid material. After complete setting of reversible hydrocolloid material the putty index was safely retrieved and the mould

formed was filled with molten modelling wax (DPI, India). The assembly was left for one hour for bench cooling. The wax pattern formed in the mould was retrieved and invested in a flask using dental stone (Kalabhai, India). Dewaxing procedure was carried out and packing was completed with clear heat cure polymethyl methacrylate using slat bag technique (Figure 4 b) to fabricate hollow prosthesis(Figure 4 c). Curing cycle was completed and the acrylic prosthesis was split into two components – an intraoral and an extraoral component. The resin components were trimmed, finished and were adjusted clinically.

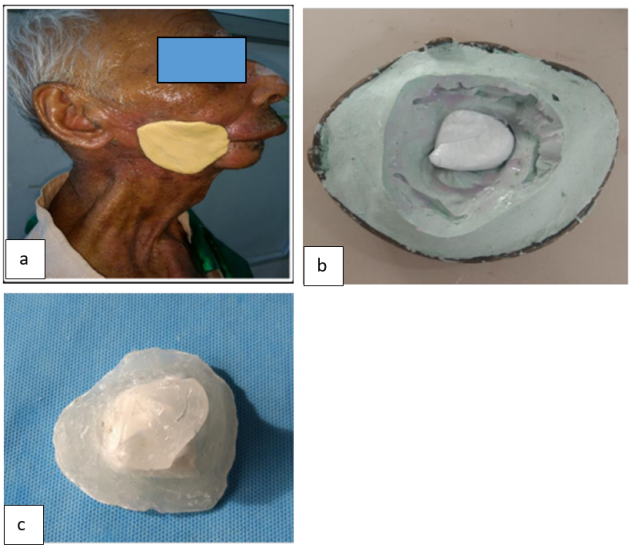

Fig. 4: a): Customized impression of extraoral defect, **b)**: Salt bag used for making hollow substructure prosthesis, **c)**: Extraoral prosthesis substructure

The treatment plan was to design an acrylic intraoral cheek component which was attached to extraoral cheek component using magnets. Total eight Cobalt-Samarium magnets, 1.5 mm in thickness and 2mm diameter (Jobmasters, Randallstown, MD, USA)[6] were used. Four magnets were embedded in acrylic framework of intra oral component using autopolymerising polymethyl methacrylate (DPI, India). (Figure 5) Orientation marks were placed on both components after clinical try-in. Then complementary connection between magnets was made by placing the magnets with the opposite pole on the intraoral component and were picked up on the extraoral component using autopolymerising PMMA.

For facial aesthetics siliconization of extraoral component was planned. An impression of the facial defect was made using irreversible hydrocolloid and later supported with dental plaster (Kalabhai, India). Later wax pattern was fabricated over the extraoral cheek acrylic component for extraoral prosthesis using modelling wax and tried in situ. The silicone prosthesis was then fabricated following conventional technique of investing,

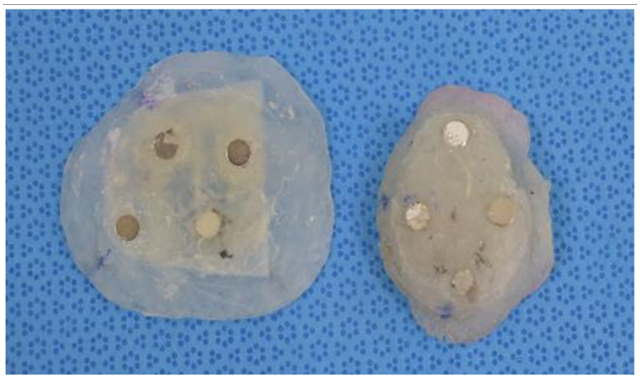

Fig. 5: Fabrication of intraoral and extraoral cheek components and attaching magnets on them

dewaxing and packing with room temperature vulcanizing silicone(Copsil T-30TN, COP, France). The wax pattern was flasked using diestone (Ernst Hinrichs GMBH, Goslar, Germany) to form a mold for packing the silicone. Dewaxing was performed. Laminar intrinsic staining was carried out in packing according to the patient's skin color, using intrinsic stains (Silicone intrinsic coloring kit; Factor II, USA). Mixing, packing and processing of silicone was completed following all manufacturer's guidelines. Characterization of prosthesis was completed using extrinsic colours (Technovent, UK). The insertion of the whole assembly was completed by placement of intraoral component of cheek prosthesis and placement of extraoral component which was attached to intraoral component with the help of magnets. The intraoral component was attached to the obturator using a die pin to offer more stability to the complete assembly (Figure 6). A 6-month periodic recall appointment was advisable for assessment of the prosthesis (retention, stability and support) and the supporting tissues. A comprehensive prosthetic rehabilitation not only improved function, form and aesthetics but also remarkably improved the confidence, psychological attitude and social acceptance of the patient (Figure 7).

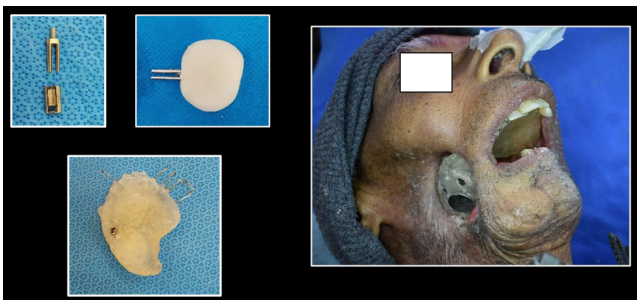

Fig. 6: Dowel pin system used to combine velopharyngeal prosthesis with extraoral component substructure

Fig. 7: Post op view showing closure of defect

3. Discussion

Large orofacial defects that result in serious functional and cosmetic deformity often has a significant psychological impact on the patient. The case report in this study had loss of right midfacial tissues secondary to surgical resection. Acceptable results were obtained with facial prosthesis. But, retention of such a large prosthesis is challenging, and only with ingenuity and an understanding of the remaining anatomic structures, combination prosthesis that mutually retain one another can be constructed, as was done in this case. Various other methods of auxiliary retention for facial prostheses which have been described in the literature that includes eyeglasses, tissue undercuts, magnets, adhesives, and combinations of the above.[8]

In this case the retention of prosthesis was enhanced by making light-weight PMMA hollow resin substructure along with magnets embedded in it to facilitate better mutual retention. Medical grade silicone adhesive also added to retention of the prosthesis. Clinically significant vertical mobility or sinking down of the prosthesis during functional movements was also not found in this case due to the distribution of weight and stabilizing the internal component to the velopharyngeal prostheses.[9] Maintaining hygiene of the prosthesis is important for the health of soft tissue underneath the prosthesis and for preserving the prosthesis itself in a good condition. Silicone materials are more difficult to clean than resins as these materials are permeable so are more susceptible to microbial colonization.[10] Water and neutral soap, together with gentle brushing using a soft nylon bristles have been recommended.[11] The use of Chlorhexidine has proved as an excellent method of disinfection, in this case prosthesis was cleaned using 4 percent chlorhexidine immersion for 1 minute everyday followed by rinse with water.[12] Multiple studies highlight that the use of disinfecting agents and rigorous cleaning adversely affects the physical properties of silicone material.[13 14]

4. Conclusion

Prosthetic rehabilitation of large facial defects is a challenging task which requires critical understanding of available anatomic structures, prosthetic materials and prosthesis designs to achieve maximum retention, stability, and esthetics. In this case maxillary defect was rehabilitated using velopharyngeal prosthesis. The extraoral cheek defect was corrected using custom-made two component hollow acrylic substructure which made the prosthesis light in weight and the components were retained using magnets making its placement and use very easy for elderly patient. Also, joining the intraoral component of facial prosthesis with velopharyngeal prosthesis improved retention and stability of prosthesis during all functional movements. Use of maxillofacial silicon gave a life like appearance to the prosthesis and immensely improved form, function and esthetics.

5. Source of Funding

None.

6. Conflict of Interest

None.

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